Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

B. Tech. Computer Science Engineering

2nd Year, Semester-III

BEC-301: Digital Logic Design

L	T	P	Credit-4
3	1	**0**	

Unit-I **08 Hours**

Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.

Floating point representation, Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine McClusky method (Tabular method).

Unit-II **08 Hours**

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers.

Unit-III **08 Hours**

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift registers, ripple counter, synchronous counter, and other counters.

Unit-IV **08 Hours**

Memory and programmable logic: RAM, ROM, PLA, and PAL.

Design at the register transfer level: ASMs, design example, design with multiplexers.

Unit-V **08 Hours**

Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table ,race free state assignment, hazards.

Text Book:

M. Morris Mano and M.D. Ciletti, "Digital Design", 4th Edition, Pearson Education

BAS-301: MATHEMATICS-III

L T P **Credit-4**

3 1 **0**

Unit - I: Function of Complex variable **08 Hours**

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type and $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ $\int_{-\infty}^{\infty} f(x)\, dx$

Unit - II : Statistical Techniques - I **08 Hours**

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non -linear and multiple regression analysis, Probability theory.

Unit - III : Statistical Techniques - II **08 Hours**

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.

Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, , R, p, np, and c charts.

Unit-IV:Numerical Techniques-I **08 Hours**

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit-V:NumericalTechniques-II **08 Hours**

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous)equations by Euler's, Picard's and forth-order Runge- Kuttamehthods.

Test Books:-

1. Peter V. O' Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.

2. Jain, Iyenger & Jain, Numerical Methods for Scientific Computation, New Age International, New Delhi , 2003.

3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd., 2000.

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya,1996.
3. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.

BCS-301: DATA STRUCTURES USING - C

L T P **Credit-4**

3 1 0

Unit-1 **08 Hours**

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT)

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

Unit-II **08 Hours**

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion .

Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit-III **08 Hours**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit-IV **08 Hours**

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

Unit-V **08 Hours**

Searching: Sequential search, Binary Search, Comparison and Analysis.

Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

Text books and References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI

2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication

3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill

4. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education

5. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

6. G A V Pai, "Data Structures and Algorithms", TMH

BCS-302: DISCRETE MATHEMATICAL STRUCTURES

L T P **Credit-4**

3 1 **0**

Unit-I **08 Hours**

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter - example, Proof by contradiction.

Unit-II **08 Hours**

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III **08 Hours**

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices - Bounded, Complemented, Modular and Complete lattice.

Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV **08 Hours**

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference.

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V **08 Hours**

Trees: Definition, Binary tree, Binary tree traversal, binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar Graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms,

Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

References Book:

1. Koshy, Discrete Structures, Elsevier Pub. 2008

2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.

3. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.

4. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.

5. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004.

6. Jean Paul Trembley, RManohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill, Inc. New York, NY, 1975.

BCS-303: Web technology

L T P **Credit-4**

3 1 **0**

Unit I: **08Hours**

Introduction & Web Develop. Strategic: Introduction Web Technology, History of Web ,Protocols governing Web, Creating Websites for Individual & Corporate World, Cyber Laws, Web application, Writing Web Projects, Identification of Objects, Web Team, Planning & Process Development

Unit II: **08Hours**

HTML, XML & SCRIPTING LANGAUGE: List, Tables, Images, Forms, Frames, CSS, Document type Definition, XML Schemes, Object Models, Presenting XML, Processing: DOM & SAX, Introduction of Java Script, Object in Java Script, Dynamic HTML with Java Script

Unit III: **08Hours**

JAVA BEANS & WEB SERVERS: Introduction of Java Beans, Java Beans Advantage & properties, BDK, Introduction of EJB, Java Beans API, Introduction to Servlets, Life Cycle of Servlet & JSDK, Servlet API, Servlet Packages: HTTP Package, Working with HTTP Request &Response, Security Issues.

Unit IV: **08Hours**

JAVA SERVER PAGES: Introduction of JSP,JSP Processing, JSP Application Design, Tomcat Server, Implicit JSP Objects, Conditional Processing, Declaring Variable & Methods, Error Handling & Debugging, Sharing Data b\w JSP pages-sharing Session, Sharing Data b\w JSP pages-sharing Application Data.

Unit V: **08Hours**

DATABASE CONNECTIVITY: Database Programming using JDBC, Studying Javax.sql.*, Accessing a database from JSP pages, Application -specific Database Action, Developing Java Beans in a JSP page, Introduction of struts frame work.

Reference Books:

1. Patrick Naughton and Herbertz Schildt, “J ava-2 The Complete Reference” 199, TMH.
2. Shelley Powers, “Dynamic Web Publishing” 2nd Ed. Techmedia, 1998.
3. Ivor Horton, “Beginning Java-2” SPD Publication
4. Jason Hunter, “Java Servlet Programming” O’Reilly

BEC-351: Logic Design Lab

L T P **Credit-1**

0 0 2

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of $V_{cc}$and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project.

BCS-351: Data Structure Lab

L T P **Credit-1**

0 0 3

Write Program in C or C++ for following.

1. Array implementation of Stack, Queue, Circular Queue, List.
2. Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4. Implementation of Searching and Sorting Algorithms.
5. Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm

BCS-353: Web Technology Lab

L	T	P	Credit-1
0	0	2	

EXPERIMENTS:

1. Create a web page with the following using HTML

   i) To embed an image map in a web page

   ii) To fix the hot spots

   iii) Show all the related information when the hot spots are clicked.

2. Create a web page with all types of Cascading style sheets.

3. Client Side Scripts for Validating Web Form Controls using DHTML

4. Write programs in Java to create applets incorporating the following features:

   - Create a color palette with matrix of buttons
   - Set background and foreground of the control text area by selecting a color from color palette.
   - In order to select Foreground or background use check box control as radio buttons
   - To set background images

5. Write programs in Java using Servlets:

   - To invoke servlets from HTML forms
   - To invoke servlets from Applets

6. Write programs in Java to create three-tier applications using JSP and Databases

   - for conducting on-line examination.
   - for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

7. Programs using XML - Schema - XSLT/XSL

8. Programs using AJAX

9. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.

BCS-352: Numerical Techniques Lab

L T P **Credit-1**

0 0 2

Write Programs in 'C' Language:

1. To deduce error envolved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using
3. Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the
4. rate of convergence of roots in tabular form for each of these methods.
5. To implement Newton's Forward and Backward Interpolation formula.
6. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's
7. Interpolation formula
8. To implement Newton's Divided Difference and Langranges Interpolationformula.
9. To implement Numerical Differentiations.
   a. To implement Numerical Integration using Trapezoidal, Simpson1/3 andSimpson3/8 rule.
   b. To implement Least Square Method for curve fitting.
   c. To draw frequency chart like histogram, frequency curve and pie-chart etc.
   d. .To estimate regression equation from sampled data and evaluate values of
      i. standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two
      ii. independent variables.

2nd Year, Semester-IV

Departmental Elective-I

1. BCS -041 Software Testing
2. BCS -042 Software Reliability
3. BCS -043 Software Quality Engineering
4. BCS-044 Principal of Programming Language
5. BCS-045 Management Information System

Department Elective-I

BCS-041: Software Testing

L T P **Credit-4**

3 1 **0**

Unit-I: Introduction **08 hours**

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing **08 hours**

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing **08 hours**

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing **08 hours**

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation **08 hours**

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, testing in Object Oriented Systems.

Reference Books:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

BCS-042: Software Reliability

L T P **Credit-4**

3 1 **0**

UNIT-I: Introduction **08 hours**

Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics **08 hours**

Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models **08 hours**

Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models **08 hours**

Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal ReliabilityAllocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques **08 hours**

Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

Reference Books:

1. John Musa, "Software Reliability Engineering", McGraw-Hill

2. Fenton, and P fleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press

3. Jeff Tian, Software Quality Engineering (SQE), Wiley.

BCS-043: Software Quality Engineering

L T P **Credit-4**

3 1 **0**

UNIT-I: Introduction **08 hours**

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics **08 hours**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer SatisfactionMetrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models **08 hours**

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance **08 hours**

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing: **08 hours**

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Reference Books:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley

2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

BCS-044: Principal of Programming Languages

L T P **Credit-4**

3 1 **0**

UNIT I **08 hours**

Program Design: Introduction- fundamental Design Concepts - Modules and Modularization Criteria Design notation: Procedure Template, Pseudo Code - Structured Flow Chart - Decision Tables- Designt echniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans- Design Guidelines. Implementation Issues: Introduction - Structured Coding techniques: single entry and single exit constructs, Efficiency consideration, Validation of single entry and single exit, Coding Style.

UNIT II **08 hours**

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues. Programming Language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

UNIT III **08 hours**

Data types: Properties of types and objects - elementary data types - structured data types. Abstraction: Abstract data types - encapsulation by subprograms - type definition – storage management.

UNIT IV **08 hours**

Sequence Control: Implicit and explicit sequence control - sequencing with arithmetic and non arithmetic expressions - sequence control between statements. Subprograms Control: Subprogram sequence control - attributes of data control - shared data in.

UNIT V **08 hours**

Object Oriented Programming: The class notion - Information hiding and data abstraction using classes, derived classes and inheritance, Polymorphism, Parameterized types. Logic Programming: Formal logical systems - PROLOG. Functional Programming: Features of functional languages - LISP - Applications of functional and logic programming languages.

BOOK

1. Richard Fairley," Software Engineering Concepts", Tata Macgraw Hill, 2006 (UNIT I)

2. Terrance W. Pratt, and Marvin V. Zelkowitz, "Programming Languages, Design and Implementation", Prentice-Hall of India, Fourth edition, 2002 (UNIT II to V)

REFERENCES

1. Ravi Sethi, "Programming Languages - Concepts and Constructs", Addison-Wesley, Second edition, 1996.

2. Allen B. Tucker, Robert Noonan, Programming Languages: Principles and Paradigms, Tata McGraw-Hill, 2006.

3. E. Horowitz, "Fundamentals of Programming Languages", Galgotia Publishers, 1984.

4. A.B. Tucker, Robert, Noonan, "Programming Languages", McGraw-Hill, 2002.

5. Robert W. Sebesta, "Concepts of Programming Languages", Addison Wesley, Sixth edition, 2003.

BCS-045: Management Information System

L T P **Credit-4**

3 1 0

UNIT I **08 hours**

INFORMATION SYSTEM AND ORGANIZATION

Matching the Information System Plan to the Organizational Strategic Plan – Identifying Key Organizational Objective and Processes and Developing an Information System Development User role in Systems Development Process - Maintainability and Recoverability in System Design.

UNIT II **08 hours**

REPRESENTATION AND ANALYSIS OF SYSTEM STRUCTURE

Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) - Information Flow - Process Flow - Methods and Heuristics - Decomposition and Aggregation - Information Architecture - Application of System Representation to Case Studies.

UNIT III **08 hours**

SYSTEMS, INFORMATION AND DECISION THEORY

Information Theory - Information Content and Redundancy - Classification and Compression Summarizing and Filtering - Inferences and Uncertainty - Identifying Information needed to Support Decision Making - Human Factors - Problem characteristics and Information System Capabilities in Decision Making.

UNIT IV **08 hours**

INFORMATION SYSTEM APPLICATION

Transaction Processing Applications - Basic Accounting Application - Applications for Budgeting and Planning - Other use of Information Technology: Automation - Word Processing - Electronic Mail Evaluation Remote Conferencing and Graphics - System and Selection - Cost Benefit Centralized versus Decentralized Allocation Mechanism.

UNIT V **08 hours**

DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS

Systems analysis and design - System development life cycle - Limitation - End User Development Managing End Users - off- the shelf software packages - Outsourcing -Comparison of different methodologies.

REFERENCES BOOK

1. Laudon K.C, Laudon J.P, Brabston M.E, "Management Information Systems - Managing the digital firm", Pearon Education, 2004.

2. Turban E.F, Potter R.E, "Introduction to Information Technology"; Wiley, 2004.

3. Jeffrey A.Hoffer, Joey F.George, Joseph S. Valachich, "Modern Systems Analysis and Design", Third Edition, Prentice Hall, 2002.

BCS-401: Software Engineering

L T P **Credit-4**

3 1 **0**

Unit I **08Hours**

Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Water fall Model, Spiral Model, Feasibility Analysis, Technical Feasibility, Cost Benefit Analysis, COCOMO model.

Unit II **08Hours**

System Requirement Specification-DFD, Data Dictionary, ER diagram, Process Organization &Interactions. System Design- Problem Partitioning, Top down and Bottom Up design; Decision tree, decision table and structured English; Functional vs. Object Oriented approach.

Unit III **08Hours**

Coding & Documentation Structured Programming, OOPS Programming, Information Hiding, Reuse, System Documentation. Testing - Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment. , Validation & Verification Metrics, Monitoring & Control.

Unit IV **08Hours**

Software Project Management - Project Scheduling, Staffing, Software Configuration Management.

Unit V **08Hours**

Quality Assurance, Project Monitoring. CASETOOLS: Concepts, use and application.

Reference Books:

1. R.G.Pressman-Software Engineering, TMH
2. Behforooz, Software Engineering Fundamentals, OUP
3. Ghezzi, Software Engineering, PHI
4. Pankaj Jalote-An Integrated Approach to Software Engineering, NAROSA.
5. Object Oriented & Classical Software Engineering (Fifth Edition),SCHACH,TMH

BCS-402: Computer Organization &Design

L T P **Credit-4**

3 1 0

Unit-I **08 Hours**

Introduction: Number representation; fixed and floating point number representation, IEEE standard for floating point representation. Error detection and correction codes: Hamming code. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer.

Unit-II **08 Hours**

Central Processing Unit: Addition and subtraction of signed numbers look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general registers organization, stack organization and addressing modes.

Unit-III **08 Hours**

Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc) , micro-operations, execution of a complete instruction.

Hardwire and micro programmed control: microprogramming sequencing, wide branch addressing, and microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.

Unit-IV **08 Hours**

Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories.

Cache Memories: concept and design issues 9 performance, address mapping and replacement)

Auxiliary Memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.

Unit-V **08 Hours**

Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions.

Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access.,I/O channels and processors.

Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Reference Books

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. William Stalling, " Computer Organization", PHI
3. Vravice, Hamacher & Zaky, "Computer Organization", TMH
4. Mano," Computer System Architecture", PHI
5. John P Hays, " Computer Organization", McGraw Hill
6. Tannenbaum," Structured Computer Organization', PHI
7. P Pal chaudhry, ' Computer Organization & Design', PHI

BCS-403: Data Base Management System

L T P **Credit-4**

3 1 0

Unit-I **08 Hours**

Introduction: An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure.

Data modeling using the Entity Relationship Model:

ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationship of higher degree.

Unit-II **08 Hours**

Relational data Model and Language: Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands.SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PLSQL

Unit-III **08 Hours**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV **08 Hours**

Transaction Processing Concept: Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Distributed Database: distributed data storage, concurrency control, directory system.

Unit-V **8 Hours**

Concurrency Control Techniques: Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple Granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.

Reference Books

1. Date C J, " An Introduction to Database Systems", Addision Wesley
2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fudamentals of Database Systems", Addision Wesley O'Neil, Databases, Elsevier Pub.
4. Leon & Leon, "Database Management Systems", Vikas Publishing House
5. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publication

BCS-404: Theory of Automata and Formal Languages

L T P **Credit-4**

3 1 **0**

Unit–I **8 Hours**

Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, My hill-Nerode Theorem .

Unit-II **8 Hours**

Regular expression (RE), Definition, Operators of regular expression and The precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit-III **8 Hours**

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit-IV **8 Hours**

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Unit–V **8 Hours**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem,

Introduction to Undesirability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

Text Books and References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education

2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI

3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH

4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

BCS-451: Software Engineering Lab

L T P **Credit-1**

0 0 2

1. Program for configuration Management.

2. Perform SA/SD for the following software.

- Hotel Automation System
- Book Shop Automation Software
- Word processing Software
- Software Component Cataloguing Software.

3. Design and development of test cases for testing.

4. Writing program in Java for Computing Cyclomatic Complexity.

5. Development of Software t ool for Halstead Analysis.

6. Perform Cost/Benefit analysis.

7. Illustration of various activities of Software development using MS Project 2000.

8. Lab exercise involving development of various practical applications using software Like VJ++VB, SYBASE, JDK.

[Students are to be given a major assignment t to be completed using one or more of these tools, Student's exposure to any CASE tool is desirable]

9. Case Studies: Payroll System, Banking System, Purchase Order System, Library Management System, Railway Reservation System, Bill Tracking System, College Admission System, State management System.

BCS-452: Computer Organization LAB

L	T	P	Credit-1
0	0	2	

1. Bread Board Implementation of Flip-Flops.
2. Experiments with clocked Flip-Flop. Design of Counters.
3. Bread Board implementation of counters & shift registers.
4. Implementation of Arithmetic algorithms.
5. Bread Board implementation of Adder/Subtractor (Half, Full)
6. Bread Board implementation of Binary Adder.
7. Bread Board implementation of Seven Segment Display.
8. Institute may also develop the experiment based on the infrastructure available with them.

BCS-453: DBMS LAB

L T P **Credit-1**

0 0 3

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations (=,<,>,etc)
3. Write SQL queries using SQL operators
4. Write SQL query using character, number, date and group functions
5. Write SQL queries for relational algebra
6. Write SQL queries for extracting data from more than one table
7. Write SQL queries for sub queries, nested queries
8. Write a programme by the use of PL/SQL
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS
10. Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS

Note:

1. The queries to be implemented on DBMS using SQL
2. Students are advised to use Developer 2000/Oracle9i or other latest version for above experiments.. However student may use Power Builder/SQL SERVER .Mini Projects may also be planned & carried out throughout the semester to understand important concepts of database.

BCS-454: Principal of Programming Language LAB

L T P **Credit-1**

0 0 2

1. Introducing Turbo C++ Compiler and its environment / Linux Environment
2. A Sample C program. Some problems related formatted strings.
3. Write a program to convert centigrade to Fahrenheit. [F = 9/5 * C + 32]
4. Write a program that calculates the area of a circle and circumference.
5. Write a program that calculates the area of a triangle.
6. Write a program that reads the marks in each subject and calculates the percentage.
7. Write a program that reads a number and identifies whether the given number is even or odd.
8. Write a program to find the largest number among two numbers
9. Write a program to read the mark of a subject and prints the equivalent grade.
10. Write a program to read a sentence and counts the total number of character (excluding space) using while loop.
11. Write a program to generate Fibonacci number using do while loop.
12. Write a program to read number and identifies whether the given number is a prime number ornot.
13. Write a program to identify whether the given number is a perfect number or not. 28 is a perfect number.
14. Write a program to calculate the factorial of a given number.
15. Write a program to identify whether the given number is a perfect number or not using a function. 28 is a perfect number.
16. Write a program to evaluate GCD of two given integers. Use function that returns GCD.
17. Write a recursive program to find the factorial of a given number.
18. Write a recursive program to find a GCD of two numbers.
19. Write a recursive program to find the sum of n natural numbers.
20. Write a C program to store N numbers in a one dimensional array and calculate its average with the help of the function.
21. Write a C program to convert a binary number to decimal with the help of the function.

    [*Inttodecimal (char bits[20], int length)]* here *bits* is the character array to represent bits of binary numbers and *length* is the number of bits in the binary number.
22. Write a program to evaluate transpose of n by n matrix with the help of function.

    [*int [][20] transpose(int matrix[][20],n*] here *matrix is* the matrix is the to be transformed and *n* is the dimension of *matrix*. The function should return transpose of the matrix.

23. Write a C program for matrix addition with the help of function

[*int [][20] add(int a[][20], int b[][20], int n, int m)*] Here *a* and *b* are matrix to be added and *n* and *m* are dimension of *a* and *b*. the function should return *m* by *n* matrix containing the addition data.

3rd Year, Semester-V

Departmental Elective-II

1. BCS -051 Graph Theory & Combinatorics
2. BCS -052 Mobile Computing
3. BCS -053 Software Project Management
4. BCS-054 E-Commerce Technology
5. BCS-055 Microprocessor

Department Elective-II

BCS-051: Graph Theory and Combinatory

L T P **Credit-4**

3 1 0

Unit –I **08 hours**

Introduction to graphs - definitions - sub graphs - paths and cycles - matrix representation of graphs Euler tours - Chinese postman problem planar graphs Euler's formula platonic bodies applications of Kuratowski's theorem - Hamiltonian graphs - graph coloring and chromatic polynomials – map coloring.

Unit –II **08 hours**

Trees - definitions and properties - rooted trees - trees and sorting - weighted trees and prefix code biconnected components and articulation points - the max-flow min-cut theorem - maximum bipartite matching - Matching's' and augmenting paths -the personal assignment problem – Networks flows and cuts - ford and Fulkerson algorithm - separating sets.

Unit- III **08 hours**

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit- IV **08 hours**

Fundamental principles of counting permutations and combinations binomial theorem combinations with repetition combinatorial numbers principle of inclusion and exclusion derangements arrangements with forbidden positions.

Unit –V **08 hours**

Generating functions partitions of integers the exponential generating function the summation operator - recurrence relations first order and second order non-homogeneous recurrence relations method of generating functions.

Reference Books:

1. Corman T.H., Leiserson C.E. & Rivest R.L., Introduction to Algorithms, Prentice Hall India.

2. Mott J.L., Kandel A. & Baker T.P, Discrete Mathematics for Computer Scientists and arithmeticians, Prentice Hall of India.

3. Liu C.L., Elements of Discrete Mathematics, McGraw Hill.

4. Rosen K.H., Discrete Mathematics and Its Applications, McGraw Hill.

BCS-052: Mobile Computing

L T P **Credit-4**

3 1 0

Unit – I **08 hours**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II **08 hours**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit - III **08 hours**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV **08 hours**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit - V **08 hours**

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Reference Books:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley.
4. . Upadhyaya, "Mobile Computing", Springer

BCS-053: Software Project Management

L T P **Credit-4**

3 1 0

UNIT-I: Introduction and Software Project Planning **08 hours**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling **08 hours**

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control **08 hours**

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing **08 hours**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.

UNIT-V: Project Management and Project Management Tools **08 hours**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Reference Books:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

BCS-054: E-Commerce Technology

L T P **Credit-4**

3 1 **0**

UNIT I **08 hours**

Internet Concepts: WWW, Internet and E-Commerce, Linking to the Internet, Internet Address, Internet Tools- Information Retrieval tools (ftp, Gopher),Communication Tools(Email, FTP, Telnet, Usenet), Multimedia Information Tools(Home page), Information Search Tools(Archie, Veronica, WAIS). Domain Name System.

Intranet and Extranet: Intranet, Intranet vs. Groupware, Intranet Hardware, Intranet Software, Intranet Services (Web (HTTP) Publishing, HTML, Hypertext), Communication Systems (Email, Fax), Software used in Electronic mail, Electronic Meeting Systems (Audio conferencing, Video Conferencing, Groupware), Extranet.

UNIT II **08 hours**

Working of the internet with TCP/IP: Origin of TCP/IP.,TCP/IP communication architecture, Internet Architecture, Working of TCP/IP,TCP/IP Applications-FTP, Telnet, Trivial File Transfer Protocol, Simple Mail Transfer Protocol, Network File System. TCP/IP implementations

Internet Security: Security on the internet, Network and Website Security Risks, Site Hacking, Security Incidents on the internet, security and email, network and website security, Firewall (Concept, Components and Constituents, Benefits, Enterprise wide security Framework, secure physical infrastructure).

UNIT III **08 hours**

Overview of E-Commerce Technologies: Encryption overview, Elements of an encryption system, Secret key encryption, Public-key encryption, Digital signatures, Digital Certificates, Cryptography export restrictions, Secure Sockets Layer(SSL), Secure Electronic Transactions (SET),Smart Cards and its applications.

UNIT IV **08 hours**

Electronic Data Interchange- Evolution, uses, Benefits, Working of EDI, EDI Standards (includes variable length EDI standards), Cost Benefit Analysis of EDI, Electronic Trading Networks, EDI Components, File Types, EDI Services, EDI Software, Business Approach of EDI, EDIFACT (Overview, Structure, EDIFACT Software), Business Future of EDI,EDI Administration. EDI Security, Security Mechanisms, Technological aspects (Smart Cards, Worm Disks, Biometrics), Security Mechanism.

Security Issues in E-Commerce Technologies- Introduction to Security, Passwords, Viruses, Firewalls,

Encryption (PGP, SHTTP, SSL).

UNIT V **08 hours**

Enterprise Resource Planning-Evolution of ERP, Characteristics, Features, Components, Need, ERP Vendors, Business Process Reengineering, Advantages of ERP Packages, Implementation of ERP Packages, Future of ERP Systems, Integrated SAP Model, Integrated Data-Master Data, Transactional data, Integrated Processes, Pros and cons of integration, SAPArchitecture and Integration.

Books:

1. Doing Business on the Internet E-COMMERCE (Electronic Commerce for Business) S. Jaiswal, Galgotia Publications.

2. E-Commerce An Indian Perspective, P.T.Joseph, S.J., PHI.

3. Electronic Commerce: Greenstein, Merylin, Tata Mc.Graw Hill

BCS-055: Microprocessor

L T P **Credit-4**

3 1 0

UNIT I **08 hours**

Architecture of 8085 microprocessor, registers, flags, ALU-Address bus and data bus De-multiplexing address / data bus-control and status signals-Control bus-Programmer's model of 8085-Pin-out signal function diagram-Functions of different pins.

UNIT II **08 hours**

Instruction set of 8085-data transfer, arithmetic, logic, branching and machine control group of instructions-Addressing modes-register, register indirect, direct, and immediate and implied addressing modes. Assembly language and machine language - Programming exercises addition, Subtraction, multiplication and division (all 8-bit) of binary and BCD numbers. [6]

UNIT III **08 hours**

Stack and stack related operations-Subroutines-Advanced programming techniques: Code conversions Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII and ASCII to BCD, Block transfer, ascending order and descending order - Time delays using single register and register pair-Delay calculations-Debugging a program.

UNIT IV **08 hours**

RAM, ROM, EPROM, EEPROM functional explanation-Memory interface, interfacing ROM, 2K X 8 and 4K X 8-Interfacing RAM, 2K X 8 and 4K X 8-Timing diagrams for memory read and memory write cycles-Instruction cycle, machine cycle and T-state.

UNIT V **08 hours**

Explanation of timing diagram for 8085 instructions, MOV R_d, R_s, MVIR, data 8, STA address 16 Introduction of Wait states-Halt state-Dynamic RAM-Cache memory-Direct Memory Access (DMA), explanation with block diagram.

Books and Reference:

1. Ramesh S. Gaonkar: Microprocessor Architecture, Programming and Application with the 8085-Penram International Publishing, Mumbai

2. B. Ram: Fundamentals of microprocessors and microcomputers-Dhanpat Rai Publications, New Delhi

3. V. Vijayendran: Fundamentals of microprocessor-8085- S. Viswanathan publishers, Chennai

BCS-501: Operating System

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II **8 Hours**

Concurrent Processes: Process Concept, Principle of Concurrency, Producer Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III **8 Hours**

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV **8 Hours**

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit - V **8 Hours**

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Reference Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley

2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education

3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition, TMH

BCS-502: Design and Analysis of Algorithms

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit –II **8 Hours**

Advanced Data Structures: Red-Black trees, B - trees, Binomial Heaps, Fibonacci Heaps.

Unit – III **8 Hours**

Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees - Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

Unit – IV **8 Hours**

Dynamic programming with examples such as Kanpsack, All pair shortest paths - Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit –V **8 Hours**

Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

Reference Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",Berman, Paul," Algorithms", Cengage Learning.

BCS-503: Object Oriented Techniques

L T P **Credit-4**

3 1 **0**

Unit I **8 Hours**

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

Unit II **8 Hours**

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine, Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Unit III **8 Hours**

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object Oriented Programming Style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

Unit IV **8 Hours**

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans,Introduction to Enterprise Java beans (EJB).

Unit V **8 Hours**

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC

Bridge, Introduction to servlets.

Reference Books:

1. James Rumbaughet. al, "Object Oriented Modeling and Design", PHI

2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education

3. Naughton, Schildt, "The Complete Reference JAVA2", TMH

4. Mark Priestley "Practical Object-Oriented Design with UML", TMH

5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education

6. Pandey, Tiwari, " Object Oriented Programming with JAVA" , Acme Learning

BCS504: Computer Graphics& Multimedia

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction to computer graphics & graphic systems:

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures or presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion:

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Unit – II **8 Hours**

2D-transformation & viewing

Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, Transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipe line, Window to view port coordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons &ellipse.

3D transformation & viewing

3D transformations: translation, rotation, scaling & other transformations. Rotational about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Unit –III **8 Hours**

Curves

Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan line algorithm; Hidden line elimination, wire frame methods, fractal geometry. Color & shading models Light &color model; interpolative shading model; Texture;

Unit – IV **8 Hours**

Multimedia

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia. Image, video and audio standards.

Audio: digital audio, MIDI, processing sound, sampling, compression.

Unit- V **8 Hours**

Video: MPEG compression standards, compression through spatial and temporal redundancy, inter frame and intra frame compression.

Animation: types, techniques, key frame animation, utility, morphing. Virtual Reality concepts.

Reference Books:

1. Foley, Vandam, Feiner, Hughes-"Computer Graphics principles (2ndEd.)-Pearson Education.

2. W.M. Newman, R.F.Sprou-"Principles of Interactive computer Graphics"-TMH.

3. Elsom Cook-"Principles of Interactive Multimedia"-McGrawHi

BCS-551: Operating system lab

L	T	P	Credit-1
0	0	2	

1. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).

2. Process: starting new process, replacing a process image, duplicating a process image, waiting for a Process, zombie process.

3. Signal: signal handling, sending signals, signal interface, signal sets.

4. Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5. POSIX Threads: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit,pthread_attr_init, pthread_cancel)

6. Inter-process communication: pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO)

BCS-552: Algorithm lab

L	T	P	Credit-1
0	0	3	

Programming assignments on each algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication),

2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).

3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling sales person Programming assignments on each algorithmic strategy:

4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).

5. Sorting: Insertion sort, Heap sort, Bubble sort

6. Searching: Sequential and Binary Search

7. Selection: Minimum/ Maximum, Kth smallest element

BCS-553: Object Oriented Techniques Lab

L	T	P	Credit-1
0	0	2	

1. To become familiar with classes that represent entities that can interact with the user.
2. To successfully write simple programs that involve if statements.
3. To gain practice in the use of Boolean operators like && and ||.
4. To construct a class that represents a simple ATM (automatic teller machine).
5. Write a new program called Options.java that will request that the user enter an integer and then will display the message .positive,. .negative,.or zero. if the value that was entered was greater than zero, less than zero, or equal to zero, respectively.
6. Write a simple program called RandomGeneration.java that will request N, the number of values desired, and then generate a list of N random double values. Usea View Frame for input and output.
7. Write program for Java Applets.
8. Use Java Servlets for proxy server.

BCS-554: Computer Graphics & Multimedia

L	T	P	Credit-1
0	**0**	2	

1. Point plotting, line & regular figure algorithms
2. Raster scans line & circle drawing algorithms
3. Clipping &Windowing algorithms for points, lines & polygons
4. 2D/3Dtransformations
5. Simple fractals representation
6. Filling algorithms
7. Web document creation using Dreamweaver.
8. Creating Animation using Flash.

3rd Year, Semester-VI

BHU-601: Engineering Economics &Industrial Management

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology Managerial Economics and its scope in engineering perspective.

Basic Concepts Demand Analysis, Law of Demand, Determinates of Demand, Elasticity of Demand-Price, and Income and cross Elasticity .Uses of concept of elasticity of demand in managerial decision.

Unit-II **8 Hours**

Demand forecasting**:** Meaning, significance and methods of demand forecasting, production function, Laws of returns to scale & Law of Diminishing returns scale. An overview of Short and Long run cost curves - fixed cost, variable cost, average cost, marginal cost, Opportunity cost.

Unit-III **8 Hours**

Market Structure: Perfect Competition, Imperfect competition, features of price determination and various market conditions. National Income, Inflation and Business Cycles Concept of N.I. and Measurement. Meaning of Inflation, Type causes & prevention methods, Phases of business cycle.

Unit-IV **8 Hours**

Introduction: Concept, Development, application and scope of Industrial Management. Management Function: Principles Production requirements.

Productivity: Definition, measurement, productivity index, types of production system, Industrial of Management- Management Tools - time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Ownership.

Unit-V **8 Hours**

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain Management.

Quality control: Meaning, process control, SQC control charts, single, double and Sequential sampling, Introduction to TQM.

Environmental Issues: Environmental Pollution - various management techniques to

Control Environmental pollution - Various control acts for Air, Water, Solid waste and Noise pollution.

Reference Books

1. Koutsoyiannis A: Modern Microeconomics, ELBS.

2. Managerial Economics for Engineering: Prof. D.N. Kakkar

3. Managerial Economics: D.N. Dwivedi

4. Managerial Economics: Maheshwari.

5. Khanna O.P.: Industrial Engineering

6. T.R. Banga: Industrial Engineering and Management

Departmental Elective-III

1. BCS-061 Real Time System
2. BCS-062 Advance Computer Architecture
3. BCS-063 Cryptography & Network Security
4. BCS -064 Distributed Database
5. BCS -065 Data Compression

Department Elective-III

BCS-061: Real Time System

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II **08 hours**

Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III **08 hours**

Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV **08 hours**

Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.

UNIT-V **08 hours**

Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases.

Reference Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education

BCS-062: Advance Computer Architecture

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Parallel Computer Models

The state of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM And VLSI Models

Program and Network Properties

Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architecture

UNIT-II **08 hours**

Processors and Memory Hierarchy

Advanced Processor Technology, Superscalar and vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT-III **08 hours**

Bus, Cache, and Shared Memory

Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Pipelining and Superscalar Techniques

Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design.

UNIT-IV **08 hours**

Multiprocessors and Multicomputer

Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message-Passing Mechanisms.

UNIT-V **08 hours**

Multivector, Scalable, Multithreaded, Data Flow Architecture

Vector Processing principles, Multivector Multiprocessors, Compound Vector Processing, Principles of Multithreading, Dataflow and Hybrid Architectures.

References:

1. Advanced Computer Architecture by Kai Hwang, McGraw Hill {Single author edition}

2. Computer Architecture by Micheal J. Flynn, Narosa.

BCS-063: Cryptography & Network Security

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to security attacks, services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES.

UNIT-II **08 hours**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA

UNIT-III **08 hours**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, secure hash algorithm (SHA).

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

UNIT-IV **08 hours**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos.

Electronic mail security: pretty good privacy (PGP), S/MIME.

UNIT-V **08 hours**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, and transaction (SET).

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, Firewalls.

Reference Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.

2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill

3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons

4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.

BCS-064: Distributed Database

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascade less schedules.

UNIT-II **08 hours**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.

UNIT-III **08 hours**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT-IV **08 hours**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT-V **08 hours**

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

Reference Books:

1. Silberschatz, orth and Sudershan, Database System Concept', McGraw Hill
2. Ramakrishna and Gehrke,' Database Management System, McGraw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

BCS-065: Data Compression

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory.

Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

UNIT-II **08 hours**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall Codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

UNIT-III **08 hours**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

UNIT-IV **08 hours**

Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

UNIT-V **08 hours**

Advantages of Vector Quantization over Scalar Quantization, the Linde-Buzo-Gray Algorithm, Treestructured Vector Quantizers. Structured Vector Quantizers.

Reference Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

BCS-601 Data mining and Data warehousing

L T P **Credit-4**

3 1 0

Unit I **8 Hours**

Data Preprocessing, Language, Architectures, Concept Description: Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

Unit II **8 Hours**

Association Rule: Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases-mining multidimensional Association rules -association mining to correlation analysis-constraint based association mining.

Unit III **8 Hours**

Classification and Prediction: Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy.

Unit IV **8 Hours**

Cluster Analysis: Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, hierarchical methods, density based methods, grid based methods - Outlier Analysis. Recent trends - Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining.

Unit V **8 Hours**

Data Warehousing: Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation - Data Warehousing to Data Mining -Data warehousing components-building a data warehouse - mapping the data warehouse to an architecture – data extraction - cleanup-transformation tools- metadata - OLAP - Patterns and models - Data visualization principles.

TEXT BOOKS

1. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Harcourt India /Morgan Kauffman, 2001. (UNITs 1 to IV)

2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data mining and OLAP", TataMcGraw-Hill, 2004. (UNIT V)

REFERENCES

1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", PearsonEducation, 2004.

2. Sam Anahory and Dennis Murry, "Data Warehousing in the Real World", Pearson Education, 2003.

BCS-602: Computer Network

L T P **Credit-4**

3 1 **0**

Unit –I **8 Hours**

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II **8 Hours**

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit – III **8 Hours**

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit – IV **8 Hours**

Transport Layer: Transport Layer - Design issues, connection management, session Layer Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V **8 Hours**

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

Reference Books :

1. Forouzen, "Data Communication and Networking", TMH A.S. Tanenbaum, Computer Networks, Pearson Education
2. W. Stallings, Data and Computer Communication, Macmillan Press Anuranjan Misra, "Computer Networks", Acme Learning
3. G. Shanmugarathinam, "Essential of TCP/ IP", Firewall Media

BCS-603: Compiler Design

L T P **Credit-4**

3 1 **0**

Unit – I **8 Hours**

Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II **8 Hours**

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III **8 Hours**

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV **8 Hours**

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V **8 Hours**

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.

Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Reference Books:

1. Aho, Sethi& Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education

2. V Raghvan, “Principles of Compiler Design", TMH

3. Kenneth Louden," Compiler Construction", Cengage Learning.

4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

BCS-652: Computer Network Lab

L T P **Credit-1**

0 0 2

1. IPC (Message queue)
2. NIC Installation & Configuration (Windows/Linux)
3. Familiarization with

a. Networking cables (CAT5, UTP)

b. Connectors (RJ45, T-connector)

c. Hubs, Switches

4. TCP/UDP Socket Programming
5. Multicast Broadcast Sockets
6. Implementation of a Prototype Multithreaded Server
7. Implementation of

a. Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)

b. Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)

c. Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

BCS-653: Compiler Lab

L T P **Credit-1**

0 0 3

1. Design predictive parser for the given language.

2. Design a LALR bottom up parser for the given language.

3. Convert the BNF rules into YACC form and write code to generate abstract syntax tree. A program to generate machine code.

4. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant

5. spaces, tabs and new lines.

6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.

7. Write a YACC program to check the validity of an arithmetic expression.

BCS-651: Data Mining and Data warehousing Lab

L	T	P	Credit-1
0	0	2	

1. Evolution of data management technologies, introduction to data warehousing concepts.
2. Develop an application to implement defining subject area, design of fact dimension table, data mart.
3. Develop an application to implement OLAP, roll up, drill down, slice and dice operation
4. Develop an application to construct a multidimensional data.
5. Develop an application to implement data generalization and summarization technique.
6. Develop an application to extract association rule of data mining.
7. Develop an application for classification of data.
8. Develop an application for one clustering technique
9. Develop an application for Naïve Bayes classifier.
10. Develop an application for decision tree.

BCS-655: .Net Lab

L T P **Credit-1**

0 0 2

1. Write a Program in C# to check whether a number is Palindrome or not.
2. Write a Program in C# to demonstrate Command line arguments processing.
3. Write a Program in C# to find the roots of Quadratic Equation.
4. Write a Program in C# to demonstrate Boxing and un Boxing.
5. Write a Program in C# to implement Stack operations.
6. Write a Program to demonstrate Operator overloading.
7. Write a Program in C# to find the second largest element in a single dimensional array.
8. Write a Program in C# to multiply to matrices using Rectangular arrays.
9. Find the sum of all the elements present in a jagged array of 3 inner arrays.
10. Write a Program to reverse a given string using C#.
11. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
12. Design a simple calculator using Switch Statement in C#.
13. Demonstrate Use Of Virtual and override keyword in C# with a simple Program.
14. Implement Linked Lists in C# using the existing collections name space.
15. Write a Program to demonstrate abstract class and abstract methods in C#.
16. Write a Program in C# to build a class which implements an interface which already exists.
17. Write a Program to illustrate the use of different properties in C#.
18. Demonstrate arrays of interface types with a C# program.

4th Year, Semester-VII

BCS-701: Distributed Systems

L T P **Credit-4**

3 1 0

Unit–I **8 Hours**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global lock, shared memory, Logical clocks, Lamppost's& vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, and termination detection.

Unit-II **8 Hours**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit-III **8 Hours**

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit-IV **8 Hours**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit-V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Reference Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGrawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

BCS-702: Digital Image Processing

L T P **Credit-4**

3 1 0

UNIT-I **8 Hours**

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters -Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters - Gaussian Low pass Filters; Sharpening Frequency Domain Filters - Gaussian High pass Filters; Homomorphic Filtering.

UNIT-II **8 Hours**

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions - Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations - Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening - The Laplacian.

UNIT-III **8 Hours**

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering - Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters - Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering -Band pass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **8 Hours**

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms- Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

UNIT-V **8 Hours**

Registration

Introduction, Geometric Transformation - Plane to Plane transformation, Mapping, Stereo Imaging - Algorithms to Establish Correspondence, Algorithms to Recover Depth.

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Reference Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.

2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.

3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

BCS-703: Artificial Intelligence

L T P **Credit-4**

3 1 **0**

Unit-I **8 Hours**

Introduction Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **8 Hours**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **8 Hours**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **8 Hours**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning.

Unit-V **8 Hours**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques - Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K - means clustering.

Reference Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence - A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

Departmental Elective-IV

1. BCS-071 Neural Networks
2. BCS-072 Embedded Systems
3. BCS-073 Cloud Computing
4. BCS-074 Soft Computing

Department Elective-IV

BCS-071: Neural Networks

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Neurocomputing and Neuroscience

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

UNIT-II **08 hours**

Data Processing : Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co- Variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perception, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark Problems in NN.

UNIT-III **08 hours**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

UNIT-IV **08 hours**

Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

UNIT-V **08 hours**

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Euro-Fuzzy-genetic algorithm Integration.

Reference Books:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI

BCS-072: Embedded Systems

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications.

UNIT-II **08 hours**

Timing and clocks in embedded systems, Task Modeling and management, Real time operating system issues.

UNIT-III **08 hours**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

UNIT-IV **08 hours**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

UNIT-V **08 hours**

Fault-Tolerance, Formal Verification. Trends in Embedded Processor, OS, Development Language

Reference Books:

1. H.Kopetz, "Real-Time Systems", Kluwer

2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems",Kluwer

3. Shibu K.V., "Introduction to Embedded Systems", TMH

4. Marwedel, "Embedded System Design", Springer

BCS-073: Cloud computing

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

UNIT-II **08 hours**

Cloud Applications: Technologies and the processes required when deploying web services; Deploying A web service from inside and outside a cloud architecture, advantages and disadvantages.

UNIT-III **08 hours**

Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic Constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat

UNIT-IV **08 hours**

Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT-V **08 hours**

Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

References

1. Gautam Shroff, *Enterprise Cloud Computing Technology Architecture Applications* [ISBN: 978-0521137355]

2. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing, A Practical Approach* [ISBN: 0071626948]

3. Dimitris N. Chorafas, *Cloud Computing Strategies* [ISBN: 1439834539]

B C S-074: Soft Computing

L	T	P	Credit-4
3	1	0	

UNIT-I **08 hours**

Artificial Neural Networks: Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back propagation networks - Kohnen's self-organizing networks - Hopfield network.

UNIT-II **08 hours**

Fuzzy Systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions Decomposition Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III **08 hours**

Neuro- Fuzzy Modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing - Evolutionary computation.

UNIT-IV **08 hours**

Genetic Algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method Rank space method.

UNIT-V **08 hours**

Application of Soft Computing: Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

Reference Books:

1. Sivanandam, Deepa, “Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley

Open Elective

1. BOE-071 Non-Conventional Energy Resources
2. BOE-072 Disaster management
3. BOE-073 Engineering System Modeling and Simulation
4. BOE-074 Bioinformatics

Open Elective

BOE-071 Non-Conventional Energy Recourse

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction: Various non-conventional energy resources- Introduction, availability, Classification, relative merits and demerits.

UNIT-II **08 hours**

Solar Cells: Theory of solar cells. Solar cell materials, solar cell power plant, limitations.

Solar Thermal Energy: Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III **08 hours**

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

UNIT-IV **08 hours**

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.

Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V **08 hours**

Bio-mass: Availability of bio-mass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

References:

1. AndraGabdel, "A Handbook for Engineers and Economists".

2. A. Mani, "Handbook of Solar radiation Data for India".

3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series. 5. Frank Kreith, "Solar Energy Hand Book".

6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".

7. N.G. Calvert, " Wind Power Principles".

8. W. Palz., P. Chartier and D.O. Hall," Energy from Biomass".

BOE-072 Disaster Management

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Understanding disaster- Concept of disaster**,** Different approaches**, Concept** of Risk**,** Levels of disasters**,** Disaster phenomena and events *(Global, national and regional).*

UNIT-II **08 hours**

Hazards and Vulnerability-Natural and man-made hazards; response time, frequency and forewarning levels of different hazards**,** Characteristics and damage potential of natural hazards; hazard assessment Dimensions of vulnerability factors; vulnerability assessment**,** Vulnerability and disaster risk**,** Vulnerabilities to flood and earthquake hazards.

UNIT-III **08 hours**

Disaster management mechanism-Concepts of risk management and crisis management**,** Disaster management cycle**, Response** and Recovery**, Development**, Prevention, Mitigation and Preparedness**,** Planning for relief.

UNIT-IV **08 hours**

Capacity building -Capacity building: Concept **,**Structural and nonstructural measures**,** Capacity assessment; strengthening capacity for reducing risk **,**Counter-disaster resources and their utility in disaster management**,** Legislative support at the state and national levels

Coping with disaster- Coping strategies; alternative adjustment processes**,** Changing concepts of disaster management**,** Industrial safety plan; safety norms and survival kits, Mass media and disaster management.

UNIT-V **08 hours**

Planning for disaster management- Strategies for disaster management planning**,** Steps for formulating a disaster risk reduction plan**,** Disaster management Act and Policy in India**,** Organizational Structure for disaster management in India**,** Preparation of state and district disaster management plans.

Text books

1. Alexander, D. *Natural Disasters,* ULC press Ltd, London, 1993.

2. Carter, W. N. *Disaster Management: A Disaster Management Handbook,* Asian Development Bank, Bangkok, 1991.

3. Chakraborty, U. K. *Industrial Disaster Management and Emergency Response*, Asian Books Pvt. Ltd., New Delhi 2007.

References

1. Abarquez I. &Murshed Z. *Community Based Disaster Risk Management: Field Practitioner's Handbook*, ADPC, Bangkok, 2004.

2. Goudie, A. *Geomorphological Techniques,* Unwin Hyman, London 1990.

3. Goswami, S. C. *Remote Sensing Application in North East India,*PurbanchalPrakesh, Guwahati, 1997.

4. *Manual on Natural Disaster Management in India,* NCDM, New Delhi, 2001.

5. *Disaster Management in India,* Ministry of Home Affairs, Government of India, New Delhi, 2011.

6. *National Policy on Disaster Management,* NDMA, New Delhi, 2009.

7. *Disaster Management Act. (2005),* Ministry of Home Affairs, Government of India, New Delhi, 2005.

8. *District Disaster Management Plan-Model Template,* NIDM, New Delhi, 2005.

BOE-073 Engineering System Modeling and Simulation

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction-Systems, System types, System Modeling, Types of system modeling, Classification and comparison of simulation models, attributes of modeling, Comparison of physical and computer experiments, Application areas and Examples.

UNIT-II **08 hours**

Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

UNIT-III **08 hours**

Language-System modeling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application.

UNIT-IV **08 hours**

Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

UNIT-V **08 hours**

Case study-Developing simulation model for information centers, inventory systems and analysis of maintenance systems.

Text Books:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.

2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, "Discrete Event System Simulation", Third edition, Prentice Hall, India, 2002.

Reference Books:

1. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.

2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

BOE-074 Bioinformatics

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introductory Concepts: The Central Dogma - The Killer Application - Parallel Universes - Watson's Definition-Top Down Versus Bottom up-Information Flow-Convergence-Databases–Data Management-Data Life Cycle - Database Technology - Interfaces - Implementation - Networks-Geographical Scope - Communication Models - Transmissions Technology - Protocols - Bandwidth - Topology - Hardware - Contents - Security - Ownership - Implementation - Management.

UNIT-II **08 hours**

Search Engines and Data Visualization: The search process - Search Engine Technology – Searching and Information Theory - Computational methods - Search Engines and Knowledge Management –Data Visualization - sequence visualization - structure visualization - user Interface – Animation Versus simulation - General Purpose Technologies.

UNIT-III **08 hours**

Statistics and Data Mining: Statistical concepts -Microarrays - Imperfect Data -Randomness Variability - Approximation - Interface Noise -Assumptions -Sampling and Distributions Hypothesis Testing - Quantifying Randomness - Data Analysis - Tool selection statistics of Alignment Clustering and Classification - Data Mining - Methods - Selection and Sampling - Preprocessing and Cleaning Transformation and Reduction - Data Mining Methods - Evaluation - Visualization -Designing new queries - Pattern Recognition and Discovery - Machine Learning - Text Mining Tools.

UNIT-IV **08 hours**

Pattern Matching: Pairwise sequence alignment - Local versus global alignment - Multiple sequence alignment - Computational methods - Dot Matrix analysis - Substitution matrices – Dynamic Programming - Word methods - Bayesian methods - Multiple sequence alignment – Dynamic Programming - Progressive strategies - Iterative strategies - Tools - Nucleotide Pattern Matching - Polypeptide pattern matching - Utilities - Sequence Databases.

UNIT-V **08 hours**

Modeling and Simulation: Drug Discovery - Components - Process - Perspectives – Numeric considerations - Algorithms - Hardware - Issues - Protein structure - AbInitio Methods – Heuristic methods - Systems Biology - Tools - Collaboration and Communications - Standards - Issues - Security - Intellectual property.

TEXT BOOK

Bryan Bergeron, "Bio Informatics Computing", Pearson Education, Second edition, 2003.

REFERENCE

T.K. Attwood and D.J. Perry Smith, "Introduction to Bio Informatics", Longman Essen, 1999.

BCS-751: Distributed System Lab

L	T	P	Credit-1
0	0	2	

List of Program

1. Simulate the functioning of Lamport's Logical Clock in C.
2. Simulate the functioning of Vector Clock in C.
3. Implement a Distributed Chat Server using TCP Sockets.
4. Implement Remote Procedure Call (RPC) mechanism for a file transfer across a network in C.
5. Implement Java Remote Method Invocation (RMI) mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in C.
7. Implement Common Object Request Broker Architecture (CORBA) mechanism by using Java program.

BCS-752 Mini Project

L T P **Credit 1**
0 0 2

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

BCS-753 Seminar

L T P **Credit 1**
0 0 3

Students have to give multiple presentations on research & recent technologies with respect to his/her course.

BCS-754 Industrial Training & Viva-voce

L T P **Credit 1**
0 0 2

Students have to undergo six to eight week industrial training at end of sixth semester.

4th Year, Semesters-VIII

Departmental Elective-V

1. BCS-081 VLSI Design
2. BCS-082 Web service and service Oriented Architecture
3. BCS-083 Multimedia Computing
4. BCS-084 Information Security

Department Elective-V

BCS-081 VLSI Design

L T P **Credit-4**

3 1 **0**

UNIT-II **08 hours**

Introduction: Basic principle of MOS transistor, Introduction to large signal MOS models (long channel) for digital design. MOS Circuit Layout & Simulation: MOS SPICE model, device characterization, Circuit characterization, interconnects simulation. MOS device layout: Transistor Layout, Inverter layout, CMOS digital circuit layout & simulation.

UNIT-II **08 hours**

The MOS Inverter: Inverter principle, Depletion and enhancement load inverters, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, and Dynamic behavior, Propagation Delay, Power Consumption.

UNIT-III **08 hours**

Combinational MOS Logic Design

Static MOS design: Complementary MOS, Rationed logic, Pass Transistor logic, complex logic circuits.

Sequential MOS Logic Design

Static latches, Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Mon stable sequential Circuits, A stable Circuit. Memory Design: ROM & RAM cells design.

UNIT-IV **08 hours**

Dynamic MOS design: Dynamic logic families and performances. Interconnect & Clock Distribution Interconnect delays, Cross Talks, Clock Distribution. Introduction to low power design, Input and Output Interface circuits. BiCMOS Logic Circuits Introduction, BJT Structure & operation, Basic BiCMOS Circuit behavior, Switching Delay in BiCMOS Logic circuits, BiCMOS Application.

UNIT-V **08 hours**

VLSI System Testing & Verification: Introduction, A walk through the Test Process, Reliability, Logic Verification Principles, Silicon Debug Principles, Manufacturing Test Principles, Design for Testability, Boundary Scan. VLSI Applications like RISC microcontroller, ATM Switch.

Text Books

1. Kang &Leblebigi "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

2. Rabey, "Digital Integrated Circuits Design", Pearson Education, Second Edition, 2003.

Reference Books

1. Weste and Eshraghian, "Principles of CMOS VLSI design" Addison-Wesley, 2002.

BCS-082: Web Service and service Oriented Architecture

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction - Service Oriented Enterprise - Service Oriented Architecture (SOA) - SOA and Web Services - Multi-Channel Access - Business Process management - Extended Web Services Specifications - Overview of SOA - Concepts - Key Service Characteristics - Technical Benefits Business Benefits.

UNIT-II **08 hours**

SOA and Web Services - Web Services Platform - Service Contracts - Service-Level Data Model Service Discovery - Service-Level Security - Service-Level Interaction patterns - Atomic Services and Composite Services - Proxies and Skeletons - Communication - Integration Overview XML and Web Services - .NET and J2EE Interoperability - Service-Enabling Legacy Systems - Enterprise Service Bus Pattern.

UNIT-III **08 hours**

Multi-Channel Access - Business Benefits - SOA for Multi-Channel Access -Tiers - Business Process Management - Concepts - BPM, SOA and Web Services - WSBPEL - Web Services Composition.

UNIT-IV **08 hours**

Java Web Services - JAX APIs - JAXP - JAX-RPC - JAXM - JAXR – JAXB.

UNIT-V **08 hours**

Metadata Management - Web Services Security - Advanced Messaging - Transaction Management

Text Books:

1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.

2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2003.

Reference Books:

1. Thomas Erl, "Service Oriented Architecture", Pearson Education, 2005.

2. Frank Cohen, "Fast SOA", Elsevier, 2007.

BCS-083: Multimedia Computing

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

UNIT-II **08 hours**

Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

UNIT-III **08 hours**

Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

UNIT-IV **08 hours**

Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

UNIT-V **08 hours**

Images: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatted Animations Images standards, JPEG Compression, ZigZag Coding, Multimedia Database. Content based retrieval for text and images. Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia

Text Books:

1. "Multimedia Computing Communications & Applications" by Ralf Steinmetz, Klara Nahrstedt, Pearson Education (2004)

2. Principles of Multimedia by Parekh Ranjan,Tata McGraw-Hill(2007)

Reference Books:

1. Multimedia Systems, By John E Koegal, Buford, IIBK. (1994)

2. Virtual Reality Systems, John Vince, ACM Press (1995)

3. Computer Networks, A S Tanenbaum, Fourth Edition.(2004)

Departmental Elective-VI

1. BCS-085 Computational Geometry
2. BCS-086 Computational Complexity
3. BCS-087 Parallel Algorithms
4. BCS-088 Pattern Recognition

Department Elective-VI

BCS-085: Computational Geometry

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.

UNIT-II **08 hours**

Voronoi diagrams: construction and applicant ions, variants; Delaney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties.

UNIT-III **08 hours**

Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems.

UNIT-IV **08 hours**

Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V **08 hours**

Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry.

Reference Books:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; SpringerVerlag

2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,

3. KetanMulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall

4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

BCS-086: Computational Complexity

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II **08 hours**

Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III **08 hours**

Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV **08 hours**

Circuit complexity, lower bounds; Parallel computation and complexity; counting problems Interactive proofs.

UNIT-V **08 hours**

Probabilistically checkable proofs; Communication complexity; Quantum computation.

Reference Books:

1.Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity, Prentice-Hall

2. SanjeevArora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press

3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

BCS-087: Parallel Algorithms

L T P **Credit-4**

3 1 **0**

UNIT-I **08 hours**

Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

UNIT-II **08 hours**

Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, an example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

UNIT-III **08 hours**

Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.

UNIT-IV **08 hours**

Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

UNIT-V **08 hours**

Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms Permutation, Combinations, Derangements.

Reference Books:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer", McGrawHill.

2. S.G. Akl, "Design and Analysis of Parallel Algorithms"

3. S.G. Akl, "Parallel Sorting Algorithm" by Academic Press

BCS-088: Pattern Recognition

L T P **Credit-4**

3 1 0

UNIT-I **08 hours**

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations - Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II **08 hours**

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

UNIT-III **08 hours**

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT-IV **08 hours**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

UNIT-V **08 hours**

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitioned clustering - K means, agglomerative hierarchical clustering, Cluster validation.

Reference Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.

2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.

3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

BCS-851 Major Project

L T P **Credit 16**
0 0 21

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

2nd Year, Semester-III

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BME-309	Thermal & Hydraulic M/cs	3	1	0	20	20	60	100	4
2	BAS-301	Mathematics III	3	1	0	20	20	60	100	4
3	BEE-301	Basic System Analysis	3	1	0	20	20	60	100	4
4	BEE-302	Electrical Meas.& Measuring Instruments	3	1	0	20	20	60	100	4
5	BEC-309	Analog & Digital Electronics	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEE-351	Numerical Techniques Lab	0	0	2	30	20	50	100	1
7	BEE-352	Electrical Measurement Lab	0	0	2	30	20	50	100	1
8	BEC-359	Electronics Lab	0	0	2	30	20	50	100	1
9	BME-359	Thermal & hydraulic lab	0	0	3	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

2nd Year, Semester-IV

S.N	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BOE-048	Discrete Mathematics	3	1	0	20	20	60	100	4
2	BEE-401	Electromechanical Energy Conversion-I	3	1	0	20	20	60	100	4
3	BEE-402	Network Analysis and Synthesis	3	1	0	20	20	60	100	4
4	BEE-403	Electrical& Electronics Engineering Materials	3	1	0	20	20	60	100	4
5	BEE-404	Microprocessors	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEE-451	Electromechanical Energy Conversion-I Lab	0	0	2	30	20	50	100	1
7	BEE-452	Network Lab	0	0	2	30	20	50	100	1
8	BEE-453	Electrical Simulation Lab	0	0	3	30	20	50	100	1
9	BEE-454	Microprocessor Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

3rd Year, Semester-V

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEC-508	Fundamentals of E.M. Theory	3	1	0	20	20	60	100	4
2	BEE-501	Electromechanical Energy Conversion-II	3	1	0	20	20	60	100	4
3	BEE-502	Control System	3	1	0	20	20	60	100	4
4	BEE-503	Elements of Power System	3	1	0	20	20	60	100	4
5	BEE-504	Electrical Instrumentation & Process Control	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEE-551	Electromechanical Energy Conversion-II Lab	0	0	3	30	20	50	100	1
7	BEE-552	Control System Lab	0	0	2	30	20	50	100	1
8	BEE-553	Electrical Instrumentation Lab	0	0	2	30	20	50	100	1
9	BEE-554	Power System Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

5. Attendance: 5 Marks
6. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

3rd Year, Semester-VI

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BHU-601	Industrial Management	3	1	0	20	20	60	100	4
2	BEE-012	Special Electrical Machine	3	1	0	20	20	60	100	4
3	BEE-601	Power System Analysis	3	1	0	20	20	60	100	4
4	BEE-602	Power Electronics	3	1	0	20	20	60	100	4
5	BEC-608	Communication Engineering	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEE-651	Power Electronics Lab	0	0	2	30	20	50	100	1
7	BEC-658	Communication EngineeringLab	0	0	2	30	20	50	100	1
8	BEE-652	Seminar	0	0	2	30	20	50	100	1
9	BEE-653	MAT-Pspice Lab	0	0	3	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

7. Attendance: 5 Marks
8. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

4th Year, Semester-VII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BOE-071-BOE-074	Open Elective-I	3	1	0	20	20	60	100	4
2	BEE-011-BEE-013	Departmental Elective-I	3	1	0	20	20	60	100	4
3	BEE-021-BEE-022	Departmental Elective-II	3	1	0	20	20	60	100	4
4	BEE-701	Switch Gear & Protection	3	1	0	20	20	60	100	4
5	BEE-702	Electric Drives	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEE-751	Power System Lab	0	0	2	30	20	50	100	1
7	BEE-752	Electric Drives Lab	0	0	3	30	20	50	100	1
8	BEE-753	Project	0	0	2	30	20	50	100	1
9	BEE-754	Industrial Training Viva voice	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

9. Attendance: 5 Marks
10. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme

B. Tech. Second Year (Electrical Engineering)

(Effective from the session 2015-16)

4th Year, Semester-VIII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BEE 031-034	Departmental Elective-III	3	1	0	20	20	60	100	4
2	BEE 041-49	Departmental Elective-IV	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
3	BEE-851	Project	0	0	21	300	---	400	700	16
		Total	**6**	**2**	**21**	**340**	**40**	**520**	**900**	**24**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

11. Attendance: 5 Marks
12. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

2nd Year, Semester-III
BME-309: THERMAL AND HYDRAULIC MACHINES

L T P **Credits – 4**

3 1 0

UNIT-I
Thermodynamic equilibrium, cyclic process, enthalpy, Zero, first and second laws of thermodynamics, carnot cycle, concept of entropy, properties of steam, processes involving steam in closed and open systems, Enthalpy.
Vapour Pressure Cycles: Rankine cycle, reheat cycle, Regenerative cycle (8)

UNIT-II
Steam Turbine:
Classification, impulse and reaction turbines their velocity diagrams and related calculations, work done and efficiencies, re-heat factor, staging, bleeding and governing of turbines.
Gas Turbine:
Classification, Brayton cycle, working principle of gas turbine, gas turbine cycle with intercooling, reheat and regeneration, stage and polytrophic efficiencies (8)

UNIT-III
Compressors:
Classification, single and multistage reciprocating compressors, isothermal and volumetric efficiencies, centrifugal and axial flow compressors, surging, choking and stalling
I.C. Engines:
Otto, Diesel and Dual cycles, introduction to 2-stroke and 4-stroke SI and CI engines, indicator diagram and power measurement (8)

UNIT-IV
Impact of Jet:
Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat and curve), effect of inclination of jet with the surface
Hydraulic Turbines:
Classification, heads and efficiencies, construction, working, work done and efficiency of impulse and reaction turbines (7)
UNIT-V
Centrifugal Pump:
Classification, construction, working, work-done, efficiencies, cavitation and priming; jet pump
Reciprocating Pump:
Classification, construction, working, work-done, slip and coefficient of discharge (6)

Text Books:
1. Onkar Singh "Applied Thermodynamics" New Age International, 2006
2. R.K.Rajput " A Text Book of Hydraulic Machines" S. Chand & Co.,2008.
Reference Books:
3. P.L.Ballany "Thermal Engineering " Khanna Publishers, 2003
4. R.K.Bansal "A Text Book of Fluid Mechanics and Hydraulic Machines" Laxmi Publications, 2006.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-301: MATHEMATICS –III

L T P **Credits – 4**
3 1 0

Unit – I
Function of Complex variable:
Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type and (10)

Unit – II
Statistical Techniques – I:
Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear and multiple regression analysis, Probability theory. (8)

Unit – III
Statistical Techniques – II:
Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chisquare test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, , R, p, np, and c charts. (8)

Unit – IV
Numerical Techniques – I:
Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals. (8)

Unit – V
Numerical Techniques –II:
Solution of system of linear equations, Gauss-Seidal method, Crout method. Numerical differentiation, Numerical integration, Trapezoidal, Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler's, Picard's and forth-order Runge- Kutta mehthods (8)

Test Books:-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson(Cengage) Learning, 2007.
2. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi, 2003.
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd., 2000

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
5. Devi Prasad, An introduction to Numerical Analysis, Narosa Publication house, New Delhi 2006.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-301: BASIC SYSTEM ANALYSIS

L T P **Credits – 4**
3 1 0

UNIT I

Introduction to continuous time signals and systems: Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Introduction to various types of systems

Analogous System: Linear mechanical elements, force-voltage and force-current analogy,Modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method (9)

UNIT II

Fourier Transform Analysis: Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and Periodic wave forms: Applications of Fourier Transform to network analysis. (8)

UNIT III

Laplace Transform Analysis: Review of Laplace Transform, Laplace Transform of periodic functions, Initial and Final Value Theorems, Inverse Laplace Transform, Convolution Theorem, Superposition Integral, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform of complex waveforms (8)

UNIT IV

State – Variable analysis: Introduction, State Space representation of linear systems, Transfer Function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State-Variable technique to the analysis of linear systems

(8)

UNIT V

Z-Transform Analysis: Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function.

(7)

Text Books:

1. David K.Cheng; “Analysis of Linear System”, Narosa Publishing Co.
2. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
3. C.L.Wadhwa, “Network Analysis and Synthesis”, New Age International Publishers,2007.
4. Samarajit Ghosh, “Network Theory: Analysis and Synthesis” Prentice Hall of India, 2008

Reference Books:

5. Choudhary D.Roy, “Network & Systems”, Wiley Eastern Ltd.
6. Donald E.Scott, “Introduction to circuit Analysis” Mc. Graw Hill
7. B.P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
8. I.J. Nagrath, S.N. Saran, R. Ranjan and S.Kumar, “Singnals and Systems, “Tata Mc. Graw Hill, 2001.
9. Taan S. Elali & Mohd. A. Karim, “Continuous Signals and Systems with MATLAB” 2nd Edition, CRC Press

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-302: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L T P **Credits – 4**
3 1 0

UNIT I

Philosophy of Measurement: Methods of Measurement, Measurement System**,** Classification of instrument system, Characteristics of instruments & measurement system**,** Errors in measurement & its analysis, Standards. **Analog Measurement of Electrical Quantities :** Electrodynamics, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters , Electrodynamics Wattmeter, Three Phase Wattmeter, Power in three phase system , errors & remedies in wattmeter and energy meter. (8)

UNIT II

Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (6)

UNIT III

Measurement of Parameters: Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Q Meter. (7)

UNIT IV

AC Potentiometer: Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement

Magnetic Measurement: Ballistic Galvanometer, **f**lux meter, determination of hysteresis loop, measurement of iron losses**.** (7)

UNIT V

Digital Measurement of Electrical Quantities: Concept of digital measurement, block diagram Study of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter.

Cathode Ray Oscilloscope: Basic CRO circuit (Block Diagram),Cathode ray tube (CRT) & its components **, a**pplication of CRO in measurement ,Lissajous Pattern.; Dual Trace & Dual Beam Oscilloscopes. (6)

Text Book:

1. E.W. Golding & F.C. Widdis, “Electrical Measurement &Measuring Instrument”, A.W. Wheeler& Co. Pvt. Ltd. India.
2. A.K. Sawhney,“Electrical & Electronic Measurement & Instrument”, Dhanpat Rai & Sons India.

Reference Books:

3. Forest K. Harries,“Electrical Measurement”,Willey Eastern Pvt. Ltd. India .
4. M.B. Stout, “Basic Electrical Measurement” Prentice hall of India,India.
5. W.D.Cooper,” Electronic Instrument & Measurement Technique “Prentice Hall International
6. Rajendra Prashad, “Electrical Measurement &Measuring Instrument” Khanna Publisher
7. J.B. Gupta, “Electrical Measurements and Measuring Instruments”, S.K. Kataria & Sons

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-309: ANALOG AND DIGITAL ELECTRONICS

L T P **Credits – 4**
3 1 0

ANALOG ELECTRONICS

UNIT-I

Special Diodes-LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications, Transistors as a switch (6)

UNIT-II

Frequency Response: Amplifier transfer function, low and high frequency response of common emitter and common source amplifiers

Feedback: General feedback structure; properties of negative feedback; series-series, series-shunt, shuntseries and shunt-shunt feedback amplifiers (8)

UNIT-III

Basic principle of sinusoidal oscillator, R-C Phase Shift and Wein Bridge oscillators, tuned Oscillators- Collpits and Hartley; Crystal oscillator (6)

DIGITAL ELECTRONICS

UNIT-IV

Combinational Logic Circuits: Multiplexers/Demultiplexures, Encoders/Decoders.
Sequential Logic Circuits: latches, flip-flops- S-R, T, D, J-K.
Shift Registers: Basic principle, serial and parallel data transfer, shift left/right registers, universal shift register.
Counters: Mode N Counters, ripple counters, synchronous counters, ring/Johnson counters. (8)

UNIT-V

OP-AMP applications - Astable, Monostable and Bistable multivibrators, Schmitt trigger, IC- 555 Timer, A/D and D/A converters.
Voltage Regulators: Series, shunt and switching regulators, op-amp based configurations.
Memories: Introduction to ROM, RAM; Sequential Memory, Memory organization. (8)

Text Books:

1. A.S. Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)
2. Malvino & Leach, “Digital Principles and applications” Tata Mc. Graw Hill
3. R.A. Gayakwad “Op amps and Linear Integrated Circuits” Prentice Hall of India.
4. Balbir Kumar and Shail B.Jain, “Electronic Devices and Circuits” Prentice Hall of India,2007

Reference Books:

1. Taub & Schilling “Digital Electronics”- Tata Mc Graw Hill
2. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits” Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, “Microelectronics” Mc Graw Hill
4. Anand Kumar, “Switching Theory and Logic Design” Prentice Hall of India, 2008.
5. Aloke. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-351: NUMERICAL TECHNIQUE LAB

L T P **Credits – 1**
0 0 2

Note: Minimum seven experiments out of the following list:

MATLAB Based Experiments

1 Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
6. Solution of differential equations using 4th order Runge-Kutta method.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.
9. Determination of time response of an R-L-C circuit.
10. College may add any three experiments in the above list.

Text/Reference Books:

1. Almos Gilat, "MATLAB: An Introduction with Applications" Wiley India Ltd., 2004.
2. R.P. Singh, "Getting Started with MATLAB" Oxford University Press.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-352: ELECTRICAL MEASUREMENT LAB

L T P **Credits – 1**
0 0 2

Note: Minimum of nine experiments from the following:

1. Calibration of ac voltmeter and ac ammeter
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s. value is measured by a multi-meter
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor
5. Measurement of low resistance by Kelvin's double bridge
6. Measurement of voltage, current and resistance using dc potentiometer
7. Measurement of inductance by Maxwell's bridge
8. Measurement of inductance by Hay's bridge
9. Measurement of inductance by Anderson's bridge
10. Measurement of capacitance by Owen's bridge
11. Measurement of capacitance by De Sauty Bridge
12. Measurement of capacitance by Schering Bridge
13. Study of Frequency and differential time counter
14. College may add any two experiments in the above list

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-359: ELECTRONICS LAB

L T P **Credits – 1**

0 0 2

ANALOG ELECTRONICS:

Note: Select at least any five out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any five out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comporator
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Sub tractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-359: THERMODYNAMICS AND HYDRAULIC MACHINE LAB

L T P **Credits – 1**
0 0 2

Experiments: Minimum 10 experiments out of following;

1. Study and working of Two stroke petrol Engine
2. Study and working of Four stroke petrol Engine
3. Study and working of two stroke Diesel Engine
4. Study and working of four stroke Diesel Engine.
5. Study of Velocity compounded steam turbine
6. Study of Pressure compounded steam turbine
7. Study of Impulse & Reaction turbine
8. Study of Gas Turbine Model
9. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
10. Experiment on Reciprocating pump.
11. Experiment on centrifugal pump.
12. Experiment on Compressor

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

2nd Year, Semester-IV

BOE-048: DISCRETE MATHEMATICS

L T P **Credits – 4**

3 1 0

UNIT-I

Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identitites on sets, pigeonhole principle.

Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation.

Function: Definition and types of function, composition of functions, recursively defined functions.

(10)

UNIT-II

Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example. (7)

UNIT-III

Combinatories: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (n^{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.) (7)

Unit-IV

Algebraic Structure: Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results). (6)

UNIT-V

Graphs: Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation. (10)

Text/Reference Books:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
2. J.P.Tremblay & R. Manohar, “Discrete Mathematical Structure with Applications to Computer Science” Mc.Graw Hill, 1975.
3. V. Krishnamurthy, “Combinatories:Theory and Applications”, East-West Press.
4. Seymour Lipschutz, M.Lipson, “Discrete Mathemataics” Tata Mc Graw Hill, 2005.
5. Kolman, Busby Ross, “Discrete Matheamatical Structures”, Prentice Hall International

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I

L T P **Credits – 4**
3 1 0

Unit – I

Principles of Electro-mechanical Energy Conversion - Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems(defining energy & Co-energy) , Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation,Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque , Generated emf in machines; torque in machines with cylindrical air gap . (7)

Unit – II

D.C. Machines:- Construction of DC Machines, Armature winding, Emf and torque equation , Armature Reaction ,Commutation , Interpoles and Compensating Windings, Performance Characteristics of D.C. generators. (9)

Unit –III

D.C. Machines (Contd.):- Performance Characteristics of D.C. motors ,Starting of D.C. motors; point and 4 point starters , Speed control of D.C. motors: Field Control , armature control and Voltage Control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test). (8)

Unit –IV.

Single Phase Transformer: Phasor diagram, efficiency and voltage regulation, all day efficiency.
Testing of Transformers: O.C. and S.C. tests, Sumpner;s test, polarity test.
Auto Transformer: Single phase and three phase auto transformers, volt-amp, relation, efficiency, merits & demerits and applications. (8)

Unit –V

Three Phase Transformers: Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers, three winding transformers. (8)

Text Books:

1. I.J. Nagrath & D.P.Kothari," Electrical Machines", Tata McGraw Hill
2 .Husain Ashfaq ," Electrical Machines", Dhanpat Rai & Sons
3 .A.E. Fitggerald, C.Kingsley Jr and Umans,"Electric Machinery" 6th Edition McGraw Hill, I.nternational Student Edition.
4 B..R. Gupta & Vandana Singhal "Fundamentals of Electrical Machines, New Age International.

Reference Books:

5 .Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
6 .M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
7 .Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" Oxford University Press, 2001.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE- 402: NETWORK ANALYSIS AND SYNTHESIS

L T P **Credits – 4**
3 1 0

Unit – I

Graph Theory: Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis. (7)

Unit – II

Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem. (8)

Unit – III

Network Functions : Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot. (8)

Unit – IV

Two Port Networks:Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation. (8)

Unit – V

(a) Network Synthesis: Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters: Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, high pass, (constant K type) filters, and introduction to active filters. (9)

Text Books:

1. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2 .A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.
3 .C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers, 2007.
4 .D.Roy Choudhary, "Networks and Systems" Wiley Eastern Ltd.
5 .Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill

Reference Books:

6 .M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
7 .N.C. Jagan and C. Lakshminarayana, "Newwork Analysis" B.S. Publications, 2008.
8 .K.S. Suresh Kumar, "Electric Circuits and Networks" Pearson Education, 2009.
9 .A Ramakalyan, "Linear Circuits: Analysis and Synthesis" Oxford University Press, 2005.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-403: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

L T P **Credits – 4**
3 1 0

UNIT – I

Crystal Structure of Materials: Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth**,** Energy bands in solids, classification of materials using energy band. (6)

UNIT – II

Conductivity of Metals: Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals (7)

UNIT – III

Mechanism of Conduction in semiconductor materials: Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials. (6)

UNIT – IV

Magnetic Properties of Material: Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetisms, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials. (7)

Text Books :

1 A.J. Dekker,"Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S.Chand & Co.

References :

4 Solymar, "Electrical Properties of Materials" Oxford University Press.
5. Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
8 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
9 T. K. Basak, "Electrical Engineering Materials" New age International.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-404: MICROPROCESSORS

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction to Digital Computer and Microprocessor: Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system. (10)

UNIT-II

8-bit Microprocessors:8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing. Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives. (8)

UNIT-III

16-bit Microprocessors: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation, Operating Modes

Instruction Set of 8086: Addressing Modes**:** Instruction format: Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types. (8)

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

(8)

UNIT-V

Peripheral Interfacing: I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter. 8259 programmable Interrupt Controller.

(8)

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, “Microcomputers and Microprocessors” PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata Mc Graw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. Hall D.V., “Microprocessors Interfacing” Tata Mc Graw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-451: ELECTROMECHANICAL ENERGY CONVERSION- I LAB

L T P **Credits – 1**
0 0 2

Note: Minimum eight experiments are to be performed from the following list :

1 To obtain magnetization characteristics of a d.c. shunt generator
2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded
3 To obtain efficiency of a dc shunt machine using Swinburn's test
4 To perform Hopkinson's test and determine losses and efficiency of DC machine
5 To obtain speed-torque characteristics of a dc shunt motor
6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard Static Ward – Leonard method.
8 To study polarity and ratio test of single phase and 3-phase transformers
9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11 To obtain 3-phase to 2-phase conversion by Scott connection.
12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-452: NETWORK LABORATORY

L T P
0 0 2

Credits – 1

Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests Write Demo for the following (in Ms-Power point)
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.
11. Determination of frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.
13. to 15 College may add any three experiments in the above list.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-453: ELECTRICAL SIMULATION LAB
(List of Experiments (PSPICE based)

L T P **Credits – 1**
0 0 2

Note: Select any 10 out of the following:

1. Study of various commands of PSPICE.
2. To determine node voltages and branch currents in a resistive network.
3. To obtain Thevenin's equivalent circuit of a resistive network.
4. To obtain transient response of a series R-L-C circuit for step voltage input.
5. To obtain transient response of a parallel R-L-C circuit for step current input.
6. To obtain transient response of a series R-L-C circuit for alternating square voltage waveform.
7. To obtain frequency response of a series R-L-C circuit for sinusoidal voltage input.
8. To determine line and load currents in a three phase delta circuit connected to a 3-phase balanced ac supply.
9. To plot magnitude, phase and step response of a network function.
10. To determine z,y,g,h and transmission parameters of a two part network.
11. To obtain transient response of output voltage in a single phase half wave rectifier circuit using capacitance filter.
12. To obtain output characteristics of CE NPN transistor.
13. To obtain frequency response of a R-C coupled CE amplifier.
14. To obtain frequency response of an op-Amp integrator circuit.
15. To verify truth tables of NOT, ANDor OR gates implemented by NAND gates by plotting their digital input and output signals.

Reference Books:

1. Irvine, Calif, "PSPICE Manual" Microsim Corporation, 1992.
2. Paul W. Tuinenga, "SPICE : A guide to circuit Simulation and Analysis Using PSPICE", Prentice Hall, 1992.
3. M.H. Rashid, "SPICE for Circuits and Electronics Using PSPICE" Prentice Hall of India, 2000.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-454: MICROPROCESSOR LABORATORY

L T P **Credits – 1**
0 0 2

A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from 0F to 0C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

3rd Year, Semester-V

BEC-508: FUNDAMENTALS OF E.M.THEORY

L T P **Credits – 4**

3 1 0

Unit I

Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation, divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density, Energy and potential. (8)

Unit-II

Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations. (6)

Unit-III

Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation. (8)

Unit-IV

Uniform Plane waves, Plane wave reflection and dispersion (6)

Text Books:

1. Mayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata Mc.Graw Hill Publishing

Reference Books:

1. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
2. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-501: ELECTRO-MECHANICAL ENERGY CONVERSION - II

L T P **Credits – 4**
3 1 0

UNIT-I

Synchronous Machine I: Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus

(8)

UNIT-II

Synchronous Machine II: Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating characteristics

Synchronous Motor: Starting methods, Effect of varying field current at different loads, V- Curves, Hunting & damping, synchronous condenser (8)

UNIT-III

Three phase Induction Machine – I: Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator & its applications. (8)

UNIT-IV

Three phase Induction Machine- II: Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.)

(6)

UNIT-V

Single phase Induction Motor: Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor

AC Commutator Motors: Universal motor, Single phase a.c. series compensated motor, stepper motors

(8)

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain"Electric Machines" Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans"Electric Machinery", MC Graw Hill.

Reference Books:

4. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher
5. P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers
6. M.G.Say, "Alternating Current Machines",Pitman & Sons

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-502: CONTROL SYSTEM

L T P **Credits – 4**
3 1 0

Unit-I
The Control System: Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

(8)

Unit-II
Time Response analysis: Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices. (8)

Unit-III
Control System Components: Constructional and working concept of ac servomotor, synchros and stepper motor **Stability and Algebraic Criteria** concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.
Root Locus Technique: The root locus concepts, construction of root loci (8)

Unit-IV
Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots
Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles (8)

Unit-V
Introduction to Design: The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.
Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

(8)

Text Books:
1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley IndiaLtd, 2008.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:
5. Norman S. Mise, Control System Engineering 4th edition, Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International, 2006.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-503: ELEMENTS OF POWER SYSTEM

L T P **Credits – 4**
3 1 0

Unit-I

Power System Components: Single line Diagram of Power system, Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines: Configurations, types of conductors, resistance of line, skin effect, Kelvin's law. Proximity effect (10)

Unit-II

Over Head Transmission Lines Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading (8)

Unit-III

Corona and Interference: Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators: Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency (10)

Unit-IV

Mechanical Design of transmission line: Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables: Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables. (8)

Unit-V

Neutral grounding: Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line: Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission: Introduction to EHV AC and HVDC transmission and their comparison, use of bundle conductors, kinds of DC links, and incorporation of HVDC into AC system (10)

Text Books

1.W. D. Stevenson, "Element of Power System Analysis", McGraw Hill,
2.C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3.Asfaq Hussain, "'Power System", CBS Publishers and Distributors,
4.B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5.M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 504: ELECTRICAL INSTRUMENTATION AND PROCESS CONTROL

L T P **Credits – 4**
3 1 0

Unit-I

Transducer – I: Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT,RVDT (6)

Unit-II

Transducer – II : Capacitive,Piezoelectric Hall effect and opto electronic transducers. Measurement of Motion, Force pressure, temperature, flow and liquid level. (6)

Unit-III

Telemetry : General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter.

Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV

Display Devices and Recorders: Display devices, storage oscilloscope, spectrum analyzer, strip chart & x-y recorders, magnetic tape & digital tape recorders.

Recent Developments: Computer aided measurements, fibre optic transducers, microsessors, smart sensors, smart transmitters. (8)

Unit-V

Process Control : Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers. (6)

Text Books:

1. A.K.Sawhney, "Advanced Measurements & Instrumentation", Dhanpat Rai & Sons
2. B.C. Nakra & K.Chaudhry, "Instrumentation, Measurement and Analysis", Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall

Reference Books:

4. E.O. Decblin, "Measurement System – Application & design", Mc Graw Hill.
5. W.D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques" Prentice Hall International
6. Rajendra Prasad,"Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, "Electronic Instruments and Instrumentation Technology" PHI Learning.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE- 551: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY

L T P **Credits – 1**

0 0 3

Note: The minimum 8 experiments are to be performed from the following, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
3. Torque -speed characteristics
4. Power factor-line current characteristics
5. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
6. To study speed control of three phase induction motor byKeeping V/f ratio constant
7. To study speed control of three phase induction motor by varying supply voltage.
8. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
9. To determine V-curves and inverted V-curves of a three phase synchronous motor.
10. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
11. To study synchronization of an alternator with the infinite bus by using:
12. dark lamp method (ii) two bright and one dark lamp method

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or other commercial software)

13. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
14. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
15. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
16. Draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
17. To determine steady state performance of a three phase induction motor using equivalent circuit.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 552: CONTROL SYSTEM LABORATORY

L T P **Credits – 1**
0 0 2

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/S input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behaviour of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

Software based experiments (Use MATLAB, LABVIEW software etc.)

11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 553: ELECTRICAL INSTRUMENTATION LAB)

L T P **Credits – 1**
0 0 2

Note: Minimum ten experiments should be performed from the following

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer
13. Study of data acquisition system using "**lab view**" software and test all signal points
14. Measurement of sine, triangular ,square wave signal of function generator and verify its frequency at 100 Hz tap point using "**labview**" software.
15. Measurement of voltage and current signal of programmable power supply using **Lab view** GPIB interface.

Note: - Three more software based experiments may be added in place of experiments nos. 13 to 15.at the institute level.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-554: POWER SYSTEM LAB

L T P **Credits – 1**
0 0 2

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata Mc.Graw Hill.
2. T. K. Nagsarskar & M.S. Sukhija,’ Power System Analysis’

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

3rd Year, Semester-VI

BHU-601: Industrial Management

L T P **Credits – 4**
3 1 0

Unit-I

Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership. (6)

Unit-II

Management Function: Principles of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Production requirements. (6)

Unit-III

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain management. (5)

Unit-IV

Quality control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM. (6)

Unit-V

Environmental Issues: Environmental Pollution – various management techniques to control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution. (6)

Reference Books

1. Khanna O.P. : Industrial Engineering
2. T.R. Banga : Industrial Engineering and Management
3. Sharma B.R. : Environmental and Pollution Awareness.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-012: SPECIAL ELECTRICAL MACHINES

L T P **Credits – 4**

3 1 0

UNIT-I

Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power) (8)

UNIT-II

Single phase Induction Motors:

Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitorstart capacitor-run and shaded pole motors.

Two Phase AC Servomotors:

Construction, torque-speed characteristics, performance and applications (8)

UNIT-III

Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:

Construction; principle of operation; torque production, modes of operation, drive circuits. (8)

UNIT-IV

Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators. (8)

UNIT-V

Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications. (6)

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “ Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001
3. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-601: POWER SYSTEM ANALYSIS

L T P **Credits – 4**

3 1 0

Unit-I

Representation of Power System Components:

Synchronous machines, Transformers, Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Symmetrical fault analysis:

Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions. (10)

Unit-II

Unsymmetrical faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Zbus using singular transformation and algorithm, computer method for short circuit calculations (8)

Unit-III

Load Flows:

Introduction, bus classifications, nodal admittance matrix (*BUS Y*), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method (6)

Unit-IV

Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement (8)

Unit-V

Traveling Waves:

Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves (6)

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International, 200

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-602: POWER ELECTRONICS

L T P **Credits – 4**
3 1 0

Unit-I
Power semiconductor Devices:
Power semiconductor devices their symbols and static characteristics Characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT
Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC (8)

Unit-II
Power Semiconductor Devices(Contd)
Protection of devices. Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:
Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers (8)

Unit-III
Phase Controlled Converters
Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode. Single phase fully controlled and half controlled bridge converters. Performance Parameters Three phase half wave converters Three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters
(8)

Unit-IV
AC Voltage Controllers
Principle of On-Off and phase controls Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison only)
Single phase transformer taps changer. Cyclo Converters Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation (8)
Unit-V
Inverters
Single phase series resonant inverter Single phase bridge inverters Three phase bridge inverters Voltage control of inverters Harmonics reduction techniques Single phase and three phase current source inverters (6)

Text Books:
1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.

2. M.D. Singh and K.B.Khanchandani, “Power Electronics”Tata MC Graw Hill, 2005
3. V.R. Moorthy, “ Power Electronics : Devices, Circuits and Industrial Applications” Oxford University Press,2007.

Reference Books:

4. M.S. Jamil Asghar, “Power Electronics” Prentice Hall of India Ltd., 2004
5. Chakrabarti & Rai, “Fundamentals of Power Electronics &Drives”Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics:Converters, Applications and Design”, Wiley India Ltd,2008.
7. S.N.Singh, “A Text Book of Power Electronics” Dhanpat Rai & Sons

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-608 COMMUNICATION ENGINEERING

L T P **Credits – 4**
3 1 0

Unit-I
Amplitude Modulation:
Amplitude modulation, DSBSC, SSB and VSB modulation and demodulation schemes AM transmitters and receivers, super-hetrodyne receiver, IF amplifiers, AGC circuits Frequency division multiplexing (8)

Unit-II
Angle Modulation: Frequency modulation, phase modulation Generation of frequency modulation FM receivers and demodulators
Noise:
External noise, internal noise, Noise calculations, signal to noise ratio Noise in AM and FM systems (8)

Unit-III
Pulse Communication
Sampling Process, PAM, PWM, PPM and PCM, Delta modulation and adaptive delta modulation
Digital Modulation:
Introduction, brief description of phase shift keying (PSK), Differential phase shift keying (DPSK), frequency shift Keying (FSK), Quadrature amplitude modulation (QAM) and time division multiplexing (TDM). (8)

Unit-IV
Radio Propagation:
Ground waves, sky wave propagation, space waves, tropospheric scatter propagation, Satellite Communication- transponders, Geo-stationary satellite system, low earth and medium earth-orbit satellite system. Introduction to Cellular system Personal communication system (PCS), data communication with PCS. (8)

Unit-V
Television:
TV systems and standards, scanning and synchronizing, common video and sound circuits, vertical and horizontal deflections, colour transmission and reception.
Fibre Optical Communication:
Optical fibre and fibre cables, fibre characteristics and classification, fibre optic components and systems. (8)
Text Books:
1. G. Kennedy and B. Davis , “Electronic Communication Systems” Tata McGraw Hill
2. Simon Haykin, “ Communication Systems” John Wiley & Sons

Reference Books:
3. Roy Blake, “ Wireless Communication Technology” Thomson Asia Pvt. Ltd. Singapore
4. B. P. Lathi, “Modern Analog and Digital Communication Systems” Oxford University Press.
5. Taub & Schilling, “Principles of Communication Systems” McGraw Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-651: POWER ELECTRONICS LABORATORY

L T P **Credits – 1**
0 0 2

Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in out put voltage and load current.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” prentice hall Inc. 1997.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media, 2007.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-654 MATLAB & PSpice Lab

L T P **Credits – 1**
0 0 2

Note: The minimum of 8 experiments is to be performed (All contents are to be covered with tutorial sheets)

MATLAB

1. Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data,
2. plotting simple graphs, scripts and functions, Script files, Function files, Global Variables,
3. Loops, Branches, Control flow, Advanced data objects,
4. Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation.
5. Numerical integration, Ordinary differential equation.

SIMULINK

6. Idea about simulink, problems based on simulink.

PSPICE PROGRAMS

7. Calculate the resistance of a conductor, given its dimensions & resistivity or determine the change in conductor resistance when the temp changes.
8. D.C.-analyze resistor networks to determine all junction voltages, component voltages, and component currents.
9. Transient –analyze RC & RL circuits to produce tables of component voltage& current levels for a given set of time instants.
10. Convert Y-connected resistor networks to delta connected circuits.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-658: COMMUNICATION ENGINEERING LABORATORY

L T P **Credits – 1**
0 0 2

Note: A minimum of 10 experiments is to be performed.

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation.
12. To study PSK-modulation system.
13. To study FSK-modulation system.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-652: Seminar

L T P **Credits – 1**

0 0 2

Students have to give multiple presentations on research & recent technologies with respect to his/her course.

Open Elective-I

BOE -071	Entrepreneurship Development
BOE-072	Quality Management
BOE-073	Operations Research
BOE-074	Introduction to Biotechnology

Departmental Elective-I

BCS-019	Object Oriented Systems and C++
BEE-011	Power System Operation and Control
BEE-012	Advanced microprocessors and micro controllers
BEE-013	Neural Networks and fuzzy System

Departmental Elective-II

BCS-029	Computer Networks
BEE-021	EHV AC & DC Transmission
BEC-029	Digital Communication
BOE-022	Power Station Practice

Departmental Elective-III

BEE-031	Bio Instrumentation
BEE-032	Advanced Control System
BEE-033	Reliability Engineering
BEE-034	Energy Efficiency & Conservation

Departmental Elective-IV

BEE-041	Power Quality
BEE-042	SCADA & Energy Management System
BEC-049	Multimedia System
BEE-043	Power Converters Applications

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

4th Year, Semester-VII

BEE – 701: SWITCHGEAR AND PROTECTION

L T P **Credits – 4**

3 1 0

Unit I:

Introduction to Protection System:

Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay. (8)

Unit-II:

Relay Application and Characteristics:

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:

Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay. (8)

Unit-III

Protection of Transmission Line:

Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing, (6)

Unit-IV:

Circuit Breaking:

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:

Classification, testing station and equipments, testing procedure, direct and indirect testing (8)

Unit-V

Apparatus Protection: Protection of Transformer, generator and motor.

Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers. (8)

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear, iley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, “Fundamentals of Power System Protection”, Prentice Hall of India.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE –702: ELECTRIC DRIVES

L T P **Credits – 4**
3 1 0

Unit-I:

Fundamentals of Electric Drive:

Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation Types of load Load torque: components, nature and classification (8)

Unit-II:

Dynamics of Electric Drive: Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive

Selection of Motor Power rating:

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty.Load equalization (8)

Unit-III:

Electric Braking: Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking (6)

Unit-IV:

Power Electronic Control of DC Drives:

Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor. (8)

Unit-V:

Power Electronic Control of AC Drives: Three Phase induction Motor Drive:

Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications (8)

Text Books:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K.Pillai, “A First Course on Electric Drives”, New Age International.

Reference Books:

3. M.Chilkin, “Electric Drives”,Mir Publishers, Moscow.
4. Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-751: POWER SYSTEM SIMULATION LABORATORY

L T P **Credits – 1**

0 0 2

LIST OF EXPERIMENTS

1. Formation of Bus Admittance Matrix and Bus Impedance Matrix using MATLAB.
2. Formation of Jacobian for s system not exceeding 4 buses (no PV buses) in polar coordinates using MATLAB.
3. Sequence Components of Power System Network with Single Line to Ground Fault using MATLAB SIMULINK.
4. Modeling of Single machine Power System using SIMULINK.
5. Short circuit studies of power system using ETAP/PSCAD.
6. Load flow analysis using Gauss Seidel Method, Newton Raphson Method, Fast Decouple for both PQ and PV Buses using ETAP/PSCAD.
7. DC Load flow analysis using SIMULINK.
8. Simulation and analysis of magnetic circuits using SIMULINK.
9. Simulation and measurements of Three Phase circuits using SIMULINK.
10. Modeling of Automatic Generation Control for a two area network using SIMULINK.
11. To Determine 1) Swing curve 2) Critical clearing time for a single machine connected to infinite bus through a pair of identical transmission lines, three phase fault on one of the lines for variation of inertia constant/line parameters/fault locations/ clearing time/pre fault electrical output using MATLAB/C-Program
11. Modeling and Simulation of Non Conventional Energy Systems using MATLAB

Optional Experiments

1. Analysis of Static Var Compensators.
2. Analysis of STATCOM.
3. Load forecasting using ETAP.
4. Power Quality studies using PSCAD.
5. Substation layout using AutoCAD Electrical.
6. Transient Stability Analysis and formation of Swing Curves using MATLAB/SIMULINK.
7. Modeling of Surge Arresters using PSCAD.
8. Modeling of FACTS devices using SIMULINK.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 752: ELECTRIC DRIVES LAB

L T P **Credits – 1**
0 0 2

Note: - Minimum 10 experiments are to be performed from the following out of which at least three should be simulation based.

(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. To study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recovery control scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE -753: MINI PROJECT

L T P **Credits – 1**

0 0 2

Project shall be assigned to students at the start of VIIth semester. There should not usually be more than 3 students in batch. The project should be based on latest technology as far as possible and it may be hardware or/and software based. The assessment of performance of students should be made at least twice in the semester. Students should be encouraged to present their progress of project using overhead projector or LCD projector.

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RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 754 PRACTICAL & INDUSTRIAL TRAINING PRESENTATION

L T P **Credits – 1**
0 0 2

Students will go practical & Industrial training of four weeks in any industry or reputed organization after the VIth semester examination in summer. They will also prepare an exhaustive technical report of the training which will be duly signed by the officer under whom training was taken in the industry/organization. They will have to present about the training before a committee consisting of faculty members constituted by the concerned Head of the Department.

Departmental Elective –I

BCS -019 OBJECT ORIENTED SYSTEMS AND C++

L T P **Credits – 4**

3 1 0

Unit-I

Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data. (6)

Unit-II

Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models. (6)

Unit-III

Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology (6)

Unit-IV

Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors,Functions overloading, Operator Overloading, I/O Operations. Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates,Exception handling, String manipulation. Translating object oriented design into implementations. (8)

Unit-V:

Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files,concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

(6)

Text Books:

1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das “Unix concepts & application” TMH

Reference Books:

4. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
5. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
6. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
7. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
8 Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE –011: POWER SYSTEM OPERATION AND CONTROL

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction : Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability (6)

UNIT-II

Economic Operation : Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow (6)

UNIT-III

Load Frequency Control: Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response (8)

UNIT-IV

Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.

Voltage and Reactive Power control : Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation (8)

UNIT-V

State Estimation: Detection and identification, Linear and non-linear models.

Flexible AC Transmission Systems: Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC (8)

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-012: ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P **Credits – 4**

3 1 0

Unit-I

Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS. (6)

Unit-II

Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors. Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction. (8)

Unit-III

Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts. (6)

Unit-IV

Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++ (6)

Unit-V

Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.

8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing, Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.

16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming. (8)

Text Books:

1. Ray, A.K. & Burchandi, K.m., "Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing" Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, "Advanced Microprocessors and Microcontrollers" New Age International.
3. Krishna Kant,"Microprocessors and Microcontrollers" PHI Learning.
4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.

Reference Books:

5. Ayala, "The 8051 Micro Controller", Centage Learning.
6. Mazidi M.A., Maizidi J.G. Mckinlay R.D., "The 8051 Microcontroller and Embedded Systems" Pearson Education.
7. Rajkamal, "The concept and feature of microcontrollers 68HC11, 8051 and 8096", S.Chand Publisher, New Delhi Peatman John, "Design with microcontroller", Mc.-Graw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-013: NEURAL NETWORKS AND FUZZY SYSTEM

L T P **Credits – 4**
3 1 0

Unit-I
Neural Networks-1(Introduction & Architecture)
Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory (8)

Unit-II
Neural Networks-II (Back propogation networks)
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications. (8)

Unit-III
Fuzzy Logic-I (Introduction)
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. (6)

Unit-IV
Fuzzy Logic –II (Fuzzy Membership, Rules)
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications. (8)

Unit-V
Fuzzy Neural Networks:
L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation(BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications. (6)

Text Books:
1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.

Reference Books:
3. Siman Haykin,”Neural Netowrks”Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Departmental Elective –II

BCS-029: COMPUTER NETWORKS

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction :

Goals and applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design- Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods , ISDN, Terminal Handling.

(8)

UNIT-II

Medium Access Control sub layer:

Medium Access sub layer- Channel Allocation, LAN protocols- ALOHA protocols- Overview of IEEE standards – FDDI, Data Link Layer – Elementary data Link Protocols, Sliding Window protocols, Error Handling. (8)

UNIT –III

Network Layer:

Network Layer – Point – to Point Networks, routing, Congestion control, Internetworking – TCP /IP –IP packet, IP address, IP v6. (6)

UNIT –IV

Transport Layer:

Transport Layer – Design issues, connection management, session Layer – Design issues, remote procedure call, Presentation Layer – Design issues, data compression techniques, cryptography – TCP Window Management. (8)

UNIT –V

Application Layer:

Application Layer- File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks – Internet and Public Networks. (6)

Text Books:

1. Behrouz A. Forouzan, “Data Communication and Networking”, Tata Mc Graw Hill.
2. A.S. Tanenbaum, “ Computer Networks”, 3rd Edition, Prentice Hall India .
3. S. Keshav, “An Engineering Approach on Computer Networking”, Addition Wesley.
4. W. Stallings, “Data and Computer Communication”, Macmillan Press.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE - 021: EHV AC & DC TRANSMISSION

L T P **Credits – 4**

3 1 0

UNIT-I

Introduction:

Need of EHV transmission, standard transmission voltage, comparison of EHV ac & dc transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission (8)

UNIT-II

EHV AC Transmission :

Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission. (6)

UNIT-III

Extra High Voltage Testing:

Characteristics and generation of impulse voltage, generation of high Ac and Dc voltages, measurement of high voltage by spheregaps and potential dividers.

Consideration for Design of EHV Lines:

Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines. (8)

UNIT-IV

EHV DC Transmission – I:

Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters. Principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link. (8)

UNIT-V

EHV DC Transmission – II:

Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, ac and dc filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications. (6)

Text Books :

1.R. D. Begamudre, “Extra High Voltage AC Transmission Engineering” Wiley Eastern.
2.K. R. Padiyar, “HVDC Power Transmission Systems: Technology and System Reactions” New Age International.
3.J. Arrillaga,“ High Voltage Direct current Transmission” IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, “High Voltage Engineering” Tata Mc Graw Hill.

Reference Books:

5.M. H. Rashid , " Power Electronics : Circuits, Devices and Applications" Prentice Hall of India.

6.S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Pub
lisher.

7."EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute. Palo Alto, California, 1982.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC- 029 : DIGITAL COMMUNICATION

L T P **Credits – 4**
3 1 0

UNIT-I
Elements of Digital Communication and Information Theory:
Model of a Digital Communication, System, Probability Theory and Random Variables , Logarithmic Measure of Information, Entropy and Information and InformationRate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variables Length Code Words, Source Coding Theorem, Prefix Doing and Kraft Inequality, Shannon-Fano and Huffman Coding. (8)

UNIT-II
Digital Base band Transmission:
PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and its Properties and its Properties, NRZ &RZ &RZ Types, Signaling Format For Unipolar, Polar, Bipolar (AMI) & Manchester Coding and Their Power Spectra (No Derivation) Matched Filter Reciver, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio. Correlation Detector Decision Threshold and Error Probability For Binary, Unipolar (ON-OFF) Signaling, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum. (8)

UNIT-III
Digital Modulation Techniques:
Gram-Schmidt Orthgonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent &Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques.
(8)

UNIT-IV
Digital Multiplexing:
Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 toT4 PCM TDM System (DS1 to DS4 Signals) (6)

UNIT-V
Error Control Coding:
Error Free Communication Over a Noize Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Tree diagram state diagram and Trellis Diagram, Viterbi and Sequential Decoding Comparison of performance. (6)

Text Book:
Haykin, simon / “Communication System” / John Wiley /4th Ed.

Reference Books:

1. Singh, R.P. & Sapre, S.D. /"Communication Systems: Analog &Digital" /Tata McGraw-Hill.
2. Lathi, B.P. / "Modern Digital &Analog Communication System" /Oxford University Press.
3. Simon Haykin/ "Prinicples of Communication Systems"/ Tata McGraw-Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE 022: POWER STATION PRACTICE

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction: Electric energy demand and growth in India, electric energy sources.

Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.

Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India (8)

UNIT-II

Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.

Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.

Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications (8)

UNIT-III

Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.

Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements. (8)

UNIT-IV

Economic Operation of Power Systems:

Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling (8)

UNIT-V

Non Conventional Energy Sources:

Power Crisis, future energy demand, role of Private sectors in energy management,

MHD generation: Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

Solar power plant: Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

Wind Energy: Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices& economic size.

Geothermal Energy: Earth energy, heat extraction, vapor turbine cycle

Tidal energy: Tidal phenomenon, tidal barrage, tidal power Schemes.
Ocean Thermal Energy: Introduction, energy conversion, problems. (10)

Text Books:
1. B.R. Gupta,"Generation of Electrical Energy", S. Chand Publication.
2. Soni, Gupta & Bhatnagar, "A text book on Power System Engg.", Dhanpat Rai & Co.
3. P.S.R. Murthy, "Operation and control of Power System" BS Publications, Hyderabad.
Reference Books:
4. W. D. Stevenson, "Elements of Power System Analysis", McGraw Hill.
5. S. L. Uppal, "Electrical Power", Khanna Publish

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Departmental Elective-III

4th Year, Semester-VIII

BEE – 031: BIO-INSTRUMENTATION

L T P **Credits – 4**

3 1 0

UNIT-I

Basic physiological system of the body:

Problems encountered in measuring living systems, bioelectric potentials, biomaterials

Basic Transducer Principles:

Active and passive transducers, Transducers for biomedical applications. Generation, propagation and distribution of bioelectric potentials (ECG, EEG and EMG). (8)

UNIT-II

Bio-potential electrodes:

Basic types (micro, skin surface and needle electrodes) biochemical transducers. (PH, blood, gas and specific ions electrodes).

The cardiovascular system and measurements:

Heart and cardiovascular system and circulation block diagram, blood pressure and measurement, characteristics of blood flow and heart sounds. Electrocardiography, ECG lead configurations, ECG recording and their types (8)

UNIT-III

The Nervous System

The anatomy of nervous system, Neuronal communication, EPSP & IPSP Organization of the brain, Measurements from the nervous system

Systemic Body & Skin Temperature Measurement

Temperature measurements Brief idea about ultrasonic measurements (6)

UNIT-IV

Patient care monitoring:

Elements of intensive care, Organization of the Hospital for patient-care monitoring Pace-makers-types, systems, modes and generators, Defibrillators-types. Bio telemetry & applications of telemetry in patient care (6)

UNIT-V

Automation of chemical tests, Instrumentation for diagnostic X Rays, Interfacing computer with medical instrumentation and other equipments, biomedical computer applications. Shock hazards from electrical equipments, methods of accident prevention (6)

Text Book:

1. T. Cromwell, F.J. Weibell & F.A.Pfieffer, “Biomedical Instrumentation & Measurements” Prentice Hall International

Reference Books:

2. R.S. Khanpur, “Handbook of Biomedical Instrumentation” Tata Mc Graw Hill
3. H.E. Thomas, “Handbook of Biomedical Instrumentation and Measurement” Restone

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 032: ADVANCED CONTROL SYSTEM

L T P **Credits – 4**
3 1 0

Unit-I

State Space Analysis of Continuous System: Review of state variable representation of continuous system, conversion of state variable models to transfer function and vice-versa, solution of state equations and state transition matrix, controllability and obsrvability, design of state observer and controller (6)

Unit-II

Analysis of Discrete System: Discrete system and discrete time signals, state variable model and transfer function model of discrete system, conversion of state variable model to transfer function model and vice-versa, modeling of samplehold circuit, solution of state difference equations, steady state accuracy, stability on the z-plane and Jury stability criterion, bilinear transformation, Routh-Hurwitz criterion on rth planes (8)

Unit-III

Stability: Lyapunov's stability theorems for continuous and discrete systems, methods for generating Lyapunov function for continuous and discrete system, Popov's criterion.

Non linear System: Types of non linearities, phenomena related to non - linear systems. Analysis of non linear systems-Linearization method, second order non-linear system on the phase plane, types of phase portraits, singular points, system analysis by phase-plane method, describing function and its application to system analysis. (8)

Unit-IV

Optimal Control: Introduction, formation of optimal control problem, calculus of variations minimization of functions, constrained optimization.Pontryagin's Minimum Maximum Principle, Linear Quadratic Problem-Hamilton Jacobi equation, Riccati equation and its solution. (6)

Unit-V

Adaptive Control: Introduction, modal reference adaptive control systems, controller structure, self tuning regulators. Introduction to neural network, fuzzy logic and genetic algorithms. (5)

Text Books:

1. M.Gopal, "Digital Control and State variable Methods", Tata Mc Graw Hill
2. Ajit K.Madal, "Introduction to Control Engineering: Modelling, Analysis and Design"
3. New Age International.
4. D.Landau, "Adaptive Control", Marcel Dekker Inc.
5. S.Rajasekaran & G.A.Vjayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic
6. Alogorithms: Synthesis and Applications" Prentice Hall of India.

Reference Book:

7. Donald E. Kiv, "Optimal Control Theory: An Introduction" Prentice Hall
8. B.C. Kuo, "Digital Control Systems" Sounders College Publishi

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 033: RELIABILITY ENGINEERING

L T P **Credits – 4**
3 1 0

Unit1

1. Introduction:

Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

Unit2

2. Reliability Mathematics:

Definition of probability, laws of probability , conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations. (8)

Unit3

3. Reliability:

Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method. (6)

Unit4

4. Reliability Improvements:

Methods of reliability improvement, component redundancy, system redundancy, types of redundancies- series, parallel, series - parallel, stand by and hybrid, effect of maintenance. (6)

Unit5

5. Reliability Testing:

Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards. (6)

Reference Books:

1. R.Billintan & R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha & B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-034: ENERGY EFFICIENCY AND CONSERVATION

L T P **Credits – 4**
3 1 0

UNIT -I

Energy conservation:-

Principles of Energy Conservation, Energy conservation Planning, Energy conservation in small scale industries, Large scale industries and in electrical generation, transmission and distribution. Energy conservation Legislation.

Energy Audit:-

Aim of energy Audit, Strategy of Energy Audit, Energy management Team Considerations in implementing energy conservation Programme, Instruments for energy audit, Energy audit of Electrical System, HVAC, Buildings, Economic analysis. (10)

UNIT -II

Demand Side Management:-

Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM. (8)

UNIT –III

Voltage and Reactive power in Distribution System:-

Voltage and reactive power calculations and control: Voltage classes and nomenclature, voltage drop calculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing. (10)

UNIT –IV & V

Efficiency in Motors and Lighting system:-

Load scheduling/shifting, Motor drives- motor efficiency testing, energy efficient motors, and motor speed control. Lighting- lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows.UPS selection, Installation operation and maintenance. Indian Electricity Act 1956, Distribution Code and Electricity Bill 2003 (10)

Text / Reference Books

1. Tripathy S. C., “Electric Energy Utilization and conservation”, Tata McGraw Hill.
2. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.
3. “The Efficient Use of Energy”, Edited by I.G.C.Dryden, Butterworths, London, 1982.
4. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
5. L.C.Witte, “P.S.Schmidt, D.R. Brown, Industrial Energy Management and Utilization”, HemispherePubl, Washington, 1988
6. Power Capacitor Handbook, Butterworth & Co (Publishers) Ltd, 1984.
7. Electrical Systems Analysis and Design for Industrial Plants, McGraw-Hill Book Company.
8. IEEE Bronze Book, ‘Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities, IEEE Press.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Departmental Elective-IV

BEE-041: POWER QUALITY

L T P **Credits – 4**
3 1 0

Unit-I

Introduction to Power Quality:

Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset,; waveform distortion; voltage fluctuation; power frequency variations**.** (7)

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator. (8)

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection. (10)

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques. (6)

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices-Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC) (10)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. C. Sankaran, " Power Quality" CRC Press.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-042: SCADA & ENERGY MANAGEMENT SYSTEM

L T P **Credits – 4**
3 1 0

1. SCADA:
Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierarchical Structure. Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.
(10)

2. Supervisory and Control Functions:
Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc. Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation. (10)

3. MAN- Machine Communication:
Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

4. Data basis- SCADA, EMS and network data basis. SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration. Performance considerations: real time operation system requirements, modularization of software programming languages.
(10)

5. Energy Management Center:
Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management. (5)

Text Books:

1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis",, Prentice Hall of India,
3. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
4. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11th Edition.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-049: MULTIMEDIA SYSTEM

L T P **Credits – 4**
3 1 0

Unit-I
Introduction
Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products
Stages of Multimedia Projects
Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools. (8)

Unit-II
Multimedia Building Blocks
Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture. (5)

Unit-III
Data Compression
Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression. (8)

Unit-IV
Speech Compression & Synthesis
Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression. (5)

Unit-V
Images
Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,Video:Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia. (10)

Text/Reference Books:

1. Tay Vaughan “Multimedia, Making IT Work” Osborne McGraw Hill.
2. Buford “Multimedia Systems” Addison Wesley.
3. Agrawal & Tiwari “Multimedia Systems” Excel.
4. Mark Nelson “Data Compression Book” BPB.
5. David Hillman “Multimedia technology and Applications” Galgotia Publications.
6. Rosch “Multimedia Bible” Sams Publishing.
7. Sleinreitz “Multimedia System” Addison Wesley.
8. James E Skuman “Multimedia in Action” Vikas.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 043: POWER CONVERTER APPLICATIONS

L T P **Credits – 4**
3 1 0

UNIT-I
HVDC Transmission:
Schematic diagram, modes of operation, twelve pulse line commutated converters, effect of source inductance, control of HVDC converters, converter faults and protection, harmonic filters.
(6)

UNIT-II
FACT Controllers :
Principle of power transmission, principles of shunt compensation and series compensation; Shunt compensators-TCR,TSC, SVC,STATCOM
Series compensators-TSSC,FCSC,TCSC,SSVC; Phase angle compensator, Unified power flow controller (UPFC),comparison of compensators. (8)

UNIT-III
Power Supplies:
Desirable specifications of power supplies, drawbacks of linear power supply.
Switch-Mode Power supply (SMPS)-schematic diagram, flyback converter, forward converter, push-pull converter, half bridge and full bridge converters; Uninterruptible power supply (UPS)-configurations of offline and on-line UPS, switch mode and resonant power supplies; air-craft power supply.
(8)

UNIT-IV
Industrial Applications:
High frequency inverters for induction and dielectric heating, ac voltage controllers for resistance heating and illumination control, high frequency fluorescent lighting, electric welding control.
(6)

UNIT-V
Interconnection of Renewable Energy Sources to the Utility Grid :
Photovoltaic array interconnection, wind and small hydro interconnection, interconnection of energy storage systems; DC circuit breaker, single phase and three phase ac switches; Excitation control of synchronous generators. 6)

Text Books:
1. Ned Mohan, T.M.Undeland and William P.Robins, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons.
2. M.H. Rashid, “Power Electronics: Circuits, Devices and Applications” Prentice Hall of India.

Reference Books:
3. K.R.Padiyar, “HVDC Power Transmission: Technology and System Reactions” New Age International

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Major Project (BEE 851)

L T P **Credits – 16**
0 0 21

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

EVALUATION SCHEME AND SYLLABUS

[Effective from the session 2015-16]

B.Tech.

(CSE, ECE, CE, ME, EE & Biomedical Engg.)

1st Year

Department of Applied Sciences & Humanities

FACULTY OF ENGINEERING & TECHNOLOGY
Rama University Uttar Pradesh, Kanpur

A meeting of the Board of Studies of the department of Applied Sciences & Humanities of Faculty of Engineering and Technology, Rama University Uttar Pradesh, Kanpur was held on 7th July 2015 at 11 AM. The following members were present:

1. Dr. Vivek Gupta — Convener
2. Dr. Vinod Kumar Yadav — Member
3. Dr. Tanima Hajra — Member
4. Dr. Deeksha Ranjan — Member
5. Dr. K. G. Sharma — Member
6. …….. — External Member
7. …….. — External Member

The quorum of the meeting was complete.

Agenda of the meeting:

1. Review of 'Evaluation Scheme & Syllabus'

The meeting resolved unanimously that attached reviewed 'Evaluation Schemes & Syllabus' are justified and approved.

Convener

Signature: ……
Name : Dr. Vivek Gupta
Date :

Internal Members

Signature: 1…… 2…… 3…… 4. ……
Name: Dr. Vinod Kr. Yadav Dr. Tanima Hajra Dr. Deeksha Ranjan Dr. K.G. Sharma
Date:

External Members

Signature: 1…… 2……
Name
Date:

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. First Year (Common to Bio Medical, Civil Engg, Computer science Engg., Electronic & Communication Engg., Mechanical Engg.)

SEMESTER-I

S. N.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Total Marks	Credit
			L	T	P	CE	MTE	ETE		
THEORY SUBJECT										
1	BAS -103	Engineering Mathematics-I	3	1	0	20	20	60	100	4
2	BEC-101/ BCS -101	Basic Electronics Engineering/ Computer System and Programming in C	3	1	0	20	20	60	100	4
3	BAS-102/ BAS-104	Engineering Chemistry/ Professional Communication	3	1	0	20	20	60	100	4
4	BEE-101/ BME-102	Basic Electrical Engineering / Engineering Mechanics	3	1	0	20	20	60	100	4
5	BAS-101	Engineering Physics-I	3	0	0	20	20	60	100	4
6	BME-101/ BAS-105	Basic Manufacturing Processes/ Environment & Ecology	3	0	0	20	20	60	100	4
PRACTICAL/DESIGN/DRAWING										
7	BAS-152/ BAS-154	Engineering Chemistry Lab/ Professional Communication Lab	0	0	2	30	20	50	100	1
8	BEE-151/ BME-152	Basic Electrical & Electronics Engineering Lab/ Engineering Mechanics Lab	0	0	2	30	20	50	100	1
9	BWS-151/ BCE-151	Workshop Practice/ Basic Engineering Drawing	0	0	3	30	20	50	100	1
10	BAS-151/ BCS-151	Engineering Physics Lab/ Computer Programming Lab	0	0	2	30	20	50	100	1
		TOTAL	**18**	**4**	**9**	**240**	**200**	**560**	**1000**	**28**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

ETE - End Term Examination: 50 Marks

Convener
Signature: ……
Name : Mr.
Date :

Internal Members
Signature: 1…….. 2……
Name: Mr. Mr.
Date:

External Members
Signature: 1…….. 2……
Name: Prof. (Dr.) Dr.
Date:

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. First Year (Common to Bio Medical, Civil Engg, Computer science Engg., Electronic & Communication Engg., Mechanical Engg.)

(Effective from the session 2015-16)

SEMESTER-II

S. N.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Total Marks	Credit
			L	T	P	CE	MTE	ETE		
THEORY SUBJECT										
1	BAS -203	Engineering Mathematics-II	3	1	0	20	20	60	100	4
2	BEC-201/ BCS -201	Basic Electronics Engineering/ Computer System and Programming in C	3	1	0	20	20	60	100	4
3	BAS-202/ BAS-204	Engineering Chemistry/ Professional Communication	3	1	0	20	20	60	100	4
4	BEE-201/ BME-202	Basic Electrical Engineering / Engineering Mechanics	3	1	0	20	20	60	100	4
5	BAS-201	Engineering Physics-II	3	0	0	20	20	60	100	4
6	BME-201/ BAS-205	Basic Manufacturing Processes/ Environment & Ecology	3	0	0	20	20	60	100	4
PRACTICAL/DESIGN/DRAWING										
7	BAS-252/ BAS-254	Engineering Chemistry Lab/ Professional Communication Lab	0	0	2	30	20	50	100	1
8	BEE-251/ BME-252	Basic Electrical & Electronics Engineering Lab/ Engineering Mechanics Lab	0	0	2	30	20	50	100	1
9	BWS-251/ BCE-251	Workshop Practice/ Basic Engineering Drawing	0	0	3	30	20	50	100	1
10	BAS-251/ BCS-251	Engineering Physics Lab/ Computer Programming Lab	0	0	2	30	20	50	100	1
		TOTAL	**18**	**4**	**9**	**240**	**200**	**560**	**1000**	**28**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

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ETE - End Term Examination: 50 Marks

Convener
Signature: ……
Name : Mr.
Date :

Internal Members
Signature: 1…….. 2……
Name: Mr. Mr.
Date:

External Members
Signature: 1…….. 2……
Name: Prof. (Dr.) Dr.
Date:

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BAS-103: Engineering Mathematics -I

L	T	P
3	1	0

Credits: -4

Unit - 1: Differential Calculus - I **8 Hours**

Differentiation, nth Derivative, Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II **8 Hours**

Maclaurin's and Taylor's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra **8 Hours**

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem, Application of matrices to engineering problems. A brief introduction to Vector Spaces,

Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals **8 Hours**

Double and triple integrals, Change of order of integration, Change of variables, Application of Integration to lengths, Surface areas and Volumes - Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus **8 Hours**

Point function, Gradient, Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
2. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
3. E. Kreyszig:Advanced Engineering Mathematics-Volume-I,John Wiley & Sons

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics - I, Pearson Education.

BAS 105/ BAS 205: Environment and Ecology

L T P
2 0 0 **Credit: 2**

UNIT-I: Nature and Scope of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources -Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources –fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel.

UNIT-II: Environmental Changes and Human Health

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics. Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards.

UNIT- III: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring. Environmental Protection– Role of individuals, organizations and government in pollution control. Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection.

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications

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BAS-203: Engineering Mathematics - II

L	T	P	Credits: -4
3	1	0	

Unit - 1: Differential Equations **8 Hrs.**

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of undetermined coefficient Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions **8 Hrs.**

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform **8 Hrs.**

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier series and Partial Differential Equations **8 Hrs.**

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis. Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations **8 Hrs.**

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimensions, Equation of transmission lines.

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
2. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
3. E.Kreyszig,Advanced Engineering Mathematics, John Wiley & Sons.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. - II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics - II, Pearson Education.

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BCS-101/BCS-201: Computer System and Programming in C

L	T	P	Credit-4
3	0	0	

Unit-I **08 Hours**

Introduction: Computer basics and classification of computers, operations of computer, components of a computer and operating system concepts.

Number System: Binary, Octal and hexadecimal number systems, Binary arithmetic.

Programming Concepts: Approaches of problem solving, computer algorithms and flow charts.Introduction of computer languages - machine language, assembly language and high level language.

Unit-II **08 Hours**

Program Structure and Execution: Representing and manipulating information. Information storage: data sizes, addressing and representing strings. Integer representation and arithmetic, Boolean algebra, logical, shift and bit level operations.

Running Programs on a System

Concept of assembler, compiler, loader and linker, exceptional control flow, processes, process control, system calls, Error handling, program execution time.

Unit-III **08 Hours**

Programming Concepts in C

Standard input and output in C, Fundamental data types and sizes: character, integer, short, long, unsigned, single and double floating point. Storage classes: automatic, register, static and external. Operators and expressions: arithmetic, relational and logical operators, operator precedence and order of evaluation.

Unit-IV **08 Hours**

Control Flow: Statements and blocks, 'If-Else', 'Else-If', 'Switch', nesting 'If-Else', loops 'While', 'Do-while' and 'For', use of 'Break' and 'Continue', 'Goto' and 'Labels'.

Functions: Basics of functions, types of functions, functions with array, passing values to functions and recursive functions.

Unit-V **08 Hours**

Pointers and Arrays: Pointers and addresses, pointers and functions arguments, pointers and arrays, Address arithmetic, pointers arrays, multidimensional arrays, pointers to functions.

Structure: Introduction, structures and functions, arrays and pointers of structures.

File Handling: Standard C preprocessors, file access, defining and calling macros and standard libraries.

Reference Book:

1. Programming in C – Gottfried B.S. (TMH).
2. let us C – Kanetkar Y. (BPB).
3.The C Programming Language - Kernighan B.W., Ritchie D.M. (PHI).
4.C++: The Complete Reference (4th Ed) – Schildt H. (TMH).
5.The C++ Programming Language – Stroustrup B. (Addison-Wesley

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BCS-151/BCS-251: Computer Programming Lab

L T P **Credit-1**

0 0 2

S No	Name of the program
1	a)To evaluate algebraic exp(ax+b)/(ax-b) b)to Evaluate algebraic exp 2.5logx+cos32+|x*x-y*y|+sqrt(2*x*y) c)to evaluate the algebraic expaepower-rt d)to evaluate algebraic exp x power5 +10 x power 4+8 x power3+4x+2
2	To evaluate area of triangle (sqrt(s(s-a)(s-b)(s-c)
3	To swap 2 no
4	Greatest of 2 no
5	Greatest of 3 numbers
5	Greatest of 3 onto print the given no in ascending order
6	To perform the arithmetic expression using switch statement
7	Factorial of given no using do while statement
8	To print prime up to n no
9	Sum of n natural no
10	Total no. of even integers
11	Total no. of odd integers
12	Sum of even integers
13	Sum of odd integers
14	A program to print the product of two matrices of any order
15	Write a program to print Fibonacci series
16	Write a program to print o/ps a)1 b) 1 c) 1 d) 1 2 2 2 2 2 2 3 3 3 3 3 3 3 3 4 5 6
17	Write a program to read n num of students and 5 sub marks
18	Write a program to find factorial of a num using 3 types of funs
19	Write a program to convert all lower case to uppercase characters.
20	Write a program to extract a string
21	Write a program to sort 5 city names in alphabetical order
22	Write a program to find the factorial of a number using recursion
23	A program to print address of variable
24	A program to access a variable using pointers
25	A program to print the element of array using pointers
26	A program to implement call by reference
27	A program to find greatest of ‘n’ num using funs
28	A program to print the elements of a structure using pointers

29	A program to display student information by initializing structures
30	A program to find total number of marks
31	Write a program to open a file.
32	Write a program to read a file.
33	Write a program to write a file.
34	Write a program to save a file.

BAS 102/ BAS 202: Engineering Chemistry

L	T	P
3	1	0

Credits: -4

UNIT-I **8 Hours**

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Liquid crystals & it's application. Space lattice (only cubes), types of unit cell, calculation of density of unit cell. Types of hydrogen bonding and its applications. Structure and applications of Graphite and Fullerenes.

UNIT-II **8 Hours**

Polymers, its classification and their applications. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. Elementary ideas and simple applications Visible, UV, IR ^{1}HNMR and mass spectroscopic Techniques, Ziegler-Natta catalyst

UNIT-III **8 Hours**

Stereochemistry with special reference to chirality, E - Z and R - S nomenclature. Elementary idea of inductive effect, mesomeric effect, reaction intermediate (carbcation, carbanion and free redical carbene). Types of organic reactions with special reference of nucleophilic substitution reaction. Grignard Reagent.

UNIT-IV **8 Hours**

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass.

UNIT-V **8 Hours**

Rate, order and molecularity of reaction, Integrated rate equation of zero order, first order and second order reactions, activation energy. Galvanic cell, electrochemical theory of corrosion and its protection. Phase Rule and its application to one component system (water and sulfur).

Reference Books

1. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
2. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
3. Concise Inorganic Chemistry by J.D. Lee; Wiley India
4. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
5. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill

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BAS-152 /BAS-252: ENGINEERING CHEMISTRY LAB

L T P
0 0 2
Credit:-1

List of Experiments:-

1. Determination of alkalinity in the given water sample.
2. Determination of Temporary and Permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of Iron content in the given Iron ore sample by using [K_3 Fe $(CN)_6$] as an external indicator.
6. Determination of solubility of salt (NaCl) at room temperature.
7. Determine the viscosity of a given solution.
8. Determination of Iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as a colour developing agent and the measurement are carried out at λ_{max} 480 nm.
9. Element detection and Functional group identification in organic compounds.
10. Preparation of Bakelite & Urea Formaldehyde resin.

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BAS-101: ENGINEERING PHYSICS-I

L T P
3 0 0
Credits: -3

Unit - I

Relativistic Mechanics 06 Hrs.

Inertial & non-inertial frames, Michelson- Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II 06 Hrs.

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation - particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III

Wave Optics 10 Hrs.

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film),Newton's rings. Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating

Unit- IV

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - V 08 Hrs.

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics -Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

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BAS-201: ENGINEERING PHYSICS-II

L T P
2 0 0
Credits: -2

Unit - I 08 Hrs.

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II 08 Hrs.

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti- Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III 08 Hrs.

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV 09 Hrs

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Unit – V

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Optical Fibre & Laser - Anuradha De. (New Age)
3. Optics -Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)

BAS-151/BAS-251: PHYSICS LAB

L	T	P
0	0	2

Credits: -1

List of Experiments-

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.

Group - B

6. To determine the specific resistance of a given wire using Carey Foster's bridge.
7. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter by potentiometer.
10. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of agiven semiconductor using Hall effect set up.
11. To determine the energy band gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the coefficient of viscosity of a liquid.

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BAS-104/BAS-204 : PROFESSIONAL COMMUNICATION

L	T	P
3	1	0

Credits: 4

UNIT- I: FUNDAMENTALS OF COMMUNCATION **8 hours**

Technical Communication: Features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral or Horizontal (peer group); Importance of technical communication; Barriers to Communication.

UNIT-II: WRITING CORRECT ENGLISH **8 hours**

The Sentence: Meaning and definition, Kinds of Sentences; Tenses; Present, Past and Future; Concord: Meaning; Concord of Numbers and Persons; Articles.

UNIT-III: CONSTITUENTS OF TECHNICAL WRITTEN COMMUNICATION **8 hours**

Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500- 1000 new words; Correct Usage; All Parts of Speech; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc.

UNIT-IV: BUSINESS COMMUNICATION **8 hours**

Principles; Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports; Technical Proposal; Parts; Types; Writing of Proposal and its significance.

UNIT-V: PRESENTATION STRATEGIES AND SPEECH MECHANISM **8 hours**

Defining Purpose; Audience and Locale, Organizing Contents; Preparing Outline; Audio-Visual Aida; Nuance of Delivery; Body Language; Dimensions of Speech; Syllable; Accent Pitch; Rhythm; Intonation; Difference between stress and intonation; Paralinguistic features of voice;

Text books:

1- Technical Communication: Principles and Practice. Meenakshi Raman and Sangeeta Sharma, Oxford University Press, New Delhi.

2- Professional Communication. Dr. Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.

Reference books:

1. Gerson, Sharon J. & Gerson, Steven M., *Technical Writing- Process and Product ,* Delhi, Pearson/ Education Publications.
2. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata Mc Graw Hill Publishing Company Ltd.
3. Sinha, R.P., English Grammar and Usage, New Delhi, Oxford University Press.
4. Lewis, Norman, Word Power Made Easy, Delhi, W.R. Goyal Pub. & Distributors.

BAS-154/BAS-254: PROFESSIONAL COMMUNICATION LAB

L	T	P
0	0	2

Credit: 1

LIST OF PRACTICALS

1. Introduction to sounds in English language. Practice of consonants, vowels and diphthongs (sounds).

2. Stress and intonation in speech.

3. Conversational skills: Group Discussion: Practical based on accurate and current grammatical patterns.

4. Conversational skills for interviews under suitable Professional Communication Lab conditions with emphasis on kinesics.

5. Official/Public speaking .Sample speeches by eminent people (video).

6. Theme- presentation/ Key-note presentation.

7. Individual speech delivery/conferences with skills to defend interjections/quizzes.

8. Role plays with argumentative skills/Role play presentation with stress and intonation.

9. Comprehension skills based on reading and listening. Practical based on a model audio-visual usage.

Text book:

1. Communication Lab (English). Dr. Malti Agarwal, Krishna Prakashan Media (P) Ltd. Meerut.

Reference books:

1. Kenjer,Hanif., *All the Right Answers*, New Delhi, Macmillan India Ltd.
2. Taylor,Grant., *English Conversation Practice*, New Delhi, Tata Mc Graw Hill Publishing Company Ltd.
3. Pandey, L.U.B., Singh, R.P., *A Manual of Practical Communication*, Delhi, A.I.T.B.S.Pub. India.Ltd.
4. Jones Daniel., *English Pronouncing Dictionary*, New Delhi, Cambridge University Press.
5. Sethi, J.,& Dhamija, P.V., *A Course in Phonetics and Spoken English*, New Delhi, Prentice Hall.
6. Online dictionary references.

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BEC 101/BEC201 Basic Electronics Engineering

L T P **Credits – 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**Semiconductor materials and properties:** Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concept of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities Junction diode, p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage), Hall effect. **Diode Applications:** rectifiers (half wave and full wave) calculation of transformer utilization factor and diode ratings, filter, calculation of ripple factor and load regulation clipping circuits, clamping circuits, voltage multipliers, Breakdown diodes breakdown mechanisms (zener and avalanche) breakdown characteristics, zener resistance, zener diode ratings zener diode application as shunt regulator.	**10**
Unit II	**Operational Amplifiers:** Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators etc. **Instrumentation:** Digital Voltmeter, Digital Multimeter, **Oscilloscope:** Introduction, Basic Principle, CRT, Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency.	**8**
Unit III	**Bipolar Junction Transistor**: Basic construction, transistor action CB, CE and CC configurations, input/output characteristics Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits Transistor	**9**
Unit IV	**Field Effect Transistor :** **JFET:** Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed, self-biasing**.** **MOSFET:** depletion and enhancement type MOSFET-construction, operation and characteristics.	**6**
Unit V	**Switching theory and logic design**: Number systems, conversion of bases Boolean algebra, logic gates, concept of universal gate, canonical forms. Minimization using K-map, Combinational Circuits, Basic of Flip flops .	**7**

Text Book/ Reference books:

1. Boylestad and Nashelsky, "Electronic Devices and circuits" PHI, 6e.
2. Morris Mano, "Digital Computer Design", PHI.
3. Millman J. and Halkias C., Jit Satybrat, "Integrated Electronics ", Tata McGraw-Hill.

BEE101/BEE201 Basic Electrical Engineering

L T P **Credits: 4**
3 1 0

Unit	Topic	No. of Lecture
Unit I	**D C Circuit Analysis and Network Theorems**: Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation. **Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem.	**9**
Unit II	**Steady- State Analysis of Single Phase AC Circuits:** AC fundamentals: Sinusoidal, square and triangular waveforms - Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor, Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement.	**8**
Unit III	**Three Phase AC Circuits:** Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement. **Measuring Instruments:** Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers.	**7**
Unit IV	**Introduction to Earthing and Electrical Safety:** Need of Earthing of equipment and devices, important electrical safety issues. **Magnetic Circuit:** Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. **Single Phase Transformer:** Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Introduction to auto transformer.	**9**
Unit V	**Electrical Machines:** Concept of electro mechanical energy conversion **DC machines:** Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors.	**8**

	Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications. **Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.	

Text Books and Reference Books:

1. V. Del Toro, "Principles of Electrical Engineering", Prentice Hall International.
2. D P Kothari, I.J. Nagarath, "Basic Electrical Engineering", Tata McGraw Hill.
3. S N Singh, "Basic Electrical Engineering", Prentice Hall International.
4. B Dwivedi, A Tripathi, "Fundamentals of Electrical Engineering", Wiley India.
5. Kuldeep Sahay, "Basic Electrical Engineering", New Age International Publishers

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

BEE151/BEE251 Electrical and Electronics Engineering Lab

L T P **Credits: 1**
0 0 2

1. Verification of Kirchhoff's laws.
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit .
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics.
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates.
15. To study Operational Amplifier as Adder and Subtractor.
16. To study transistor as a switch.

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

BME-102/BME202: ENGINEERING MECHANICS

L T P **Credits-4**
3 1 0

UNIT I

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications 5

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry friction, Belt friction, Application. 4

UNIT II

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams. 5

Trusses: Introduction, Simple Truss and Solution of Simple truss, Method f Joints and Method of Sections. 4

UNIT III

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axestheorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

8

UNIT IV

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity. 7

UNIT V

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium 7

Reference Books:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas 9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

BME-101/BME-201: BASIC MANUFACTURING PROCESSES

L T P **Credit -2**
2 0 0

Unit-I Introduction to Engineering Materials

Materials and Engineering, Classification of Engineering Materials. Industrial applications of common engineering materials, Metals & Alloys: Properties and Applications,. Steels and Cast Irons, Alloys of Non Ferrous metals. 6

Unit-II Basic Metal Forming & Casting Process.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube drawing/making and Extrusion, and their uses. 4

.

Press-work: Die & Punch assembly, cutting and forming, its applications. Hot-working versus cold-working

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses.

2

Unit-III Machining and Welding operations and their applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding.

3

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. 3

Unit-IV Misc. Topics

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening. 1

Manufacturing Establishment: Plant location. Plant layout-its types. Types of Production. Production versus Productivity. 1

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. 1

Misc. Processes: Powder-metallurgy process & its applications, Plastic-products manufacturing, Galvanizing and Electroplating. 1

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital,

BME-152/BME/252: Engineering Mechanics Lab

L T P **Credits:-1**
0 0 2

Note: Any 10 experiments of the following or similar experiments suitably designed

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Dynamics experiment on momentum conservation

BWS-151/251: WORKSHOP PRACTICE

L	T	P
0	0	3

Credits: - 1

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving Drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

FACULTY OF ENGINEERING & TECHNOLOGY

Rama University Uttar Pradesh, Kanpur

BCE-151/251: Basic Engineering Drawing

L T P **Credits: - 1**
0 0 3

1. Introduction to Engineering drawing

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim,extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering.

2-Sheet

2. Orthographic Projections

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in Firstquadrant/first angle only), True and apparent lengths, True and apparent inclinations toreference planes (No application problems**).**

2-Sheet

3. Orthographic Projections of Plane Surfaces

(First Angle Projection Only)

Introduction, Definitions-projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates.) **1-Sheet**

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. (No problems on octahedrons and combination solid) **2-Sheet**

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, section views, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on section of solids) **1-Sheet**

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three Solids). **1-Sheet**

7. Introduction to Auto CAD

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing - M.B. Shah, B.C.Rana, 2nd Edition.

RAMA UNIVERSITY UTTAR PRADESH, KANPUR

Faculty of Engineering & Technology

EVALUATION SCHEME AND SYLLABUS

[Effective from the session 2015-16]

B.Tech. (Agriculture)

1st Semester

Department of Applied Sciences & Humanities

RAMA UNIVERSITY UTTAR PRADESH, KANPUR

A meeting of the Board of Studies of the department of Applied Sciences & Humanities of Faculty of Engineering and Technology, Rama University Uttar Pradesh, Kanpur was held on 7th July 2015 at 11 AM. The following members were present:

1.	Dr. Vivek Gupta	Convener
2.	Dr. Vinod Kumar Yadav	Member
3.	Dr. Tanima Hajra	Member
4.	Mr. Nishant Kumar	Member (HoD, Agriculture Deptt.)
5.	Dr. K. G. Sharma	Member
6.	……..	External Member
7.	……..	External Member

The quorum of the meeting was complete.

Agenda of the meeting:

1. Review of 'Evaluation Scheme & Syllabus'

The meeting resolved unanimously that attached reviewed 'Evaluation Scheme & Syllabus' are justified and approved.

Convener

Signature: ……
Name : Dr. Vivek Gupta
Date :

Internal Members

Signature: 1…… 2…… 3…… 4. ……..
Name: Dr. Vinod Kr. Yadav Dr. Tanima Hajra Mr. Nishant Kumar Dr. K.G. Sharma
Date:

External Members

Signature: 1…… 2……
Name
Date:

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme
(Effective from the Session 2015-16)
B. Tech. - Agriculture Engineering
1st YEAR, SEMESTER-I

S. N.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Total Marks	Credit
			L	T	P	CE	MTE	ETE		
THEORY SUBJECT										
1	BAS -103	Engineering Mathematics-I	3	1	0	20	20	60	100	4
2	BCS -101	Computer System and Programming in C	2	1	0	20	20	60	100	3
3	BAS-104	Professional Communication	2	1	0	10	10	30	50	3
4	BME-102	Engineering Mechanics	3	1	0	20	20	60	100	4
5	BAS-101	Engineering Physics-I	3	1	0	20	20	60	100	4
6	BAS-105	Environment & Ecology	3	0	0	10	10	30	50	3
7	BAG-101	Principles of Agriculture	2	1	0	20	20	60	100	3
PRACTICAL/DESIGN										
8	BME-152	Engineering Mechanics Lab	0	0	2	30	20	50	100	1
9	BCE-151	Basic Engineering Drawing	0	0	3	30	20	50	100	1
10	BAS-151	Engineering Physics Lab	0	0	2	30	20	50	100	1
11	BAG-151	Principle of Agriculture Lab	0	0	2	30	20	50	100	1
		TOTAL	**18**	**6**	**9**	**240**	**200**	**560**	**1000**	**28**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Internal Members:

Signature: 1…….. 2…….. 3……

Date :

External Members:

Signature: 1…….. 2…….. 3……

Name :

Date :

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

1st Year, SEMESTER-I & II

BAS-105: ENVIRONMENT AND ECOLOGY

L T P
2 0 0 **Credits: 2**

Unit-I: Nature and Scope of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources -Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources –fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel.

Unit-II: Environmental Changes and Human Health

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics. Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards.

Unit- III: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring. Environmental Protection– Role of individuals, organizations and government in pollution control. Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection.

Recommended Text book:

1. Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-103: ENGINEERING MATHEMATICS-I

L T P
3 1 0

Credit-4

Unit - 1: Differential Calculus - I 8 Hours
Differentiation, nth Derivative, Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II
Maclaurin's and Taylor's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra
Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem, Application of matrices to engineering problems. A brief introduction to Vector Spaces, Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals 8 Hours Double and triple integrals, Change of order of integration, Change of variables, Application of Integration to lengths, Surface areas and Volumes - Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus 8 Hours Point function, Gradient, Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
2. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
3. E. Kreyszig:Advanced Engineering Mathematics-Volume-I,John Wiley & Sons

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics - I, Pearson Education.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-203: ENGINEERING MATHEMATICS - II

L T P
3 1 0

Credit-4

Unit - 1: Differential Equations 8 Hours Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of undetermined coefficient Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions 8 Hours Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform 8 Hours Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier series and Partial Differential Equations 8 Hours Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis. Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations 8 Hours Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimensions, Equation of transmission lines.

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
2. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
3. E.Kreyszig,Advanced Engineering Mathematics, John Wiley & Sons.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. - II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics - II, Pearson Education.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCS-101: COMPUTER SYSTEM AND PROGRAMMING IN C

L T P **Credit-3**
3 0 0

Unit-I

Introduction: Computer basics and classification of computers, operations of computer, components of a computer and operating system concepts.

Number System: Binary, Octal and hexadecimal number systems, Binary arithmetic.

Programming Concepts: Approaches of problem solving, computer algorithms and flow charts. Introduction of computer languages - machine language, assembly language and high level language.

Unit-II 08 Hours Program Structure and Execution: Representing and manipulating information. Information storage: data sizes, addressing and representing strings. Integer representation and arithmetic, Boolean algebra, logical, shift and bit level operations.

Running Programs on a System

Concept of assembler, compiler, loader and linker, exceptional control flow, processes, process control, system calls, Error handling, program execution time.

Unit-III

Programming Concepts in C

Standard input and output in C, Fundamental data types and sizes: character, integer, short, long, unsigned, single and double floating point. Storage classes: automatic, register, static and external. Operators and expressions: arithmetic, relational and logical operators, operator precedence and order of evaluation.

Unit-IV 08 Hours Control Flow: Statements and blocks, 'If-Else', 'Else-If', 'Switch', nesting 'If-Else', loops 'While', 'Do-while' and 'For', use of 'Break' and 'Continue', 'Goto' and 'Labels'.

Functions: Basics of functions, types of functions, functions with array, passing values to functions and recursive functions.

Unit-V 08 Hours Pointers and Arrays: Pointers and addresses, pointers and functions arguments, pointers and arrays, Address arithmetic, pointers arrays, multidimensional arrays, pointers to functions.

Structure: Introduction, structures and functions, arrays and pointers of structures.

File Handling: Standard C preprocessors, file access, defining and calling macros and standard libraries.

Reference Book:

1. Programming in C – Gottfried B.S. (TMH).
2. Let us C – Kanetkar Y. (BPB).
3. The C Programming Language - Kernighan B.W., Ritchie D.M.
(PHI). 4. C++: The Complete Reference (4th Ed) – Schildt H. (TMH).
5. The C++ Programming Language – Stroustrup B. (Addison-Wesley

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-101: Principle of Agriculture

L T P
2 0 1 **Credit: 3**

Unit-I

Crop Classification, Cropping systems for major agro-ecological regions; crop ecosystem and strategies of crop production in tropical and sub-tropical regions; modern techniques of raising field and horticultural crops.

Unit-II

Tillage practices and soil management, seeds and seeding practices; scheduling of irrigation and fertilizers.

Unit-III

Plant protection measures; harvest and post harvest operations; dry land farming principles and practices; crop growth assessment and modeling.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-151: Principle of Agriculture Lab

L T P **Credit: 1**
0 0 2

List of Experiment:

1. Identification of an acquaintance with seeds, plants, weeds and Agro –chemicals, testing of Germination, viability and vigor of seeds, estimation of agro-chemicals for field application.

2. Determination of tillage requirement for field preparations, Hydroponics, seeding and planting techniques and assessment of stand and establishment of field crops.

3. Irrigation water measurement techniques, Biometrics observations of growth, yield and yield attributes, measurement of Leaf Area index.

3. Determination of chlorophyll content in leaf, estimation of oil in different oil seed crops, Determination of N,P,K, in crops, testing quality of Crops.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS 202: ENGINEERING CHEMISTRY

L T P
2 0 1

Credit-3

Unit-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Liquid crystals & it's application. Space lattice (only cubes), types of unit cell, calculation of density of unit cell. Types of hydrogen bonding and its applications. Structure and applications of Graphite and Fullerenes.

Unit-II

Polymers, its classification and their applications. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibers. Conducting and biodegradable polymers. Elementary ideas and simple applications Visible, UV, IR ^{1}HNMR and mass spectroscopic Techniques, Ziegler-Natta catalyst

Unit-III

Stereochemistry with special reference to chirality, E - Z and R - S nomenclature. Elementary idea of inductive effect, mesomeric effect, reaction intermediate (carbcation, carnation and free radical carbene). Types of organic reactions with special reference of nucleophilic substitution reaction. Grignard Reagent.

Unit-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass.

Unit-V

Rate, order and molecularity of reaction, Integrated rate equation of zero order, first order and second order reactions, activation energy. Galvanic cell, electrochemical theory of corrosion and its protection. Phase Rule and its application to one component system (water and sulfur).

Reference Books

1. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
2. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
3. Concise Inorganic Chemistry by J.D. Lee; Wiley India
4. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
5. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-252: ENGINEERING CHEMISTRY LAB

L T P
0 0 2

Credit:-1

List of Experiments:-

1. Determination of alkalinity in the given water sample.
2. Determination of Temporary and Permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of Iron content in the given Iron ore sample by using [K_3 Fe $(CN)_6$] as an external indicator.
6. Determination of solubility of salt (NaCl) at room temperature.
7. Determine the viscosity of a given solution.
8. Determination of Iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as a colour developing agent and the measurement are carried out at λ_{max} 480 nm.
9. Element detection and Functional group identification in organic compounds.
10. Preparation of Bakelite & Urea Formaldehyde resin.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-101: ENGINEERING PHYSICS-I

L T P
3 0 0
Credits: -3

Unit - I

Relativistic Mechanics 06 Hrs.

Inertial & non-inertial frames, Michelson- Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II 06 Hrs.

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation - particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III

Wave Optics 10 Hrs.

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film),Newton's rings. Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating

Unit- IV

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - V 08 Hrs.

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics -Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-151: PHYSICS LAB

L T P
0 0 2

Credit-1

List of Experiments-

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.

Group – B

6. To determine the specific resistance of a given wire using Carey Foster's bridge.
7. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter by potentiometer.
10. To study the Hall Effect and determine Hall coefficient, carrier density and - mobility of agiven semiconductor using Hall Effect set up.
11. To determine the energy band gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the coefficient of viscosity of a liquid.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-104: PROFESSIONAL COMMUNICATION

L T P
3 0 0

Credits: 3

Unit- I: Fundamentals of Communication

Technical Communication: Features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral or Horizontal (peer group); Importance of technical communication; Barriers to Communication.

Unit-II: Writing Correct English

The Sentence: Meaning and definition, Kinds of Sentences; Tenses; Present, Past and Future; Concord: Meaning; Concord of Numbers and Persons; Articles.

Unit-III: Constituents of Technical Written Communication

Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500- 1000 new words; Correct Usage; All Parts of Speech; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc.

Unit-IV: Business Communication

Principles; Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports; Technical Proposal; Parts; Types; Writing of Proposal and its significance.

Unit-V: Presentation Strategies and Speech Mechanism

Defining Purpose; Audience and Locale, Organizing Contents; Preparing Outline; Audio-Visual Aida; Nuance of Delivery; Body Language; Dimensions of Speech; Syllable; Accent Pitch; Rhythm; Intonation; Difference between stress and intonation; Paralinguistic features of voice;

Text books:

1. Technical Communication: Principles and Practice. Meenakshi Raman and Sangeeta Sharma, Oxford University Press, New Delhi.
2. Professional Communication. Dr. Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.

Reference books:

1. Gerson, Sharon J. & Gerson, Steven M., *Technical Writing- Process and Product ,* Delhi, Pearson/ Education Publications.
2. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata Mc Graw Hill Publishing Company Ltd.
3. Sinha, R.P., English Grammar and Usage, New Delhi, Oxford University Press.
4. Lewis, Norman, Word Power Made Easy, Delhi, W.R. Goyal Pub. & Distributors.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEC-201: BASIC ELECTRONICS ENGINEERING

L T P **Credits – 3**
2 0 1

Unit	Topic	No. of Lecture
Unit-I	**Semiconductor materials and properties:** Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concept of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities Junction diode, p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, Non-repetitive current, peak-inverse voltage), Hall effect. **Diode Applications:** rectifiers (half wave and full wave) calculation of transformer utilization factor and diode ratings, filter, calculation of ripple factor and load regulation clipping circuits, clamping circuits, voltage multipliers, Breakdown diodes breakdown mechanisms (zener and avalanche) breakdown characteristics, zener resistance, zener diode ratings zener diode application as Shunt regulator.	**10**
Unit-II	**Operational Amplifiers:** Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators etc. **Instrumentation:** Digital Voltmeter, Digital Multimeter, **Oscilloscope:** Introduction, Basic Principle, CRT, Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency.	**8**
Unit-III	**Bipolar Junction Transistor** : Basic construction, transistor action CB, CE and CC configurations, input/output characteristics Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits Transistor	**9**
Unit-IV	**Field Effect Transistor :** **JFET:** Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed, self-biasing**.** **MOSFET:** depletion and enhancement type MOSFET-construction, operation and Characteristics.	**6**
Unit-V	**Switching theory and logic design**: Number systems, conversion of bases Boolean algebra Logic gates, concept of universal gate, canonical forms. Minimization using K-map, Combinational Circuits, and Basic of Flip flops.	**7**

Text Book/ Reference books:

1. Boylestad and Nashelsky, “Electronic Devices and circuits” PHI, 6e.
2. Morris Mano, “Digital Computer Design”, PHI.
3. Millman J. and Halkias C., Jit Satybrat, “Integrated Electronics ", Tata McGraw-Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-201: BASIC ELECTRICAL ENGINEERING

L T P **Credits: 3**
2 0 1

Unit	Topic	No. of Lecture
Unit-I	**D C Circuit Analysis and Network Theorems**: Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation. **Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem.	**9**
Unit-II	**Steady- State Analysis of Single Phase AC Circuits:** AC fundamentals: Sinusoidal, square and triangular waveforms - Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor, Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement.	**8**
Unit-III	**Three Phase AC Circuits:** Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement. **Measuring Instruments:** Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers.	**7**
Unit-IV	**Introduction to Earthing and Electrical Safety:** Need of Earthing of equipment and devices, important electrical safety issues. **Magnetic Circuit:** Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. **Single Phase Transformer:** Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Introduction to auto transformer.	**9**
Unit-V	**Electrical Machines:** Concept of electro mechanical energy conversion **DC machines:** Types, EMF equation of generator and torque equation of Motor, Characteristics and applications of DC motors. **Three Phase Induction Motor:** Types, Principle of operation, Slip-torque Characteristics, Applications. **Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and Synchronous motor and their applications.	**8**

Text Books and Reference Books:

1. V. Del Toro, "Principles of Electrical Engineering", Prentice Hall International.
2. D P Kothari, I.J. Nagarath, "Basic Electrical Engineering", Tata McGraw Hill.
3. S N Singh, "Basic Electrical Engineering", Prentice Hall International.
4. B Dwivedi, A Tripathi, "Fundamentals of Electrical Engineering", Wiley India.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE-251: ELECTRICAL AND ELECTRONICS ENGINEERING LAB

L T P **Credits: 1**
0 0 2

1. Verification of Kirchhoff's laws.
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phases circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit .
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics.
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates.
15. To study Operational Amplifier as Adder and Subtractor.
16. To study transistor as a switch.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-102: ENGINEERING MECHANICS

L T P **Credits-4**
3 1 0

Unit-I

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry friction, Belt friction, Application.

Unit-II

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams. 5 **Trusses:** Introduction, Simple Truss and Solution of Simple truss, Method f Joints and Method of Sections.

Unit-III

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit-IV

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity.

Unit-V

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium

Reference Books:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S.Rajasekaran and G.Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-152: ENGINEERING MECHANICS LAB

L T P **Credits:-1**
0 0 2

Note: Any 10 experiments of the following or similar experiments suitably designed

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Dynamics experiment on momentum conservation

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BWS-251: WORKSHOP PRACTICE

L T P **Credit-1**
0 0 3

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving Drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-102: Principle of soil science

L T P **Credit: 4**

3 1 0

Unit:-I

Course Objective – To develop basic understanding in students about soil forming processes and soil as natural body/medium for storage and movement of water, gases, heat, nutrients. To develop student understanding of the general physical and chemical properties of soil.

Unit:-II

Course Content – Soil as three-phase system, Definition of soil, soil forming rocks and minerals, weathering of rocks and minerals, soil formation processes, factors of soil formation, soil profile and its development.

Soil Physical Properties-Texture, Textural classification of soils, Stoke's law and its limitations, Soil structure, Formation and types of soil structure, Bulk Density, Particle density, Porosity, Types of Soil Water, Soil Moisture Tension/Water potential, Saturation, Soil water movement, Soil Temperature, Soil Air, Aeration and its importance.

Unit:-III

Soil Chemical Properties , Soil Reaction-Soil pH, Saline, Saline Alkali, Alkali Soils and their management, Colloidal Properties of the Soil- Soil organic matter and Humus formation ; Clay minerals: Colloidal properties, 1;1, 2:1 lattice structures; Cation exchange properties of soils as contributed by organic and inorganic colloids. Diffuse Double Layer, Stern layer theory, Flocculatinand dispersion; Soil Classification – Soil Taxonomic orders.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-152: Principle of soil science Lab

L T P
0 0 2

Credits: 1

1. Techniques of soil sampling, preparation of soil samples for analysis.

2. Determination of Bulk Density and particle density of soil, soil moisture content. Determination of Soil Texture.

3. Study of soil profile, Identification of Rocks and Minerals. Si O2 determination, Hcl extraction of soil.

4. Gravimetric determination of sulphate. Organic matter / Carbon determination. Determination of cation exchange capacity of soil.

5. Determination of Ca, Phosphorus, and Iron Nitrogen, Potassium, Soil pH, Gypsum requirement.

6. Electrical conductivity, SAR. Determination of water-soluble anions chlorides, carbonates, bicarbonates.

Ref. Book:

The Nature and Properties of Soil, By: N.C. Brady and R.R. Weil
Fundamentals of Soil Science, Ed. By ICAR
Chemistry of Soil, By: E.E. Bear

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-103: Horticultural & Field Crop

L T P
3 1 0 **Credit: 4**

Unit:I

Farm crops, Cultivation of wheat, Paddy, Jowar, Cotton, Maize, Groundnut, Potato, and Sugarcane with reference to its varieties. Area of growing, sowing time, Seed rate, Method of sowing, manuring irrigation an water requirements. Harvesting, Threshing and yields. Crop rotation, Soil, Soil formation, Classification (sand, loam, silt, clay), Soil Characteristics, Manuring and its importance, Study of Gobar, Compost and Green manure.

Unit:-II

Importance of fruit and vegetable in diet, scope and importance of fruit and vegetable industry. A general survey of fruits grown in India. Planting plants: Their merits and demerits, preliminary operation before planting. Temperature relation: Temperature as part of climate, influence of temperature on plants, freeze and frost and their control.

Unit: III

Water relation: Water absorption and movement in plant, methods of irrigation systems for fruits and vegetables, their merits and demerits. Light relation: Role of light in seed germination, photoperiodism, and light source of radiant energy. Soil: Essential elements and their role, methods for correcting deficiency and excess.

Nutrition: Essential elements and their role, methods for correcting deficiency and excess. Propagation: Sexual propagation, cuttage, layarage and graftage. Raising and sectioning of root stock. Pruning and growth control: System and methods of training fruit trees pruning principles and method pruning tools and their material.

Unit: IV

Marketing storage of horticulture produce, preparation for marketing. Cultivation of Cauliflower, Cabbage, Onion, Bottle gourd, Carrot, Pea, Tomato, Banana, Oranges, Mango and Guava with reference to its varieties, sowing time, seed rate, method of sowing, manuring, irrigation and water requirements, harvesting threshing and yield.

Ref. Book:

Principles of Agronomy, By: T.Y. Reddy and G.H. Shankara Reddy
Fundamentals of Agronomy, By: D. Rajat
Principles and Practices of Agronomy, By: S.S. Singh
Introduction of Agronomy, By: V.W. Vaidya and K.R. Shahastrabudhe
Principles of Horticulture, By: Prasad and Kumar

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAG-153: Horticultural & Field Crop

L T P
0 0 2

Credits: 1

1. Different techniques of propagation.

2. Use of plating board; pruning and training tools and implements.

3. Spraying of nutrients to overcoming deficiencies in the fruit plants.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-104: Engineering Thermodynamic

L T P
2 0 0 **Credit: 2**

Unit-I
System and properties, concepts of energy.

Unit-II
Temperature and heat, first law of closed and open systems.

Unit-III
pure substance and properties second law of thermodynamics and entropy.

Unit-IV
boiler, mountings and accessories, boiler efficiency, steam engines, Rankine cycle, indicator diagrams, steam turbines, I.C. Engines, air standard ratio, otto, diesel and joule cycles.

Ref. Book:

Engineering Thermodynamics, By: C.P. Gupta & Rajendra Prakash
Thermal Engg., By: P.L. Ballaney
Elements of Heat Engines (Vol II), By: R.C. Patel & C.J. Karamchandani
Basic Mechanical Engg., By: R.P. Arora, B.K. Raghunath & J.P. Patel
Basic Engg. Thermodynamics, By: T. Roy Choudhary
Internal Combustion Engines, By: H.B. Keswani

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCE-151: BASIC ENGINEERING DRAWING

L T P **Credit-1**

0 0 3

1. Introduction to Engineering drawing

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering. 2-Sheet

2. Orthographic Projections

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). 2-Sheet

3. Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions-projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates). 1-Sheet

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. (No problems on octahedrons and combination solid) 2-Sheet

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, section views, Sectional views, apparent shapes and true shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on section of solids) 1-Sheet

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three Solids). 1-Sheet

7. Introduction to Auto CAD

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

RAMA UNIVERSITY UTTAR PRADESH, KANPUR

Faculty of Engineering & Technology

EVALUATION SCHEME AND SYLLABUS

[Effective from the session 2015-16]

B.Tech. (Biotech)

1st Year

Department of Applied Sciences & Humanities

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

A meeting of the Board of Studies of the department of Applied Sciences & Humanities of Faculty of Engineering and Technology, Rama University Uttar Pradesh, Kanpur was held on 7th July 2015 at 12 AM. The following members were present:

1.	Dr. Vivek Gupta	Convener
2.	Dr. Vinod Kumar Yadav	Member
3.	Dr. Tanima Hajra	Member
4.	Dr. Deeksha Ranjan	Member
5.	Dr. K. G. Sharma	Member
6.	……..	External Member
7.	……..	External Member

The quorum of the meeting was complete.

Agenda of the meeting:

1. Review of 'Evaluation Scheme & Syllabus'

The meeting resolved unanimously that attached reviewed 'Evaluation Schemes & Syllabus' are justified and approved.

Convener

Signature: ……
Name : Dr. Vivek Gupta
Date :

Internal Members

Signature: 1…… 2…… 3…… 4. ……..
Name: Dr. Vinod Kr. Yadav Dr. Tanima Hajra Dr. Deeksha Ranjan Dr. K.G. Sharma
Date:

External Members

Signature: 1…… 2……
Name
Date:

Course Detail and Evaluation Scheme

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

B. Tech. Biotechnology First Year

(Effective from the Session 2015-16)

SEMESTER-I

S. N.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Total Marks	Credit
			L	T	P	CE	MTE	ETE		
Theory Subject										
1	BBT-101	Elementary Mathematics-I	3	1	0	20	20	60	100	4
2	BBT-102	Elementary Biology-I	3	1	0	20	20	60	100	4
3	BAS-102/ BAS-104	Engineering Chemistry/ Professional Communication	3	1	0	20	20	60	100	4
4	BBT-104/ BCS-101	Introduction to Biotechnology / Computer Concepts & Programming in C	3	1	0	20	20	60	100	4
5	BAS-101	Engineering Physics-I	3	0	0	20	20	60	100	4
6	BME-101/ BAS-105	Basic Manufacturing Processes/ Environment & Ecology	3	0	0	20	20	60	100	4
Practical/Drawing/Design										
7	BAS-152/ BAS-154	Engineering Chemistry Lab/ Professional Communication Lab	0	0	2	30	20	60	100	1
8	BBT-152	Biology Lab-I	0	0	2	30	20	60	100	1
9	BWS-151/ BCE-151	Workshop Practice/ Basic Engineering Drawing	0	0	3	30	20	60	100	1
10	BAS-151/ BCS-151	Engineering Physics Lab/ Computer Programming Lab	0	0	2	30	20	60	100	1
		Total	**18**	**4**	**9**	**240**	**200**	**560**	**1000**	**28**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Convener
Signature: ……
Name : Mr.
Date :

Internal Members

Signature:	1…….	2……
Name:	Mr.	Mr.
Date:		

External Members

Signature:	1……	2……
Name:	Prof. (Dr.)	Dr.
Date:		

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail and Evaluation Scheme
B. Tech. Biotechnology First Year
(Effective from the Session 2015-16)
SEMESTER-II

S. N.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Total Marks	Credit
			L	T	P	CE	MTE	ETE		
Theory Subject										
1	BBT-201	Elementary Mathematics-II	3	1	0	20	20	60	100	4
2	BBT-202	Elementary Biology-II	3	1	0	20	20	60	100	4
3	BAS-202/ BAS-204	Engineering Chemistry/ Professional Communication	3	1	0	20	20	60	100	4
4	BBT-204/ BCS-201	Introduction to Biotechnology / Computer Concepts & Programming in C	3	1	0	20	20	60	100	4
5	BAS-201	Engineering Physics-II	3	0	0	20	20	60	100	4
6	BME-201/ BAS-205	Basic Manufacturing Processes/ Environment & Ecology	3	0	0	20	20	60	100	4
Practical/Drawing/Design										
7	BAS-252/ BAS-254	Engineering Chemistry Lab/ Professional Communication Lab	0	0	2	30	20	50	100	1
8	BBT-252	Biology Lab-II	0	0	2	30	20	50	100	1
9	BWS-251/ BCE-251	Workshop Practice/ Basic Engineering Drawing	0	0	3	30	20	50	100	1
10	BAS-251/ BCS-251	Engineering Physics Lab/ Computer Programming Lab	0	0	2	30	20	50	100	1
		Total	**18**	**4**	**9**	**240**	**200**	**560**	**1000**	**28**

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Convener

Signature: ……
Name : Mr.
Date :

Internal Members

Signature:	1……	2……
Name:	Mr.	Mr.
Date:		

External Members

Signature:	1……	2……
Name:	Prof. (Dr.).	Dr.
Date:		

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS 105/ BAS 205: Environment and Ecology

L T P
2 0 0 **Credit: 2**

UNIT-I: Nature and Scope of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources -Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources –fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel.

UNIT-II: Environmental Changes and Human Health

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics. Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards.

UNIT- III: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring. Environmental Protection– Role of individuals, organizations and government in pollution control. Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection.

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BBT-152: Biology Lab-I

L T P

0 0 2 **Credit: 1**

1. Preparation and study of T.S. of dicot and monocot roots and stems.
2. Study of osmosis by potato osmometer.
3. Study of plasmolysis in epidermal peels (e.g. Rhoeo leaves)
4. Study of distribution of stomata in the upper and lower surface of leaves.
5. Comparative study of the rates of transpiration in the upper and lower surface of leaves.
6. Separation of plant pigments through paper chromatography.
7. To study the rate of respiration in flower buds/leaf tissue and germinating seeds
8. Study and identification of different types of inflorescence.

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Faculty of Engineering and Technology

BBT-252: Biology Lab-II

L T P

0 0 2 **Credit: 1**

1. To test the presence of urea in urine.
2. To detect the presence of sugar in urine/blood sample.
3. To detect the presence of albumin in urine.
4. To detect the presence of bile salts in urine.
5. Study parts of a compound microscope
6. Study of specimens and identification with reasons- Amoeba, Hydra, Liver fluke, Ascaris, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
7. Study of different modifications in root, stem and leaves.
8. Study of imbibition in seeds/raisins.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BBT -104/ BBT -204: Introduction to Biotechnology

L T P
3 1 0 **Credit: 4**

Unit I

Introduction to Biotechnology

Fundamentals of Biochemical Engineering, Biotechnology and Society. Principles and Processes; Application in Health, food, medicine and Agriculture; genetically modified (GM) organisms; biosafety issues.

Unit II

Biomolecules

Building Blocks of Biomolecules-Structure and dynamics. Structure and function of Macromolecules (Carbohydrates, Proteins ,Lipids). Classification of Enzymes; Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme catalysis.

Unit III

Cell as a basic unit of life. Introduction: Definition, Study of Microbes, Types of microbes, Classification of microbes. Origin of microbiology. Application of microbes in fermentation Biotechnology. Cellular Techniques including chromatography.

Unit IV

History of Bioinformatics. Introduction and application. Biological databases (nucleotide and protein data bases, Structure databases) and their retrival.. Sequence file formats . Information Sources Analysis using Bioinformatics tools.

Unit V

Genomics

Introduction Genome Sequencing Projects, Gene Prediction and counting, Genome similarity, SNP's and comparative genomics.

TEXT BOOKS:

1. Text book of Biotechnology by H.K.Dass (Wiley India publication)

2. Biotechnology by B.D.Singh (Kalyani Publishers)

3. Text book of Biotechnology by R.C.Dubey (S.Chand and company)

Reference books:

1) Introduction to Biotechnology by William J. Thieman, Michael A. Palladino, Publisher: Benjamin Cummings

2) Basic Biotechnology by Colin Ratledge Publisher: Cambridge University Press

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BBT-102: Elementary Biology –I

L T P
3 1 0 **Credit: 4**

UNIT -I

Diversity in Living World

Diversity of living organisms Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom). Systematics and binomial System of nomenclature.

UNIT -II

Salient features of animal and plant classification, viruses, viroids, lichens, Botanical gardens, herbaria, zoological parks and museums.

UNIT -III

Structural Organisation

Tissues in animals and plants. Morphology, anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit and seed.

UNIT - IV

Cell: Structure and Function

Cell: Cell theory; Prokaryotic and eukaryotic cell, cell wall, cell membrane. Nucleus and nuclear organization. Mitosis, meiosis, cell cycle (elementary idea).Basic chemical constituents of living bodies.

UNIT - V

Plant Physiology

Movement of water, food, nutrients and gases, Respiration, Photosynthesis, Plant growth and development.

Recommended Textbooks.

1) Biology - Textbook for Class XI, NCERT Publication

2) Biology - Textbook for Class XII, NCERT Publication

Reference book:

Biology by Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer
(Macgraw Hill)

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Faculty of Engineering and Technology

BBT-202: Elementary Biology –II

L T P
3 1 0 **Credit: 4**

UNIT – I

Human Physiology-I

Digestion and absorption. Breathing and respiration. Body fluids and circulation.

UNIT-II

Human Physiology-II

Neural control and coordination, chemical coordination and regulation.

UNIT – III

Reproduction

Reproductive system in male and female, menstrual cycle, production of gametes, fertilization, embryo development.

UNIT –IV

Reproductive Health& human Welfare *:* Population and birth control, sexually transmitted diseases, infertility. Cancer and AIDS. Adolescence and drug / alcohol abuse. Basic concepts of immunology, vaccines.

UNIT -V

Evolution

Evolution: Origin of life, theories and evidences, adaptive radiation, mechanism of Evolution, origin and evolution of man

Recommended Textbooks.

1) Biology - Textbook for Class XI, NCERT Publication
2) Biology - Textbook for Class XII, NCERT Publication

Reference books:

1) Human anatomy and physiology by Marieb (pierson Education)
2) Textbook of human physiology by Chakraborthy and Ghosh (2nd ed. Calcutta, The New Bookstall)
3) Human Physiology by Pocock and Richards (oxford University press)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BBT-101: Elementary Mathematics –I

L	T	P
3	1	0

Credits: -4

UNIT-I **8 Hrs.**

Limits and Derivatives: Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

UNIT-II **8 Hrs.**

Continuity and Differentiability: Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential, logarithmic functions and their derivative. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

Applications of Derivatives: Applications of derivatives: rate of change, increasing/decreasing functions, tangents & normal, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (illustrate basic principles and understanding of the subject as well as real-life situations).

UNIT – III **8 Hrs.**

Integrals: Integration as inverse process of differentiation. Integration of a variety of functions by substitution method, by partial fractions method and by parts method only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum. Fundamental theorem of Calculus (without proof). Basic properties of definite integrals and its evaluation.

Applications of the Integrals: Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

UNIT –IV **8 Hrs.**

Differential Equations: Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type: + p y = q, where p and q are functions of *x*.

UNIT –V **8 Hrs.**

Sequence and Series: Definition of sequence and series, Arithmetic progression (A. P.). arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of *n* terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to *n* terms of the special series n1, n2 and n3.

Permutations & Combinations: Fundamental principle of counting. Factorial n. (i.e., n!) Permutations & Combinations, formulae and simple applications

PROBABILITY: Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Recommended Textbooks.

1) Mathematics Part I - Textbook for Class XI, NCERT Publication
2) Mathematics Part II - Textbook for Class XI, NCERT Publication

Reference books:

1) Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill)
2) Advanced modern engineering mathemtics by Glyn james (pearson education)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BBT-201: Elementary Mathematics –II

L	T	P
3	1	0

Credits: -4

UNIT-I **8 Hrs.**

Algebra: Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.

Linear Inequalities: Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables- graphically.

UNIT –II **8 Hrs.**

Matrix: Inverse of matrix by elementary transformations, Rank of matrix (Echelon & Normal form). Linear Dependence and Independence of matrices, Consistency of Linear System of Equations and their solution. Characteristic Equation, Eigen values and eigenvectors.

UNIT-III: Coordinate Geometry **8 Hrs.**

1. Straight Lines: Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form. General equation of a line. Distance of a point from a line.

2. Conic Sections: Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. Introduction to Three -dimensional Geometry: Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

UNIT-IV **8Hrs.**

Vectors and Scalars: Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

UNIT – V **8 Hrs.**

Three - Dimensional Geometry: Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes. (iii) a line and a plane. Distance of a point from a plane.

Recommended Textbooks.

1) Mathematics Part I - Textbook for Class XII, NCERT Publication
2) Mathematics Part II - Textbook for Class XII, NCERT Publication

Reference books:

1) Higher engineering mathematics by B. V. Ramana (Tata Macgraw Hill)
2) Advanced modern engineering mathematics by Glyn james (pearson education)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCS-101/BCS-201: Computer System and Programming in C

L	T	P	Credit-4
3	0	0	

Unit-I **08 Hours**

Introduction: Computer basics and classification of computers, operations of computer, components of a computer and operating system concepts.

Number System: Binary, Octal and hexadecimal number systems, Binary arithmetic.

Programming Concepts: Approaches of problem solving, computer algorithms and flow charts.Introduction of computer languages - machine language, assembly language and high level language.

Unit-II **08 Hours**

Program Structure and Execution: Representing and manipulating information. Information storage: data sizes, addressing and representing strings. Integer representation and arithmetic, Boolean algebra, logical, shift and bit level operations.

Running Programs on a System

Concept of assembler, compiler, loader and linker, exceptional control flow, processes, process control, system calls, Error handling, program execution time.

Unit-III **08 Hours**

Programming Concepts in C

Standard input and output in C, Fundamental data types and sizes: character, integer, short, long, unsigned, single and double floating point. Storage classes: automatic, register, static and external. Operators and expressions: arithmetic, relational and logical operators, operator precedence and order of evaluation.

Unit-IV **08 Hours**

Control Flow: Statements and blocks, 'If-Else', 'Else-If', 'Switch', nesting 'If-Else', loops 'While', 'Do-while' and 'For', use of 'Break' and 'Continue', 'Goto' and 'Labels'.

Functions: Basics of functions, types of functions, functions with array, passing values to functions and recursive functions.

Unit-V **08 Hours**

Pointers and Arrays: Pointers and addresses, pointers and functions arguments, pointers and arrays, Address arithmetic, pointers arrays, multidimensional arrays, pointers to functions.

Structure: Introduction, structures and functions, arrays and pointers of structures.

File Handling: Standard C preprocessors, file access, defining and calling macros and standard libraries.

Reference Book:

1. Programming in C – Gottfried B.S. (TMH).
2. let us C – Kanetkar Y. (BPB).
3.The C Programming Language - Kernighan B.W., Ritchie D.M. (PHI).
4.C++: The Complete Reference (4th Ed) – Schildt H. (TMH).
5.The C++ Programming Language – Stroustrup B. (Addison-Wesley

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCS-151/BCS-251: Computer Programming Lab

L T P **Credit-1**

0 0 2

S No	Name of the program
1	a)To evaluate algebraic exp(ax+b)/(ax-b) b)to Evaluate algebraic exp 2.5logx+cos32+|x*x-y*y|+sqrt(2*x*y) c)to evaluate the algebraic expaepower-rt d)to evaluate algebraic exp x power5 +10 x power 4+8 x power3+4x+2
2	To evaluate area of triangle (sqrt(s(s-a)(s-b)(s-c)
3	To swap 2 no
4	Greatest of 2 no
5	Greatest of 3 numbers
5	Greatest of 3 onto print the given no in ascending order
6	To perform the arithmetic expression using switch statement
7	Factorial of given no using do while statement
8	To print prime up to n no
9	Sum of n natural no
10	Total no. of even integers
11	Total no. of odd integers
12	Sum of even integers
13	Sum of odd integers
14	A program to print the product of two matrices of any order
15	Write a program to print Fibonacci series
16	Write a program to print o/ps a)1 b) 1 c) 1 d) 1 2 2 2 2 2 3 3 3 3 3 3 3 4 5 6
17	Write a program to read n num of students and 5 sub marks
18	Write a program to find factorial of a num using 3 types of funs
19	Write a program to convert all lower case to uppercase characters.
20	Write a program to extract a string
21	Write a program to sort 5 city names in alphabetical order
22	Write a program to find the factorial of a number using recursion
23	A program to print address of variable
24	A program to access a variable using pointers
25	A program to print the element of array using pointers

26	A program to implement call by reference
27	A program to find greatest of ‘n’ num using funs
28	A program to print the elements of a structure using pointers
29	A program to display student information by initializing structures
30	A program to find total number of marks
31	Write a program to open a file.
32	Write a program to read a file.
33	Write a program to write a file.
34	Write a program to save a file.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS 102/ BAS 202: Engineering Chemistry

L	T	P
3	1	0

Credits: -4

UNIT-I **8 Hours**

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Liquid crystals & it's application. Space lattice (only cubes), types of unit cell, calculation of density of unit cell. Types of hydrogen bonding and its applications. Structure and applications of Graphite and Fullerenes.

UNIT-II **8 Hours**

Polymers, its classification and their applications. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. Elementary ideas and simple applications Visible, UV, IR ^{1}HNMR and mass spectroscopic Techniques, Ziegler-Natta catalyst

UNIT-III **8 Hours**

Stereochemistry with special reference to chirality, E - Z and R - S nomenclature. Elementary idea of inductive effect, mesomeric effect, reaction intermediate (carbcation, carbanion and free redical carbene). Types of organic reactions with special reference of nucleophilic substitution reaction. Grignard Reagent.

UNIT-IV **8 Hours**

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass.

UNIT-V **8 Hours**

Rate, order and molecularity of reaction, Integrated rate equation of zero order, first order and second order reactions, activation energy. Galvanic cell, electrochemical theory of corrosion and its protection. Phase Rule and its application to one component system (water and sulfur).

Reference Books

1. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
2. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
3. Concise Inorganic Chemistry by J.D. Lee; Wiley India
4. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
5. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-152 /BAS-252: ENGINEERING CHEMISTRY LAB

L T P
0 0 2

Credit:-1

List of Experiments:-

1. Determination of alkalinity in the given water sample.
2. Determination of Temporary and Permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of Iron content in the given Iron ore sample by using [K_3 Fe $(CN)_6$] as an external indicator.
6. Determination of solubility of salt (NaCl) at room temperature.
7. Determine the viscosity of a given solution.
8. Determination of Iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as a colour developing agent and the measurement are carried out at λ_{max} 480 nm.
9. Element detection and Functional group identification in organic compounds.
10. Preparation of Bakelite & Urea Formaldehyde resin.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-101: ENGINEERING PHYSICS-I

L T P
3 0 0
Credits: -3

Unit - I

Relativistic Mechanics 06 Hrs.

Inertial & non-inertial frames, Michelson- Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II 06 Hrs.

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation - particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III

Wave Optics 10 Hrs.

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film),Newton's rings. Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating

Unit- IV

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - V 08 Hrs.

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics -Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-201: ENGINEERING PHYSICS-II

L	T	P
2	0	0

Credits: -2

Unit - I 08 Hrs.

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II 08 Hrs.

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti- Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III 08 Hrs.

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV 09 Hrs

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Unit – V

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Optical Fibre & Laser - Anuradha De. (New Age)
3. Optics -Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-151/BAS-251: PHYSICS LAB

L T P
0 0 2

Credits: -1

List of Experiments-

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.

Group - B

6. To determine the specific resistance of a given wire using Carey Foster's bridge.
7. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter by potentiometer.
10. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of agiven semiconductor using Hall effect set up.
11. To determine the energy band gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the coefficient of viscosity of a liquid.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-104/BAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 0

Credits: 4

UNIT- I: FUNDAMENTALS OF COMMUNCATION **8 hours**

Technical Communication: Features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral or Horizontal (peer group); Importance of technical communication; Barriers to Communication.

UNIT-II: WRITING CORRECT ENGLISH **8 hours**

The Sentence: Meaning and definition, Kinds of Sentences; Tenses; Present, Past and Future; Concord: Meaning; Concord of Numbers and Persons; Articles.

UNIT-III: CONSTITUENTS OF TECHNICAL WRITTEN COMMUNICATION **8 hours**

Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500- 1000 new words; Correct Usage; All Parts of Speech; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc.

UNIT-IV: BUSINESS COMMUNICATION **8 hours**

Principles; Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports; Technical Proposal; Parts; Types; Writing of Proposal and its significance.

UNIT-V: PRESENTATION STRATEGIES AND SPEECH MECHANISM **8 hours**

Defining Purpose; Audience and Locale, Organizing Contents; Preparing Outline; Audio-Visual Aida; Nuance of Delivery; Body Language; Dimensions of Speech; Syllable; Accent Pitch; Rhythm; Intonation; Difference between stress and intonation; Paralinguistic features of voice;

Text books:

1- Technical Communication: Principles and Practice. Meenakshi Raman and Sangeeta Sharma, Oxford University Press, New Delhi.
2- Professional Communication. Dr. Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.

Reference books:

1. Gerson, Sharon J. & Gerson, Steven M., *Technical Writing- Process and Product* , Delhi, Pearson/ Education Publications.
2. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata Mc Graw Hill Publishing Company Ltd.
3. Sinha, R.P., English Grammar and Usage, New Delhi, Oxford University Press.
4. Lewis, Norman, Word Power Made Easy, Delhi, W.R. Goyal Pub. & Distributors.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BAS-154/BAS-254 : PROFESSIONAL COMMUNICATION LAB

L	T	P
0	0	2

Credit: 1

LIST OF PRACTICALS

1. Introduction to sounds in English language. Practice of consonants, vowels and diphthongs (sounds).

2. Stress and intonation in speech.

3. Conversational skills: Group Discussion: Practical based on accurate and current grammatical patterns.

4. Conversational skills for interviews under suitable Professional Communication Lab conditions with emphasis on kinesics.

5. Official/Public speaking .Sample speeches by eminent people (video).

6. Theme- presentation/ Key-note presentation.

7. Individual speech delivery/conferences with skills to defend interjections/quizzes.

8. Role plays with argumentative skills/Role play presentation with stress and intonation.

9. Comprehension skills based on reading and listening. Practical based on a model audio-visual usage.

Text book:

1. Communication Lab (English). Dr. Malti Agarwal, Krishna Prakashan Media (P) Ltd. Meerut.

Reference books:

1. Kenjer,Hanif., *All the Right Answers*, New Delhi, Macmillan India Ltd.
2. Taylor,Grant., *English Conversation Practice*, New Delhi, Tata Mc Graw Hill Publishing Company Ltd.
3. Pandey, L.U.B., Singh, R.P., *A Manual of Practical Communication*, Delhi, A.I.T.B.S.Pub. India.Ltd.
4. Jones Daniel., *English Pronouncing Dictionary*, New Delhi, Cambridge University Press.
5. Sethi, J.,& Dhamija, P.V., *A Course in Phonetics and Spoken English*, New Delhi, Prentice Hall.
6. Online dictionary references.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-101/BME-201: BASIC MANUFACTURING PROCESSES

L T P **Credit -2**
2 0 0

Unit-I Introduction to Engineering Materials

Materials and Engineering, Classification of Engineering Materials. Industrial applications of common engineering materials, Metals & Alloys: Properties and Applications,. Steels and Cast Irons, Alloys of Non Ferrous metals. 6

Unit-II Basic Metal Forming & Casting Process.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube drawing/making and Extrusion, and their uses. 4

.

Press-work: Die & Punch assembly, cutting and forming, its applications. Hot-working versus cold-working

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses.

2

Unit-III Machining and Welding operations and their applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. 3

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. 3

Unit-IV Misc. Topics

Quality: Introduction, basic concept about quality of a product. 1

Manufacturing Establishment: Plant location. Plant layout-its types. Types of Production. Production versus Productivity. 1

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. 1

Misc. Processes: Powder-metallurgy process & its applications, Plastic-products manufacturing, Galvanizing and Electroplating. 1

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital,

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BWS-151/251: WORKSHOP PRACTICE

L	T	P
0	0	3

Credits: - 1

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving Drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCE-151/251: Basic Engineering Drawing

L T P **Credits: - 1**
0 0 3

1. Introduction to Engineering drawing

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim,extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering. **2-Sheet**

2. Orthographic Projections

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in Firstquadrant/first angle only), True and apparent lengths, True and apparent inclinations toreference planes (No application problems**).** **2-Sheet**

3. Orthographic Projections of Plane Surfaces

(First Angle Projection Only)

Introduction, Definitions-projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates.) **1-Sheet**

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. (No problems on octahedrons and combination solid) **2-Sheet**

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, section views, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on section of solids) **1-Sheet**

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three Solids). **1-Sheet**

7. Introduction to Auto CAD

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.

2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.

2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing - M.B. Shah, B.C.Rana, 2nd Edition.

RAMA UNIVERSITY UTTAR PRADESH, KANPUR
Faculty of Engineering & Technology

SYLLABUS AND EVALUATION SCHEME

B. Tech.
Civil Engineering

2nd, 3rd& 4thYear

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail and Evaluation Scheme

B. Tech. Civil Engineering

2nd Year, SEMESTER-III

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BME-301	Strength of Material	3	1	0	20	20	60	100	4
2	BCE-302	Fluid Mechanics	3	1	0	20	20	60	100	4
3	BCE-303	Building Materials & construction	3	1	0	20	20	60	100	4
4	BCE-304	Surveying - 1	3	1	0	20	20	60	100	4
5	BAS-301	Mathematics III	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCE-351	Fluid Mechanics Lab	0	0	2	30	20	50	100	1
7	BCE-352	Building. Materials Lab	0	0	3	30	20	50	100	1
8	BCE-353	Surveying Lab	0	0	2	30	20	50	100	1
9	BCE-354	Building Planning & drawing	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*BHU-001HumanValues & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3……. 4…… 5……

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
Course Detail and Evaluation Scheme
B. Tech. Civil Engineering

2nd Year, SEMESTER-IV

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCE-401	Structural Analysis -I	3	1	0	20	20	60	100	4
2	BCE-402	Hydraulics & Hydraulic Mechanics	3	1	0	20	20	60	100	4
3	BCE-403	Engineering Geology	3	1	0	20	20	60	100	4
4	BCE-404	Geoinformatics	3	1	0	20	20	60	100	4
5	BCE-011-014	*Departmental Elective-I	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCE-451	Structural Analysis Lab	0	0	3	30	20	50	100	1
7	BCE-452	Geoinformatics Lab	0	0	2	30	20	50	100	1
8	BCE-453	Hydraulics & Machine Lab	0	0	2	30	20	50	100	1
9	BCE-454	CBSNT lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.
L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:
Course without practical components

For Continuous Evaluation (CE) is such as: 20 Marks
1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3……. 4…… 5……

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail and Evaluation Scheme

B. Tech. Civil Engineering

3rd Year, SEMESTER-V

S.No.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCE-501	Geotechnical Engineering	3	1	0	20	20	60	100	4
2	BCE-502	Design of Concrete Structure-I	3	1	0	20	20	60	100	4
3	BCE-503	Transportation Engineering -I	3	1	0	20	20	60	100	4
4	BCE-504	Structure Analysis _II	3	1	0	20	20	60	100	4
5	BCE-021 BCE-024	*Departmental Elective-II	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCE-551	Geotechnical Engineering lab	0	0	3	30	20	50	100	1
7	BCE-552	Transportation lab	0	0	2	30	20	50	100	1
8	BCE-553	Cad Lab – 1	0	0	2	30	20	50	100	1
9	BCE-554	Quantity Surveying & Estimation	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail and Evaluation Scheme

B. Tech. Civil Engineering

3rd Year, SEMESTER-VI

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCE-601	Design of Concrete structure-II	3	1	0	20	20	60	100	4
2	BCE-602	Environmental Engineering-I	3	1	0	20	20	60	100	4
3	BCE-603	Transportation Engineering - II	3	1	0	20	20	60	100	4
4	BHU-601	Engineering & Managerial Economics Industrial Management	3	1	0	20	20	60	100	4
5	BCE-031 BCE-034	*Departmental Elective-III	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCE-651	Cad Lab-2	0	0	2	30	20	50	100	1
7	BCE-652	Environmental Engineering lab	0	0	2	30	20	50	100	1
8	BCE-653	Structural Detailing Lab	0	0	3	30	20	50	100	1
9	BCE-654	Mat Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*****BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
Course Detail and Evaluation Scheme
B. Tech. Civil Engineering

4th Year, SEMESTER-VII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCE-701	Design of Steel Structure	3	1	0	20	20	60	100	4
2	BCE-702	Water Resources Engineering	3	1	0	20	20	60	100	4
3	BCE -703	Environmental Engineering-II	3	1	0	20	20	60	100	4
4	BCE-041-044	*Departmental Elective-IV	3	1	0	20	20	60	100	4
5	BOE- 071, 075,076,080	**Open Elective-I	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCE-751	Seminar Departmental	0	0	2	30	20	50	100	1
7	BCE-752	Mini Project	0	0	3	30	20	50	100	1
8	BCE-753	Seminar	0	0	2	30	20	50	100	1
9	BCE-754	Industrial Training Viva-Voce	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

***BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3……. 4…… 5……

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
Course Detail and Evaluation Scheme
B. Tech. Civil Engineering

4th Year, SEMESTER-VIII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
THEORY										
1	BCE-061-065	*Departmental Elective-VI	3	1	0	20	20	60	100	4
2	BCE-051-054	*Departmental Elective-V	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
3	BCE-851	Major Project	0	0	21	300	---	400	700	16
		Total	**6**	**2**	**21**	**340**	**40**	**520**	**900**	**24**

*****BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.
L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks
1 Attendance: 5 Marks
2 Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 300 Marks

Major Project/ Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3……. 4…… 5……

*DEPARTMENTAL ELECTIVE

DEPARTMENTAL ELECTIVE-I

BCE-011: ADVANCED CONCRETE TECHNOLOGIES
BCE-012: PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE
BCE-013: DISASTER MITIGATION AND EARTHQUAKE ENGINEERING
BCE-014: INDUSTRIAL POLLUTION CONTROL ENVIRONMENTAL AUDIT

DEPARTMENTAL ELECTIVE-II

BCE-021: MATRIX ANALYSES OF STRUCTRES
BCE-022: EIA AND AUDITING
BCE-023: OPEN CHANNEL FLOW
BCE-024: EARTH AND EARTH RETAINING STRUCTURE

DEPARTMENTAL ELECTIVE-III

BCE-031: ADVANCED FOUNDATION DESIGN
BCE-032: ADVANCED CONCRETE STRUCTURES
BCE-033: TRANSPORTATION SYSTEM PLANNING
BCE-034: ENVIRONMENTAL GEOTECHNOLOGY

DEPARTMENTAL ELECTIVE-IV

BCE-041: BRIDGE ENGINEERING
ECE-044: TUNNEL ENGINEERING
BCE-043: PLASTIC ANALYSIS OF STRUCTURES
BCE-044: ENGINEERING HYDROLOGY

DEPARTMENTAL ELECTIVE-V

BCE-051: PRECAST & MODULAR CONSTRUCTION PRACTICES

BCE-052: EARTQUAKE RESISTANT DESIGNS

BCE-053: ANALYSES AND DESIGN OF HYDRAULIC STRUCTURES

BCE-054: MACHINE FOUNDATION DESIGN

DEPARTMENTAL ELECTIVE-VI

BCE-061: WATER RESOURCES SYSTEMS

BCE-062: RIVER ENGINEERING

BCE-063: GROUNDWATER MANAGEMENT

BCE-064: PRESTRESSED CONCRETE DESIGN

BCE-065: CONSTRUCTION TECHNOLOGY & MANAGEMENT

****OPEN ELECTIVE-I**

BOE-076: QUALITY MANAGEMENT

BOE-075: OPERATIONS RESEARCH

BOE-071: NON CONVENTIONAL ENERGY RESOURCES

BOE-080: ENTREPRENEURSHIP DEVELOPMENTS

2nd Year, Semester-III
BME- 301: STRENGTH OF MATERIALS

L T P
3 1 0 **Credit4**

Unit-I:
Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle. 4
3-D Stress, Theory of failure, Castinglion's Theorem, Impact load: Three dimensional state of stress & strain, equilibrium equations. Generalized Hook's Law. Theories of Failure. Castigliano's Theorem. Impact load & stresses. 4

Unit –II
Stresses in Beams: Direct and shear stresses in beams due to transverse and axial loads, composite beams.4
Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams. 2

Torsion: Review of Torsion, combined bending & torsion of solid & hollow shafts.

Unit-III
Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axialload and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs. 4
Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines. 4

Unit-IV
Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain. 4
Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stresses in rotating shaft and cylinders. Stresses due to interference fits. 4

UNIT-V
Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression. 4
Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis(for symmetry about both axis and about one axis) for I-section and channel section. 4

Books & References:

1. 'Mechanics of Material' by Dr. B. C. Punamia, Laxmi Publication.
2. 'Strength of Materials' by Ryder, Palgrave Macmillan Limited.
3. 'Strength of Materials' by Timoshenko and &Yσungs, D. Van Nostrand Company.
4. 'Mechanics of Materials' by Bear Jhonson, McGraw-Hill.
5. 'Mechanics of Materials' by Pytel, Cengage Learning.

BCE-302: FLUID MECHANICS

L T P
3 1 0 **Credit-4**

Unit-I
Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit-II
Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit-III
Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit-IV
Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit-V
Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Introduction to compressible

References :

1. S Narasimhan : First Course in Fluid Mechanics , University Press
2. Som, S.K. &Biswas G. : Introduction of fluid mechanics & Fluid Machines, TMH, 2000, 2nd edition.
3. M M Das : Fluid Mechanics &Turbomachines , Oxford University Press
4. S.K.Agarwal : Fluid Mechanics & Machinery, TMH

BCE-303: BUILDING MATERIALS

L T P
3 1 0 **Credit-4**

Unit-I
Classification of materials, materials and their performance, economics of the building materials. Stones, Requirement of good building stone, characteristics of stones and their testing. Common building stones. Preservation of stones. Bricks : Manufacture of clay bricks, and their classification. Properties of clay bricks and their testing. Problems of efflorescence & lime bursting in bricks & tiles. Gypsum : properties of gypsum plaster, building products of gypsum and their uses. Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete. Lime : Manufacture of lime, classifications of limes, properties of lime. Pozzolona : Natural and Artificial fly ash, Surkhi (burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. Timber : Classification and identification of timber, Fundamental Engineering properties. Defects in timber, Factors affecting strength of timber, seasoning and preservation of timber. Wood based products. Asphalt, Bitumen and Tar : Terminology, specifications and uses, Bituminous materials. 8

Unit-II
Chemistry of Plastics manufacturing process, classification, advantages of plastics, Mechanical properties and their use in construction. Paints varnishes and distempers, Common constituents, types and desirable properties, Cement paints. Ferrous metals, Desirable characteristics of reinforcing steel. Principles of cold working. Detailed Discussion on reinforcing steel mechanical and physical properties chemical composition. Brief discussion on properties and uses of Aluminum and lead. Glass : Ingredients, properties types and use in construction. Insulating Materials : Thermal and sound insulating material desirable properties and type.8

Unit-III
Components of building area considerations, Construction Principle and Methods for layout, Damp proofing ant termite treatment, Vertical circulation means staircases ramp design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonary construction. Cavity wall hollow block and Waffle slab. 8

Unit - IV
Doors, Windows and Ventilations, Construction details types and relative advantages & disadvantages. Roofs types and treat ents, Lintels and Chhajja Functional efficiency of Buildings. 8

Unit - V
Natural Ventilation , Water Supply and Sanitary fittings (Plumbing), Electricity. Heating Ventilation & Air conditioning , Mechanical Lifts and Escalators , Fire Fighting , Acoustics. Plastering different types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance.6

References

1. P.C. Varghese : Building Materials , PHI
2. P.C. Varghese : Building Construction , PHI
3. B.C. Funmia : A Text Book of Building Construction, Laxmi Publications, Delhi. 5.O.H. Koenisberger : "Manual of tropical housing and building" Orient Longman
4. S.P. Arora at al., "A Text Book of Building Construction - DhanpatRai& Sons,

BCE-304: SURVEYING-I

L T P
3 1 0 **Credit-4**

Unit-I
Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors, Linear measurement. 5

Unit-II
Measurement of direction: Reference meridians, bearing and azimuths, magnetic declination, compass, Vernier theodolite, temporary adjustments, measurements of horizontal and vertical angle, Horizontal control, Electronic theodolites and Total Station. 7

Unit-III
Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction, automatic levels, Contouring- methods and uses Definition, Principles of stadia systems, subtense bar and tangential methods. 6

Unit-IV
Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. 5

Unit-V
Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, intervisibility of stations, triangulation field work Principles, plane table equipments, methods, resection by three point problem

References

1. S K Duggal : Surveying Vol I & II , TMH
2. R Subramanian : Surveying & Leveling , Oxford University Press
3. B C Punamia : Surveying Volume I II & III Laxmi Publications
4. C Venkatramaih : Text Book of Surveying , University Press
5. Kanetkar T P and Kulkarni S V. Surveying and Leveling, Pune Vidyarthi Griha Prakashan, Pune

BAS-301: MATHEMATICS-III

L T P
3 1 0 **Credit-4**

Unit-I: Function of Complex variable
Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem.

Unit-II: Statistical Techniques-I
Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non linear and multiple regression analysis, Probability theory. 8

Unit-III: Statistical Techniques-II
Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, R, p, np, and c charts. 8

Unit-IV: Numerical Techniques-I
Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals. 8

Unit-V: Numerical Techniques-II
Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler's, Picard's and forth-order Runge- Kutta methods. 8

Test Books :-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning,2007.
2. Jain, Iyenger&Jain,Numerical Methods for Scientific an Engineering Computation, New Age International, New Delhi , 2003.
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.,2000
4. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.

BCE-351: FLUID MECHANICS LAB

L T P
0 0 2 **Credit – 1**

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter, venturimeter, and bend meter and study the variation of the coefficient of discharge with the Reynolds number.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
6. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
8. Verification of meta-centric height.

BCE-352: BUILDING MATERIALS LAB

L T P
0 0 2 **Credit - 1**

1. Cement (Two turns only)
    1. Normal Consistency of cement.
    2. Initial & final setting time of cement
    3. Compressive strength of cement
    4. Fineness of cement by air permeability and Le-chatalier's apparatus.
    5. Soundness of cement.
    6. Tensile strength
2. Coarse Aggregate (Two turns only)
    1. Crushing value of aggregate
    2. Impact value of aggregate
    3. water absorption of aggregate
    4. Sieve Analysis of Aggregate
    5. Specific gravity & bulk density
    6. Grading of aggregates.
3. Fine Aggregate : (one turn only)
    1. Sieve analysis of sand
    2. Silt content of sand
    3. Bulking of sand
4. Concrete Tests :
    1. Workability of concrete
    2. Effect of w/c ratio on compressive strength of concrete
    3. Relation between cube and cylinder tests
5. Physical and mechanical properties of reinforcing steel.
6. Bricks:
    1. Water absorption.
    2. Dimension Tolerances
    3. Compressive Strength
    4. Efflorescence

BCE-353: SURVEYING LAB

L	T	P	
0	0	2	**Credit - 1**

1. Study of different types of topographical maps and to prepare conventional symbols chart.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using dumpy/Auto level.
4. To perform fly leveling with a Auto /tilting level.
5. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements.
6. To measure vertical angle of given points by Electronic theodolite.
7. To measure horizontal angle between two objects by repetition method with three repetitions.
8. To measure horizontal angle by method of reiteration.
9. To determine the elevation of chimney top by trigonometrical17eveling by taking observations in single vertical plane.
10. To set out a simple circular curve by Rankine's method
11. To study various parts and practice with Wild T-2 micro-optic theodolite and EDM (Distomat DI-1600).

BCE-354: BUILDING PLANNING & DRAWING LAB.

L	T	P	
0	0	2	**Credit - 1**

Drafting of following Using Auto CAD software

1. Symbols used in Civil Engineering drawing , Masonry Bonds
2. Doors, Windows and staircases.
3. Plumbing & Electrical fitting drawing.
4. Comprehensive Drawing of Residential building (Layout, plan, elevation & sectional elevation, plumbing & electrical fillings in out)
5. Preparation of Layout planning of different civil engg. Projects.
6. Preparation of lay out plan/Maps and building drawing using computer

2nd Year, Semester-IV
BCE-401: STRUCTURAL ANALYSIS –I

L T P
3 1 0 **Credit-4**

Unit-I
Classification of Structures, stress resultants, degrees of freedom per node, Static and Kinematic determinacy. Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.8

Unit-II
Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principal & its application for determinate structures. 6

Unit-III
Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines. 4

Unit-IV
Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods. 5

Unit-V
Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section. Bending of curved bars in plane of bending, stresses in bars of small & large initial curvature. 8

References

1. Hibbler ," Structural Analysis ", Pearson Education
2. T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
5. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures ". Vol. I&II Nem Chand.
6. Vazirani&Ratwani et al ," Analysis of Strcuctures " , Khanna Publishers
7. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.

BCE-402: HYDRAULICS & HYDRAULIC MACHINES

L T P
3 1 0 **Credit-4**

Unit-I
Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation. Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.8

Unit-II
Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section. 8

Unit-III
Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in channels of non-linear alignment. 8

Unit-IV
Classical hydraulic jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, open channel surge, celerity of the gravity wave, deep and shallow water waves.6

Unit-V
Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, mano-metric head, efficiencies, cavitation in pumps, characteristics curves. Introduction, Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.8

References:

1. Garde,R.J., " Fluid Mechanics through Problems", New Age International
2. Streeter, V.L. and White, E.B., "Fluid Mechanics", McGraw Hill, New York, 8th
3. Asawa,G.L., "Experimental Fluid Mechanics", Vol.1, NemChand and Bros.
4. RangaRaju, K.G., Flow through open channels, T.M.H. 2nd edition
5. Rajesh Srivastava , Flow through Open Channels , Oxford University Press
6. Subramanya , Flow through Open Channels , TMH
7. Vasandani , Hydraulic Machines

BCE-403: ENGINEERING GEOLOGY

L T P
3 1 0 **Credit-4**

Unit-I
Minerals : Their physical and detailed study of certain rock forming minerals.
Rocks : Their origin, structure, Texture and classification of igneous sedimentary and metamorphic rocks and their suitability as Engineering. materials. 8

Unit-II
Stratification, Lamination bedding. Outcrop-its relation to topography, dip and strike of bed, overlap, outlier and inlier.
Rock deformation : Folds, Faults, joints unconformity and their classification, causes and relation to engg. Behaviour of rock masses. 8

Unit-III
Earthquake, its causes, classification, seismic zones of India and Geological consideration for construction of building, projects in seismic areas. Landslides, its causes, classification and preventive measures. 6

Unit-IV
Underground water, Origin, Aquifer, Aquicludes, Artesian Wells, underground provinces of India and its role as geological hazard. Building Stones Engg. properties of rocks, Alkali aggregate reaction, Grouting, Pozzolonic materials. 6

Unit-V
Geological investigations for site selection of Dams and reservoirs tunnels, bridges and Highways.
Principles of Geophysical explorations methods for subsurface structures. 6

Reference Books

1. Tony Waltham : Fundamentals of Engineering Geology ,SPON Press
2. J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
3. K V G K Gokhale , Text Book of Engineering Geology , B S Publication
4. Prabin Singh : Engg. and General Geology, Katson Publishing House.
5. Blyth F.G.M. : A Geology for Engineers, Arnold, London.
6. D.S. Arora : Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
7. F G Bell : Funamentals of Engineering Geology , B S Publication
8. Leggot, R.F. : Geology and Engineering, McGraw Hill, New York.
9. P.K. Mukerjee : A text Book of Geology, Calcutta Word Publishers.
10. B S Sathyanarayanswami, " Engineering Geology", DhanpatRai& Co

BCE-404: GEOINFORMATICS

L T P
3 1 0 **Credit-4**

Unit-I
Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation. 6

Unit-II
Physics of remote sensing, Ideal remote sensing system, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC. 8

Unit-III
Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Supervised Classification, Applications of remote sensing. 8

Unit-IV
Basic concepts of geographic data, GIS and its components, Data acquisition, Raster and Vector formats, topology and Data models, Spatial modelling, Data output, GIS Applications. 8

Unit-V
Introduction, Satellite navigation System, GPS- Space segment, Control segment, User segment, GPS satellite signals, Receivers, Static, Kinematic and Differential GPS. 8

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Surveying & Leveling , Vol 2
3. M Anjireddy : Remote Sensing & GIS , BS Publications
4. T M Lillesand et al: Remote Sensing & Image Interpretation , Wiley India , 5 th
5. A M Chandra : Remote Sensing & GIS , Narosa
6. S K Duggal : Surveying Vol 2 , TMH
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad

*BCE-011: ADVANCE CONCRETE TECHNOLOGY

L T P
3 1 0 **Credit-4**

Unit-I
Cement: Production, composition, and properties; cement chemistry; Types of cements; special cements.
Aggregates: Mineralogy; properties, tests and standards. 6

Unit-II
Chemical and mineral admixtures: Water reducers, air entrainers, set controllers, specialty admixtures - structure properties, and effects on concrete properties. Introduction to supplementary cementing materials and pozzolans. Fly ash, blast furnace slag, silica fume, and metakaolin - their production, properties, and effects on concrete properties. Other mineral additives - reactive and inert. 8

Unit-III
Concrete mix design: Basic principles; IS method; ACI method; new approaches based on rheology and particle packing.

Concrete Production & Fresh concrete: Batching of ingredients; mixing, transport, and placement. Consolidation, finishing, and curing of concrete; initial and final set - significance and measurement. Workability of concrete and its measurement. 8

Unit-IV
Engineering properties of concrete: Compressive strength and parameters affecting it. Tensile strength - direct and indirect; Modulus of elasticity and Poisson's ratio. Stress strain response of concrete.

Dimensional stability and durability: Creep and relaxation - parameters affecting; Shrinkage of concrete - types and significance. Parameters affecting shrinkage; measurement of creep and shrinkage

Durability of concrete: Introduction to durability; relation between durability and permeability. Chemical attack of concrete; corrosion of steel rebars; other durability issues. 8

Unit-V
Special concretes: Properties and applications of: High strength - high performance concrete, reactive powder concrete. Lightweight, heavyweight, and mass concrete; fibre reinforced concrete; self-compacting concrete; shotcrete; other special concretes. 6

Reference Book:

1. 'Advanced Concrete Technology' by Zongjin Li, John Wiley & Sons

*BCE-012: PRINCIPLES OF TOWN PLANNING AND ARCHITECHURE

L T P
3 1 0 **Credit-4**

Unit-I
Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning. 4

Unit-II
Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighbourhood planning, Brief history of architecture. 6

Unit-III
Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions. 5

Unit-IV
Principles of architecture Design, Building Bye-Laws, Scale, Forms, Texture, Colour, Balance. 8

Unit-V
Architectural Drawing, Different symbols used in building industry, Design of typical buildings such as school, hospital, residencial and commercial complex, etc. 5

*BCE-013: DISASTER MITIGATION AND EARTHQUAKE ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I
Natural Disasters : Earthquake, Floods, Drought, Coastal Hazards, Landslides, rockslides and Forest Fires.6

Unit-II
Elements of Engineering Seismology: Earthquake phenomenon, Earthquake recording instruments. Introduction to Theory of Vibrations: Single degree un-damped and damped systems, elastic response to simple load functions and earthquake response spectras. 8

Unit-III
Performance of Building sand Structures : Main causes of damage : Intensity of earthquake forces, lack of strength and integrity in buildings, quasi- resonance, lack of ductility, lack of detailing. Earthquake Effects: On ground and soil liquefaction, buildings, structures, power plants, switch yards, equipments and other lifeline structures, release of poisonous gases and radiation. 8

Unit-IV
Lessons Learnt from the Past Earthquakes: Case studies of important Indian earthquakes and major world earthquakes. 6

Unit-V
Disaster Management : Salient features of disaster rescue, risk management and casualty management. 8

References Books:

1. Dr. Indu Prakash., 'Disaster Management', Rashtra Prahari Prakashan, Gaziabad.
2. P.K. Mukherjee, 'A Text Book of Geology'

*BCE-014: INDUSTRIAL POLLUTION CONTROL AND ENVIRONMENTAL AUDIT

L T P
3 1 0 **Credit-4**

Unit-I
Industrial wastes & their sources: various industrial processes, sources and types of wastes solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial processes requiring water use and water quality. 6

Unit-II
Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 7

Unit-III
Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 9

Unit-IV
Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 9

Unit - V
Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. Industrial Wastewater Management Handbook, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. Wastewater Reuse and Recycling Technology-Pollution Technology Review-72, Culp, Gordan,
3. George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
4. The Treatment of Industrial wastes. Edmund, B. Besselieve P.E., McGraw Hill, New York.
5. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
6. Wastewater Engineering: Treatment & Re-use. Metcalf & Eddy, Tata McGraw-Hill.
7. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
8. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

BCE-451: STRUCTURAL ANALYSIS LAB

L T P
0 0 2 **Credit - 1**

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell's Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

BCE-452: GEOINFORMATICS LAB

L T P
0 0 2 **Credit - 1**

1. Demonstration and working on Electronic Total Survey Station (TC-1800).
2. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
3. Demonstration and working with Pocket/Mirror stereoscopes, Parallax Bar.
4. Aerial photographs.
5. Visual Interpretation using IRS false colour composite.
6. Demonstration and practice work with hand held GPS (GS-5).

BCE -453: HYDRAULICS & HYDRAULIC MACHINE LAB

L	T	P	
0	0	2	**Credit - 1**

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study rotodynamic pumps and their characteristics.
8. To study characteristics of any two turbines (Francis/ Kaplan / Pelton).

BCE-454: COMPUTER BASED STAISTICAL & NUMERICAL TECNIQUE

L T P
0 0 2 **Credit - 1**

Write Programs in 'C' Language:

1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
2. To implement Newton's Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation Formula.
4. To implement Numerical Differentiations & Integration.
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness.
7. Linear correlation and regression.

3rd Year, Semester-V
BCE-501: GEOTECHNICAL ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I
Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Clay minerals, Index properties, Particle size analysis, Soil classification. 10

Unit-II
Soil-water systems, capillarity-flow, Darcy's law, permeability, field and lab tests, piping, quick sand condition, seepage, flow nets, flow through dams, filters. Soil compaction, water content – dry unit weight relationships, OMC, field compaction control, Proctor needle method. 8

Unit-III
Effective stress principle, Stresses due to applied loads, Boussinesq and Westergaard equations. Compressibility and consolidation characteristics, Rate of consolidation, Terzaghi's one dimensional theory of consolidation and its applications, Over Consolidation Ratio, determination of coefficient of consolidation and secondary consolidation (creep), consolidation under construction loading. 9

Unit-IV
Shear strength - direct & triaxial shear tests, Mohr – Coulomb strength criterion, drained, consolidated, undrained and unconsolidated tests, strength of loose and dense sands, Normally Consolidated and Over Consolidated soils, dilation, pore pressure, Skempton'scoefficient. Earth pressure theories, Coulomb and Rankine approaches for c-φ soils, smooth and rough walls, inclined backfill. 9

Unit-V
Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ test, SPT, CPT, DCPT. Types of foundations – shallow / deep, isolated, combined, mat, etc., Definitions, Bearing capacity of shallow foundations (Terzaghi analysis), general, local and punching shear failures, corrections for size, shape, depth, water table, Bearing capacity by consolidation method, insitu bearing capacity determination, Provisions of IS code of practice, selection of depth of footing, eccentrically loaded footings.

BCE-502: DESIGN OF CONCRETE STRUCTURE-1

L T P
3 1 0 **Credit-4**

Unit-I
Concrete Making materials , mix design , Properties of concrete and reinforcements , testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. 6

Unit-II
Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method. 7

Unit-III
Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. 10

Unit-IV
Design of one way and two way solid slabs by Limit State Design Method, Service ability Limit States, Control of deflection, cracking and vibrations. 5

Unit-V
Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. 10
Note : All designs shall be conforming to IS : 456 – 2000.

Text Books:
1. IS : 456 – 2000.
2. Fundamentals of Reinforced Concrete by M L Gambhir, PHI,
3. Reinforced Concrete Design by S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw

References:
1. 1.Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. 2.Reinforced Concrete Structures by R. Park and Pauley.
3. 3.Reinforced Concrete Design by P. Dayaratnam., Oxford & IBH.

BCE-503: TRANSPORTATION ENGINEERING I

L T P

3 1 0 **Credit-4**

Unit-I

Introduction: Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road type sand pattern. 4

Unit-II

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. 10

Unit-III

Traffic Engineering: Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection. 8

Unit-IV

Design of Highway Pavement: Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2001), Design of rigid pavement, Westergard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC: 58 – 2002). 8

Unit-V

Road Construction Methods : WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction. 6

Text Books

1. Highway Engineering by S. K. Khanna & C.E.G. Justo.

References

1. Transportation Engineering by L. R. Kadiyali.
2. Highway Engineering by S. K. Sharma
3. Principles of Transportation Engineering by P. Chakraborty & A. Das.

BCE-504: STRUCTURAL ANALYSIS-II

L T P
3 1 0 **Credit-4**

Unit-I
Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method. 8

Unit-II
Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust. 10

Unit-III
Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. 8

Unit-IV
Basics of Force and Displacement Matrix methods for beams , frames and trusses. 7

Unit-V
Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames. 9

Text Books

1. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.
2. Structural Analysis by C. S. Reddy, Tata McGraw Hill Publishing Company Limited, New Delhi.
1. 3 Theory of Structures Vol 1 & 2 by Gupta & Gupta , TMH

References

1. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee.
2. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
3. Indterminate Structural Analysis by C. K. Wang.
4. Introduction to Matrix Methods of Structural Analysis by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.
5. Matrix Analysis of Framed Structures by Weaver and Gere.

*BCE-021: MATRIX ANALYSIS OF STRUCTRES

L T P
3 1 0 **Credit-4**

Unit-I
Introduction of Flexibility and stiffness method. Hand computation of problems on beam, 7

Unit-II
Hand computation of problems on trusses, frames and grids. 6

Unit-III
Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures. 8

Unit-IV
Analysis for imposed deformation, temperature, support settlement, etc. 7

Unit-V
Transfer matrix method of analyzing framed structure. 8

Reference:

1. Weaver & Gere , Matrix Analysis of Framed structures.
2. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York.

*BCE-022: EIA & AUDITING

L T P
3 1 0 **Credit-4**

Unit-I
Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations. 5

Unit-II
Defining the industrial activity: Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological environment and socio-economic environment. 6

Unit-III
Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, radiation emissions etc.; Biological environment- all flora & fauna including microbial activities in the local vicinity; Socio -economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues. 7

Unit-IV
Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 5

Unit-V
Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc. 6

Recommended References:

1. EIA Guidelines of MoEF Available on CPCB/MoEF Website
1. Environment (protection) Act- 1986. Any authorized & recent publication on Government Acts.Also available on CPCB/MoEF Website
2. Environmental Impact Assessment-Training resource manual, UNEP 2001
3. Wastewater Reuse and Recycling Technology-Pollution Technology Review-72, Culp, Gordan,George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
4. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co.

*BCE-023: OPEN CHANNEL FLOW

L T P
3 1 0 **Credit-4**

Unit-I
Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels.
Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,
Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transiti 8

Unit – II
Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations,flow classification and surface profiles, Control sections,Computation methods and analysis: Integration of varied flow equation by analytical,graphical and advanced numerical methods, Transitions of subcritical and supercriticalflow, flow in curved channels.6

Unit – III
Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels onhorizontal and sloping beds, Hydraulic jump in gradually and suddenly expandingchannels, submerged hydraulic jump, rolling and sky jump, use of jump as an energydissipater,
Flow measurement: by sharp crested and broad crested weirs, critical depth flumes,sluice gate, Free overfall.
Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge.7

Unit-IV
Spatially Varied Flow (SVF): Basic principles, Differential SVF equations forincreasing and decreasing discharge, Classifications and solutions, Numerical methodsfor profile computation, Flow over side-weir and Bottom-rack.6

Unit – V
Flow in channel of non-linear alignment and non-prismatic channel sections, Designconsiderations for sub critical and super critical flows, Design of culvert. 6

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. RangaRaju, K.G., Flow through open channels, T.M.H.
5. M. HanifChaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International

*BCE-024: EARTH & EARTH RETAINING STRUCTURE

L T P
3 1 0 **Credit-4**

Unit-I
Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis 6

Unit-II
Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability. 7

Unit-III
Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design. 5

Unit-IV
Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure 6

Unit-V
Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil. 6

Books:

1. V N S Murthy – Soil Mechanics and Foundation Engg
2. Swami Saran – Reinforced Soil and its Engineering Application
3. J. E. Bowles – Analysis and Design of Foundation

BCE-551: GEOTECHNICAL ENGINEERING LAB

L T P
0 0 2 **Credit - 1**

1. Sieve Analysis.
2. Hydrometer Analysis.
3. Liquid & Plastic Limit Tests.
4. Shrinkage Limit Test.
5. Proctor Compaction Test.
6. Relative Density.
7. In Situ Density – Core cutter & Sand Replacement.
8. Permeability Test.
9. Direct Shear Test.
10. Auger Boring.
11. Static Cone Penetration Test.
12. Standard / Dynamic Cone Penetration Test.

BCE-552: TRANSPORTATION ENGINEERING LAB

L T P
0 0 2 **Credit - 1**

1. Crushing Value Test of Aggregate.
2. Impact Value Test of Aggregate.
3. Los Angeles Abrasion Value of Aggregate.
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate.
5. Penetration Test of Bituminous Sample.
6. Softening Point Test of Bituminous Sample.
7. Stripping Test of Bituminous Sample.
8. Ductility Test of Bituminous Sample.
9. Flash & Fire Point Test of Bituminous Sample.
10. Classified both directional Traffic Volume Study.
11. Traffic Speed Study (Using Radar Speedometer or Enoscope).

BCE-553: CAD LAB-1

L T P
0 0 2 **Credit - 1**

1. Working on analysis softwares like ANSYS , ADINA , NISA.
2. Working on design software like STAAD PRO / STRUDS / SAP / ETAB / STRAP.
3. Working on geotechnical software like GEO-5 / PLAXIS.

BCE-554: QUANTITY SURVEYING & ESTIMATION

L T P
0 0 2 **Credit - 1**

1. Importance of estimation, different types of estimates specifications general and detailed.
2. Methods of Estimation: General items of work for estimates units and measurement, method of accounting for the deduction of openings etc.
3. Detailed estimates of a single roomed and a two roomed residential building.
4. Analysis of rates: Definition of analysis of rates, Prime cost, Work charged establishment,
5. Quantity of materials per unit of work for major civil engineering items Resource planning through analysis of rates, market rates,
6. PW.D. Scheduled and cost indices for building material and labour.
7. Public works Organization, M.E.S. Organization, India Railway Organization and concept of organizational set up for Public Work Execution. Duties and responsibilities of the officers

3rd Year, Semester-VI
BCE-601: DESIGN OF CONCRETE STRUCTURE-II

L T P
3 1 0 **Credit-4**

Unit-I
Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method). 10

Unit-II
Analysis and design of beam curved in plan. Structural behavior of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing. 8

Unit-III
Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert. 6

Unit-IV
Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground/ underground, design of overhead tanks. 8

Unit-V
Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section. 5

Text Books
1. IS : 456 – 2000.
2. Reinforced Concrete Design by Pillai & Menon , TMH
3. Prestressed Concret by N Krishna Raju, New Age

References
1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. Reinforced Concrete Structures by R. Park and Pauley.
3. Reinforced Concrete Design by P. dayaratnam.

BCE-602: ENVIRONMENTAL ENGINEERING-I

L T P
3 1 0 **Credit-4**

Unit-I
Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period. Sources of water: Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir. 10

Unit-II
Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures. 5

Unit-III
Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis. 6

Unit-IV
Rural water supply distribution system. Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply. 8

Unit-V
Wastewater collection: Systems of sanitation and wastewater collection, estimation of waste water flows and variations in wastewater flows. Storm water: Collection and estimation of storm water by different formulae. Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines; small bore sewer systems. Planning of sewerage systems. Institutional and industrial wastewater management. 9

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology

BCE-603: TRANSPORTATION ENGINEERING-II

L T P
3 1 0 **Credit-4**

Unit-I

Indian railways: Development and organization of Indian Railways. Permanent way: Sub-grade, formation, embankment and cutting, track drainage.

Rails: Rail gauges, types of rails, defects in rails, rail failure, creep of rail.

Rail Fastenings: Fish plates, spikes, chairs, keys, bearing plates.

Sleepers: Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density.

Ballast: Ballast materials, size of ballast, screeming of ballast, specification of ballast, tests on ballast.6

Unit-II

Railway Track Geometry: Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, compensation for curvature on gradients, track resistance and tractive power.

Points & Crossings: Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out. 7

Unit-III

Stations & Yards: Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards. Signalling & Interlocking: Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station. 5

Unit-IV

Airport Engineering: Air craft characteristics affecting airport design; Runway operation; Runway pavement design, design of overlay; Runway lighting and marking heliport. 5

Unit-V

Water Transport, Harbors; Layout and port facilities; Inland waterways; Inland water operation. 4

Text Books

1.A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena

References

2. Railway Engineering by M. M. Aggrawal.

BHU-601: ENGINEERING & MANAGERIAL ECONOMICS

L T P
3 1 0 **Credit-4**

Unit-I

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology. Managerial Economics and its scope in engineering perspective. 5

Unit-II

Basic Concepts demand Analysis, Law of Demand, Determinates of Demand, Elasticity of Demand-Price, Income and cross Elasticity. Uses of concept of elasticity of demand in managerial decision. 5

Unit-III

Demand forecasting Meaning, significance and methods of demand forecasting, production function, Laws of returns to scale & Law of Diminishing returns scale. An overview of Short and Long run cost curves – fixed cost, variable cost, average cost, marginal cost, Opportunity cost. 6

Unit-IV

Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions. 6

Unit-V

National Income, Inflation and Business Cycles Concept of N.I. and Measurement. Meaning of Inflation, Type causes & prevention methods, Phases of business cycle. 5

Reference Books

1. Koutsoyiannis A : Modern Microeconomics, ELBS.
2. Managerial Economics for Engineering : Prof. D.N. Kakkar
3. Managerial Economics : D.N. Dwivedi
4. Managerial Economics : Maheshwari.

*BCE-031: ADVANCED FOUNDATION DESIGN

L T P
3 1 0 **Credit-4**

Unit-I
Vertical pressures under surface loads, Elastic Solution, Bousisinesq and New Mark Charts, Westergaard's equation, approximate solution. 5

Unit-II
Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmertman's methods of settlement prediction in non cohesive soil. 6

Unit-III
Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group. 5

Unit-IV
Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour, Well sinking, Tilt, shift and their prevention.4

Unit-V
Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Machine foundation: classification, definitions, design principle in brief, Barken's method. 5

Text Books:

1. K. R. Arora – Soil Mechanics & Foundation Engineering.
2. Alam Singh – Modern Geotechnical Engineering.
3. GopalRanjan and A. S. R. Rao – Basic and Applied Soil Mechanics

Reference:

1. J. E. bowles – Analysis and Design of Foundation.
2. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.
3. B. M. Das – Foundation Engineering , CENGAGE Learning.

*BCE-032: ADVANCED CONCRETE STRUCTURE

L T P
3 1 0 **Credit-4**

Unit-I
Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects 8

Unit-II
Design of staging: Braces, Columns and Raft Foundation. 5

Unit-III
Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing. 6

Unit-IV
Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab. 7

Unit-V
High performance concrete, Production and no-conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions. 6

Reference:

1. Reinforced Concrete Design by M L Gambhir
2. Reinforced Concrete Design by B C Punamia
3 Essentials of Bridge Engineering by D.J. Victor

*BCE-033: TRANSPORTATION SYSTEM PLANNING

L T P
3 1 0 **Credit-4**

Unit-I

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning, 5

Unit-II

Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables. 5

Unit-III

Travel demand: Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment. 5

Unit-IV

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method. 5

Unit-V

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation. 6

Reference:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning – E.K. Mortak.
3. Metropolitan transportation planning – J.W. Dickey.
4. Traffic Engineering, L.R. Kadiyali

*BCE-034: ENVIORNMENTAL GEOTECHNOLOGY

L T P
3 1 0 **Credit-4**

Unit-I
Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 5

Unit-II
Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 6

Unit-III
Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 5

Unit-IV
Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment, remedial action 5

Unit-V
Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills 6

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics

BCE-651: CAD LAB-2

L T P
0 0 2 **Credit - 1**

1. Working on Environmental Engineering softwares for Analysis and Design of water & waste water treatment and distribution systems (Water Cad / Sewer Cad / Water Gem / Sewer Gem / Loop)
2. WORKING Transportation Enggsoftwares / Surveying Softwares
3. WORKING ON GIS softwares (Arc GIS / Envi / GePSy)
4. Working on Project Management softwares (Primaveera / MS Project)

BCE-652: ENVIOURNMENTAL ENGG. LAB

L T P
0 0 2 **Credit - 1**

Any 8 Experiments out of the list of 12 below:

1. Determination of turbidity, colour and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of most probable number of coliforms.
6. Measurement of air pollutants with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.

BCE-653: STRUCTURAL DETAILING LAB

L T P
0 0 3 **Credit - 1**

Preparation of working drawings for the following using any drafting software

1. RC Beams- Simply supported, Continuous, Cantilever
2. T – beam / L-beam floor
3. Slabs – Simply supported, Continuous, One way and two way slabs.
4. Columns – Tied Columns and Spirally reinforced columns.
5. Isolated footings for RC Columns.
6. Combined rectabgular and trapezoidal footings.
7. Detailing of Buildings with respect to Earthquake Resistant Design.

BCE-654: INTRODUCTION TO MATLAB

L T P **Credits- 1**
0 0 3

Basic plotting, Creating simple plots, Specifying line styles and colors, Matrix generation, Entering a vector, Entering a matrix, Array operations and Linear equations, Introduction to programming in MATLAB

4th Year, Semester-VII
BCE –701 DESIGN OF STEEL STRUCTURE

L T P
3 1 0 **Credit-4**

Unit-I

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements. 5

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 6

Unit-II

Simple Connections--Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Pin Connections.

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design. 10

Unit-III

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design 8

Unit - IV

Compression Members

Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Encased Column, Splices, Design of Column Bases. 6

Unit - V

Beams: Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Lintels, Purlins, Beam Bearing Plates, Castellated Beam, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder 9

Text Books

1. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
2. Design of Steel Structures by K S Sairam, Pearson Education.

Reference Books

3. Design of Steel Structures by N. Subramanian, Oxford University Press.
4. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
5. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
6. Design of steel structures by Willam T Segui , CENGAGE Learning.
7. Structural Steel Design By D MacLaughlin , CENGAGE Learning.

BCE-702: WATER RESOURCES ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system.
Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 7

Unit-II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 10

Unit-III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of are a statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programes for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining.
Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

Unit-IV 7

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

Unit-V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.

BCE-703: ENVIRONMENTAL ENGINEERING-II

L T P
3 1 0 **Credit-4**

Unit - I

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater. Water borne diseases and their control. Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment:Water and wastewater treatment, unit operations and processes and flow sheets. 8

Unit-II

Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling. Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. 9

Unit-III

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals. Adsorption. 8

Unit-IV

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc. 7

Unit-V

Anaerobic digestion of sludge: Design of low and high rate anaerobic digesters and septic tank. Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor. Disposal of wastewater on land and in water bodies Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies for wastewater treatment. 8

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

Reference books:

1. Manual on Water Supply and Treatment, C.P.H.E.E.O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C.P.H.E.E.O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control

*BCE-041: BRIDGE ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I
Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method. 10

Unit-II
Courbon's method of load distribution. Detail design of slab culvert 8

Unit-III
T-beam bridge, box culverts, 8

Unit-IV
Design and detailing of plate girder and steel Truss type bridges, 7

Unit-V
Design of piers and pier caps. Abutments, and bearings 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra.

*BCE-042: TUNNEL ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I
Site investigations , Geotechnical Considerations of tunneling 10

Unit-II
Design of Tunnels

Unit-III
Construction & Excavation methods , soft ground tunnels , Rock tunnels 5

Unit-IV
Micro tunneling techniques , Tunnel support design 10

Unit-V
Ventilation of tunnels , tunnel utilities , safety aspects 7

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski

*BCE-043: PLASTIC ANALYSIS OF STRUCTURE

L T P
3 1 0

Unit-I
Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit-II
Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 6

Unit-III
Semi Graphical method and Mechanism method. 8

Unit-IV
Plastic moment distribution for multi-storey and multi-bay frames. 5

Unit-V
Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek& Z P Bazant

*BCE-044: ENGINEERING HYDROLOGY

L T P
3 1 0 **Credit-4**

Unit-I
Introduction: hydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity-duration- frequency relationships, probable maximum precipitation. 10

Unit-II
Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapotranspiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation 8

Unit-III
Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-IV
Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 6

Unit-V
Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 7

Recommended Books:

1. 'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
2. 'Engineering Hydrology' by K. Subramanya
3. 'Hydrology: Principles. Analysis. Design' by Raghunath H. M.
4. 'Handbook of Applied Hydrology' by Chow V. T.
5. 'Irrigation: Theory & Practice' by Michael A. M.

**BOE-080: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0 **Credit-4**

Unit-I
Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry. 8

Unit-II
Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8

Unit-III
Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies. 9

Unit-IV
Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9

Unit-V
Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. 5
Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India

**BOE-076: QUALITY MANAGEMENT

L T P
3 1 0 **Credit-4**

Unit-I
Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. 5

Unit-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. 8

Unit-III
Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 9

Unit -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. 8

Unit-V
ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992

**BOE-075: OPERATIONS RESEARACH

L T P
3 1 0 **Credit-4**

Unit-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. 8
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis. 8

Unit-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms.
Assignment: Allocation and assignment problems and models, processing of job through machines. 4

Unit-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. 6
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.

Unit-IV
Theory of Games :
Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poissonqueing model, single server models. 8

Unit-V
Inventory Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipments that deteriorate with time, equipments that fail with time. 8

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. PanneerSeevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

**BOE-071: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0 **Credit-4**

Unit-I
Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 6

Unit-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 6

Unit-III
Geothermal Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 5
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations.
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations. 5

Unit-IV
T**hermo-electrical and thermionic Conversions:**
Principle of working, performance and limitations.
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6

Unit-V
Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations**.**
Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants. 5

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. KoteswaraRao, " Energy Resources: Conventional & Non-Conventional " BSP
4. Publications,2006.
5. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
6. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI
7. Learning. (14)
8. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by
9. Academic Press.

BCE-752: MINI PROJECT

L T P
0 0 3 **Credit-1**

Students have to perform a mini project work related to their respective stream in B. Tech. The project work may be software or hardware based. /it may be extendable to major project.

BCE-753: SEMINAR

L T P
0 0 2 **Credit-1**

Students have to give multiple presentations on research & recent technologies with respect to his/her course.

BCE-754: INDUSTRIAL TRAINING VIVA-VOCE

L T P
0 0 2 **Credit-1**

Students have to undergo six to eight week industrial training at end of sixth semester.

4th Year, Semester-VIII

*BCE-051: PRECAST & MODULAR CONSTRUCTION PRACTICES

L T P
3 1 0 **Credit-4**

Unit-I
Overview of reinforced and prestressed concrete construction Design and detailing of precast/prefabricated building components, 5

Unit-II
Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit-III
Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 6

Unit-IV
Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.10

Unit-V
Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 6

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

*BCE-052: EARTQUAKE RESISTANT DESIGN

L T P
3 1 0 **Credit-4**

Unit-I
Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit-II
Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit-III
Dynamics of multi degree of freedom system, Idealization of structures, Dynamics of soils and seismic response, Conceptual design, 8

Unit-IV
Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Design of Masonry buildings, 9

Unit-V
Reinforced Concrete buildings, Steel Buildings, Material Properties, Code provisions. Introduction to machine foundation. Degrees of freedom of a block foundation. I.S. code provisions for design and construction of machine foundations. 9

References:

1. Introduction to Structural Dynamics - J.M. Biggs
2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory &cpomputation - Mario Paz.
5. Dynamics of Structures Theory and Applicaions to Earhquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

*BCE-053: ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0 **Credit-4**

Unit-I
Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.
Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall. Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 10

Unit-II
Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.
Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 10

Unit-III
Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.
Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 10

Unit-IV
Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT-V
Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.
Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill

*BCE-054: MACHINE FOUNDATION DESIGN

L T P
3 1 0 **Credit-4**

Unit-I
Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit-II
Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford &Haddow's analysis, Hammer foundation, I. S. Codes. 7

Unit-III
Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 6

Unit-IV
Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 7

Unit-V
Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 7

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations

*BCE-061: WATER RESOURCES SYSTEMS

L T P
3 1 0 **Credit-4**

Unit –I
Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II
System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 7

Unit-III
Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 6

Unit- IV
Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 5

Unit V
Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization 8
Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 6

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, V$_{th}$Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam

*BCE-062: RIVER ENGINEERING

L T P
3 1 0 **Credit-4**

Unit-I
Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit-II
Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 7

Unit-III
Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 6

Unit-IV
Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 5

Unit-V
River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Text books:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.

*BCE-063: GROUNDWATER MANAGEMENT

L T P
3 1 0 **Credit-4**

Unit-I
Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 5

Unit-II
Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters. 8

Unit-III
Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 6

Unit-IV
Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage. 7

Unit-V
Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

1. 'Groundwater Hydrology' by Todd D. K.
2. 'Groundwater Resource Evaluation' by Walton W. C.
3. 'Groundwater' by Raghunath H. M.
4. 'Handbook of Applied Hydrology' by Chow V. T.
5. 'Irrigation: Theory & Practice' by Michael A. M.

*BCE-064: COMPUTER AIDED DESIGN

L T P
3 1 0 **Credit-4**

Unit-I
Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 5

Unit-II
Principles of software design, concept of modular programming, debugging and testing. 6

Unit-III
Computer applications in analysis and design of Civil Engineering systems. 9

Unit-IV
Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

Unit-V
Expert system, their development and applications, Introduction to Neural Networks. 5

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine& / Lane E. Drang, McGraw Hill
"Neural Computing: Waserman, vonnostrand.

*BCE-065: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L T P
3 1 0 **Credit-4**

Unit-I
Elements of Management: Project cycle, Organization, planning, scheduling monitoring updating and management system in construction. 8

Unit-II
Network Techniques: Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique. 10

Unit-III
Engineering Economics: Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis. 8

Unit-IV
Contract Management: Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project. 7

Unit-V
Equipment Management: Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipments for earth moving , Hauling Equipments, Hoisting Equipments , Conveying Equipments , Concrete Production Equipments.

Text Books

1. "Construction Planning", Equipment and Methods. : R.L. Peurify. T.M.H., International Book Company.
2. "PERT & CPM Principles and Applications" L.S. Srinath, E.W.P. Ltd., New Delhi.
3. "Network Analysis Techniques" S.K. Bhatnagar, Willey Eastern Ltd.
4. Construction Technology by Sarkar , Oxford

BCE-851: MAJOR PROJECT

L	T	P	
0	0	21	Credit-16

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

Convener

Signature: 1……
Name: Mr. Nirbhay Parmar
Date :

Internal Members

Signature **1. ……** Signature **2. ……**
Name: Mr. Sudeep Kumar Name: Mr. Utsav Mani
Date: Date:

External Members

Signature: **1……..** **2……**
Name: Name:
Date: Date:

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

SYLLABUS & EVALUATION SCHEME

B. Tech.

Computer Science & Engineering

2nd, 3rd and 4thYear

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science Engineering

2nd YEAR, SEMESTER-III

S.N.	Subject Code	Subject Name	Period			Evaluation scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BEC-301	Digital Logic Design	3	1	0	20	20	60	100	4
2	BAS-301	Mathematics-III	3	1	0	20	20	60	100	4
3	BCS-301	Data Structures Using C	3	1	0	20	20	60	100	4
4	BCS-302	Discrete Mathematical Structures	3	1	0	20	20	60	100	4
5	BCS-303	Web technology	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BEC-351	Logic Design Lab	0	0	2	30	20	50	100	1
7	BCS-351	Data structures Lab	0	0	3	30	20	50	100	1
8	BCS-353	Web technology Lab	0	0	2	30	20	50	100	1
9	BCS-352	Numerical Techniques Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course)- Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science Engineering

2nd YEAR, SEMESTER-IV

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCS -041 To BCS -045	Departmental Elective-I	3	1	0	20	20	60	100	4
2	BCS -401	Software Engineering	3	1	0	20	20	60	100	4
3	BCS -402	Computer Organization & Design	3	1	0	20	20	60	100	4
4	BCS -403	Database Management Systems	3	1	0	20	20	60	100	4
5	BCS -404	Theory of Automata & Formal Languages	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCS -451	Software Engineering Lab	0	0	2	30	20	50	100	1
7	BCS -452	Computer Organization Lab	0	0	2	30	20	50	100	1
8	BCS -453	DBMS Lab	0	0	3	30	20	50	100	1
9	BCS-454	Principal of Programming Language	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course) - Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical component**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science Engineering

3rd YEAR, SEMESTER-V

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCS -051 TO BCS -055	Departmental Elective-II	3	1	0	20	20	60	100	4
2	BCS-501	Operating System	3	1	0	20	20	60	100	4
3	BCS-502	Design and Analysis of Algorithms	3	1	0	20	20	60	100	4
4	BCS-503	Object Oriented Techniques	3	1	0	20	20	60	100	4
5	BCS-504	Computer Graphics & Multimedia	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCS -551	Operating System Lab	0	0	2	30	20	50	100	1
7	BCS -552	Algorithms Lab	0	0	3	30	20	50	100	1
8	BCS -553	Object Oriented Techniques Lab	0	0	2	30	20	50	100	1
9	BCS -554	Computer Graphics & Multimedia Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course)- Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

5. Attendance: 5 Marks
6. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science Engineering

3rd Year, SEMESTER-VI

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BHU-601	Engineering Economics & Industrial Management	3	1	0	20	20	60	100	4
2	BCS-061 TO BCS-065	Departmental Elective-III	3	1	0	20	20	60	100	4
3	BCS-601	Data Mining & Data Warehousing	3	1	0	20	20	60	100	4
4	BCS-602	Computer Network	3	1	0	20	20	60	100	4
5	BCS-603	Compiler Design	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCS-651	Data Mining & Data Warehousing Lab	0	0	2	30	20	50	100	1
7	BCS-652	Computer Network Lab	0	0	2	30	20	50	100	1
8	BCS-653	CompilerLab	0	0	3	30	20	50	100	1
9	BCS-655	.Net Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course)- Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation,MTE-Mid Term Examination,ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

7. Attendance: 5 Marks
8. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science Engineering

4th YEAR, SEMESTER-VII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
Theory Subjects										
1	BCS-701	Distributed Systems	3	1	0	20	20	60	100	4
2	BCS-702	Digital Image Processing	3	1	0	20	20	60	100	4
3	BCS-703	Artificial Intelligence	3	1	0	20	20	60	100	4
4	BCS-071 TO BCS-074	Departmental Elective-IV	3	1	0	20	20	60	100	4
5	BOE-071 TO BOE-074	Open Elective	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
6	BCS-751	Distributed Systems Lab	0	0	2	30	20	50	100	1
7	BCS-752	Mini Project	0	0	2	30	20	50	100	1
8	BCS-753	Seminar	0	0	3	30	20	50	100	1
9	BCS-754	Industrial Training Viva-Voce	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course)- Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

9. Attendance: 5 Marks
10. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Faculty of Engineering & Technology

Rama University Uttar Pradesh, Kanpur

Course Detail and Evaluation Scheme

B. Tech. Computer Science and Engineering

4th YEAR, SEMESTER-VIII

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Total	Credit
			L	T	P	CE	MTE	ETE		
1	BCS-081 TO BCS-084	Departmental Elective-V	3	1	0	20	20	60	100	4
2	BCS-085 TO BCS-88	Departmental Elective-VI	3	1	0	20	20	60	100	4
PRACTICALS / PROJECT										
1	BCS-851	Major Project	0	0	21	300	---	400	700	16
		Total	**6**	**2**	**21**	**340**	**40**	**520**	**900**	**24**

BHU-001 Human Values & Professional Ethics (Audit Course)- Student can clear from 2nd year to final year

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

Course without practical components

For Continuous Evaluation (CE) is such as: 20 Marks

1 Attendance: 5 Marks

2 Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 300 Marks

Major Project/Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

RAMA UNIVERSITY UTTAR PRADESH, KANPUR

Faculty of Engineering & Technology

SYLLABUS & EVALUATION SCHEME

[Effective from the Session 2014-15]

B.Tech (Mechanical Engineering)

2nd Year,3rd Year &4th Year

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme

B. Tech. Mechanical Engineering

YEAR II, SEMESTER III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1	BAS-301	Mathematics-III	3	1	0	20	20	60	100	4
2	BCE-302	Fluid Mechanics** Engineering Core (interdisciplinary)	3	1	0	20	20	60	100	4
3	BME301	Materials Science in Engineering	3	1	0	20	20	60	100	4
4	BME-302	Strength of Materials	3	1	0	20	20	60	100	4
5	BME-303	Thermodynamics	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
6	BME-351	Material Science Lab	0	0	2	30	20	50	100	1
7	BME -352	Machine Drawing-I	0	0	3	30	20	50	100	1
8	BME -353	Material Testing lab	0	0	2	30	20	50	100	1
9	BCE -352	Fluid Mechanics Lab *	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

**Common to Civil Engg. and Mechanical Engg& related branches (as Engineering Core – Interdisciplinary).

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme

B. Tech. Mechanical Engineering

YEAR II, SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1.	BME011-BME-015	Departmental Elective-I	3	1	0	20	20	60	100	4
2.	BEE-409	Electrical Machines &Automatic Control Engineering Core (interdisciplinary)	3	1	0	20	20	60	100	4
3.	BME -401	Applied Thermodynamics	3	1	0	20	20	60	100	4
4.	BME -402	Manufacturing Science-I	3	1	0	20	20	60	100	4
5.	BME -403	Measurement & Metrology	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
6.	BME -451	Machine Drawing-II	0	0	3	30	20	50	100	1
7.	BME 452	Manufacturing Science-I & Measurement Lab	0	0	2	30	20	50	100	1
8.	BME -453	Applied Thermodynamics Lab	0	0	2	30	20	50	100	1
9.	BEE-459	Electrical Machines &Automatic Control Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**
		Industrial Training-I of 4weeks after IV semester or Minor fabrication project involving work for nearly 4weeks,which will be evaluated in VII semester								

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme

B. Tech. Mechanical Engineering

YEAR III, SEMESTER-V

S. No.	Course code	Subject	Periods			Evaluation scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1	BME -501	Machine Design-I	3	1	0	20	20	60	100	4
2	BME -502	Theory of Machines-I	3	1	0	20	20	60	100	4
3	BME-503	Manufacturing Science-II	3	1	0	20	20	60	100	4
4	BME-504	Heat & Mass Transfer	3	1	0	20	20	60	100	4
5	BME051-BME-055	Departmental Elective-II	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
6	BME-551	Machine Design-I Lab	0	0	3	30	20	50	100	1
7	BME-552	IC Engine & Automobile lab	0	0	2	30	20	50	100	1
8	BME 553	Manufacturing Science-II & Metrology lab	0	0	2	30	20	50	100	1
9	BME 554	Heat & Mass Transfer Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

5. Attendance: 5 Marks
6. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme

B. Tech. Mechanical Engineering

YEAR III, SEMESTER-VI

S. No.	Course code	Subject	Periods			Evaluation scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1	BHU-601	Engineering Economic and Industrial Management	3	1	0	20	20	60	100	4
2	BME061-BME-064	Departmental Elective-III	3	1	0	20	20	60	100	4
3	BME-601	Theory of Machine -II	3	1	0	20	20	60	100	4
4	BME-602	Machine Design-II	3	1	0	20	20	60	100	4
5	BME-603	Refrigeration & Air-conditioning	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
7	BME-651	Fluid Machinery Lab	0	0	2	30	20	50	100	1
8	BME 652	Machine Design-II Lab	0	0	2	30	20	50	100	1
9	BME 653	Theory of Machines Lab	0	0	3	30	20	50	100	1
10	BME-654	Refrigeration & Air-conditioning Lab	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

*__Note__- 4 to 6 Weeks Industrial Training after VI semester also to be evaluated in VII semester

*BHU-001 Human Values & Professional Ethics (Audit Course) – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation,MTE-Mid Term Examination,ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

7. Attendance: 5 Marks
8. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme

B. Tech. Mechanical Engineering

YEAR IV, SEMESTER-VII

S. No.	Course code	Subject	Periods			Evaluation scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1	BME-703	Power Plant Engineering	3	1	0	20	20	60	100	4
2	BME-071 BME-077	Departmental Elective-IV	3	1	0	20	20	60	100	4
3	BOE-001 BOE-005	Open elective I	3	1	0	20	20	60	100	4
4	BME-701	Computer Aided Design	3	1	0	20	20	60	100	4
5	BME-702	Automobile Engineering	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
6	BME-751	CAD/CAM Lab	0	0	2	30	20	50	100	1
7	BME -752	Seminar	0	0	2	30	20	50	100	1
8	BME-753	Mini Project	0	0	3	30	20	50	100	1
9	BME-754	Industrial Training Evaluation and viva	0	0	2	30	20	50	100	1
		Total	**15**	**5**	**9**	**220**	**180**	**500**	**900**	**24**

Note-*Practical Training (4-weeks) done after 6th Semesters would be evaluated in 7th semester through Report and viva voice etc.

** Project should be initiated in 7th semester beginning, and should be completed by the end of 8th semester with good Report and power-point Presentation etc.

***BHU-001 Human Values & Professional Ethics (Audit Course)** – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

9. Attendance: 5 Marks
10. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…….. 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

Course Detail & Evaluation Scheme
B. Tech. Mechanical Engineering
YEAR IV, SEMESTER-VIII

S. No.	Course code	Subject	Periods			Evaluation scheme			Subject Total	Credits
			L	T	P	CE	MTE	ETE		
THEORY										
1	BME-080 - BME-083	Departmental Elective-V	3	1	0	20	20	60	100	4
2	BME-084 - BME-088	Departmental Elective-VI	3	1	0	20	20	60	100	4
PRACTICAL/TRAINING/PROJECT										
3	BME-851	Major Project	0	0	21	300	----	400	700	16
		Total	**6**	**2**	**21**	**340**	**40**	**520**	**900**	**24**

***BHU-001 Human Values & Professional Ethics (Audit Course)** – Student can clear from 2nd year to Final year.

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

Course without practical components
For Continuous Evaluation (CE) is such as: 20 Marks
1 Attendance: 5 Marks
2 Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 300 Marks
Major Project/Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

1…… 2…… 3…… 4…… 5……

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

SEMESTER-III

BAS-301: MATHEMATICS –III

L T P **Credits – 4**
3 1 0

UNIT – I: Function of Complex variable

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type 8

UNIT – II: Statistical Techniques - I

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear and multiple regression analysis, Probability theory. 8

UNIT – III: Statistical Techniques - II

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, , R, p, np, and c charts. 8

UNIT – IV: Numerical Techniques – I

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation , Lagrange's and Newton's divided difference formula for unequal intervals. 8

UNIT – V: Numerical Techniques –II

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous)equations by Euler's, Picard's and forth-order Runge-Kutta methods. 8

Books:-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger& Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi , 2003.
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.,2000
4. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
5. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
6. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
8. Devi Prasad, An introduction to Numerical Analysis, Narosa Publication house, New Delhi

BCE-302: FLUID MECHANICS

L T P **Credits – 4**

3 1 0

UNIT - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance.

UNIT - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

UNIT - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Introduction to compressible flow

Books:-

1. Som, S.K. &Biswas G. : Introduction of fluid mechanics & Fluid Machines, TMH, 2012, 3rd edition.
2. Rajput.R.K, "*A text book of Fluid Mechanics and Hydraulic Machines"*, S. Chand & Company Ltd., New Delhi, Fourth edition, 2012.
3. Bansal.R.K, "*Fluid Mechanics and Hydraulics Machines"*, 5th edition, Laxmi publications (P) Ltd., New Delhi, Ninth Edition, 2010.
4. Narasimhan S, "First Course in Fluid Mechanics", University Press

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-301:MATERIAL SCIENCE IN ENGINEERING

L T P **Credits – 4**

3 1 0

UNIT-I

Crystallography and Imperfections: Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X ray crystallography techniques. Imperfections, Defects & Dislocations in solids. 8

UNIT-II

Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testing such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT)

Microstructure Exam: Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.

Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

UNIT-III

Ferrous materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses.

Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys.

UNIT-IV

Magnetic properties: Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.

Electric properties: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors.P-n junction and transistors. Basic devices and its application. Diffusion of Solid.

Super conductivity and its applications. Messier effect. Type I& II superconductors. HighTc superconductors.

UNIT-V

Ceramics: Importance, Classification of composites - Particulate reinforced, Fibre reinforced composites, Composite Laminates, Sandwich and Honeycomb structures, Wood composites, Concrete, Degradation and failure of materials, Scope of recycling. 2

Plastics: Structure of polymers, Degree of polymerization, Structure and properties of thermoplastics, thermosets and elastomers (rubbers), Additives to polymers. Processing of Polymers. Mechanical behavior and processing of plastics. Future of plastics.

Other materials: Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smart materials & Nano materials and their potential applications

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

BOOKS:-

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesley Publication .
2. K.M.Gupta, Materials Science, Umesh Publication.
3. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.
4. V. Raghvan - Material Science, Prentice Hall.
5. Narula - Material Science, TMH.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME- 302 STRENGTH OF MATERIALS

L T P **Credits – 4**

3 1 0

UNIT-I

Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle.

3-D Stress, Theory of failure, Castiglion's Theorem, Impact load: Three dimensional state of stress & strain, equilibrium equations. Generalized Hook's Law.Theories of Failure.Castigliano's Theorem. Impact load & stresses4

UNIT –II

Stresses in Beams: Direct and shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams.

Torsion: Review of Torsion, combined bending & torsion of solid & hollow shafts.

UNIT-III

Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines.

UNIT-IV

Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain.

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stresses in rotating shaft and cylinders. Stresses due to interference fits.

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis(for symmetry about both axis and about one axis) for I-section and channel section

BOOKS:-

1. Mechanics of Materials by Pytel
2. Strength of Materials by Ryder
3. Strength of Materials by Timoshenko and &Youngs
4. Mechanics of Materials by Bear Jhonson

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-303 : THERMODYNAMICS

L T P **Credits – 4**

3 1 0

UNIT – I:

Fundamental Concepts and Definitions: Introduction and definition of thermodynamics, Dimensions and units, Microscopic and Macroscopic approaches, Systems, surroundings and universe, Concept of continuum, Control system boundary, control volume and control surface, Properties and state, Thermodynamic properties, Thermodynamic path, process and cycle, Thermodynamic equilibrium, Reversibility and irreversibility, Quasi static process, Energy and its forms, Work and heat, Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases.

Zeroth law of thermodynamics: Zeroth law of thermodynamics, Temperature and its' measurement, Temperature scales.

UNIT – II:

First law of thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. First law analysis for closed system (non flow processes), Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer, Limitations of first law of thermodynamics, PMM-I.

UNIT – III

Second law: Devices converting heat to work, Thermal reservoir, Heat engines, Efficiency, Devices converting work to heat, Heat pump, refrigerator, Coefficient of Performance, Reversed heat engine, Kelvin Planck statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II.

UNIT – IV

Entropy : Clausius inequality, Concept of Entropy, Entropy change in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

UNIT – V

Properties of steam and thermodynamics cycles: Pure substance, Property of steam, Triple point, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams,

use of property diagram, Steam-Tables &Mollier charts, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, Stirling cycle, Ericsson cycles, Actual cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, stratified charge engine.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines. 4

Books:

1. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
2. Fundamentals of Thermodynamics by Sonntag, Wiley India Pvt. Ltd.
3 . Engineering Thermodynamics by Onkar Singh, New Age International Pub..
4. Thermodynamics by J.P. Holman, McGraw Hill.
5. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub.

BME-351*:* MATERIALS SCIENCE LAB

L T P **Credits – 1**
0 0 2

Experiments: Minimum 5 experiments out of following;

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain Size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, casehardening and comparison of hardness before and after.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/Electronic materials.

BME-351Material Testing Lab

L T P **Credits – 1**
0 0 2

Experiments: Minimum SIX experiments out of following;

1. Strength testing of a given mild steel specimen on UTM with full details and S-E plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact testing on impact testing machine like Charpy, Izod or both.
4. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index testing on spring testing machine.
6. Fatigue testing on fatigue testing machine.
7. Creep testing on creep testing machine.
8. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion testing of a rod on torsion testing machine.
10. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrate tests.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME – 352: MACHINE DRAWING-I LAB

L T P **Credits – 1**
0 0 3

Introduction (1 drawing sheet)

Graphics Language, Classification of drawings, Principles of drawing, IS codes for machine drawing, scales, types of lines, section lines, Dimensioning

Orthographic Projections (1 drawing sheet)

Principle of first angle and third angle projection, drawing of machine elements in first angle projection, selection of views, sectional views

Screwed fasteners (2 drawing sheet)

Thread nomenclature, Forms of thread, Thread series, designation, Representation of threads, Bolted joints, Locking arrangement of nuts

Keys and Cotters and Pin joint (1 drawing sheet)

Types of keys, Cotter joint or Knuckle joint

Shaft& Couplings (1drawingsheet)

Introduction, Rigid coupling or Flexible coupling

Riveted joints (1 drawing sheet)

Introduction, rivets and riveting, Types of rivet heads, Types of riveted joints, Boiler joint

Assembly Drawing (1 drawing sheet)

Introduction, Engine parts- stuffing box, crosshead

Freehand sketching*

Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, Studs, pulleys, couplings etc. (1 drawing sheet)

BOOKS:

1. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy-New Age
2. Machine Drawing-PS Gill-SK Kataria& sons
3. Machine Drawing-N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
4. Engineering drawing Practice for School and Colleges, SP46-1988 (BIS)

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BCE-352: FLUID MECHANICS LAB

Experiments: Minimum FIVE experiments out of following.

1. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter, venturimeter, and bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
6. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 409 : ELECTRICAL MACHINES & AUTOMATIC CONTROL

L T P **Credits – 4**

3 1 0

UNIT I:–

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.

Three Phase Transformer: Three phase transformer connections, 3-phase to 2-phaseOr 6-phase connections and their applications.

Auto Transformer: Volt- Amp relations, efficiency, advantages & disadvantages, applications.

D.C. Motors: Concept of starting, speed control, losses and efficiency.

UNIT II:

Three phase Induction Motor: Construction, equivalent circuit, torque equation and torque- slip characteristics, speed control.

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method.

Synchronous Motor: Starting, effect of excitation on line current (V-curves),synchronous condenser.

Servo Motor: Two phase a.c. servo motor & its application.

UNIT III:

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, electrical analog of simple mechanical systems; concept of transfer function & its determination for simple systems.

Control System: Open loop & closed loop controls, servo mechanisms; concept of various types of system.

Signals: Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics**.**

UNIT IV:

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants.

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations; Polar plot, Nyquist stability Criterion and assessment of stability.

UNIT V:

Root Locus Techniques: Concept of root locus, construction of root loci.

Frequency Response Analysis: Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots.

Process control: Introduction to P,PI and PID controllers their characteristics, representation and applications.

BOOKS:-

1. I. J. Nagrath& D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2. B.R. Gupta &VandanaSinghal, "Fundamentals of Electrical Machines", New Age International.
3. K. Ogata, "Modern Control Engineering" Prentice Hall of India.
4. B.C. Kuo, "Automatic Control systems." Wiley India Ltd

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

SEMESTER-IV
BME-401 APPLIED THERMODYNAMICS

L T P
3 1 0

UNIT-I

Thermodynamic relations: Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility.`

Fuels and Combustion: Combustion analysis, Heating Values, Air requirement, Air/Fuel ratio, Standard heat of Reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT-II

Boilers: Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, Air leakage, Condenser performance parameters

UNIT-III

Steam Engines: Rankine and modified Rankine cycles, Working of stream engine, Classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance.

Steam& Gas Nozzles: Flow through nozzle, Variation of velocity, Area and specific volume, Choked flow, Throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow.

Unit-IV

Vapour Power cycles: Carnot vapour power cycle, Effect of pressure & temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Steam Turbines : Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, Impulse reaction Turbines, state point locus, Comparison with steam engines, Losses in steam turbines, Governing of turbines.

Unit-V

Gas Turbine: Gas turbine classification Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines & their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Compressors:

Classification, Reciprocating compressors, Single and Multi stage compressors, IntercoolingVolumetricefficiency.Rotarycompressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor

BOOKS:

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Basic and Applied Thermodynamics by P.K. Nag, Tata McGraw Hill Pub.
3. Thermal Engg. By P.L. Ballaney, Khanna Publisher
4. Theory of Stream Turbine by W.J. Kearton
5. Steam & Gas Turbine by R.Yadav, CPH Allahabad
6. Thermal Engg. By R.K. Rajput, Laxmi Publication
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME- 402 :MANUFACTURING SCIENCE-I

L T P **Credits – 4**
3 1 0

UNIT-I

Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items.

Metal Forming Processes :

Elastic & plastic deformation, yield criteria Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging

UNIT-II

Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. 2Design, lubrication and defects in metal forming processes

UNIT-III

Sheet Metal working:

Presses and their classification, Die & punch assembly and press work methods And processes. Cutting/Punching mechanism, Blanking vs Piercing. Compound vs Progressive die. Flat-face vs Inclined-face punch and Load(capacity) needed.

Analysis of forming process like cup/deep drawing. Bending & spring-back

UNIT-lV

Unconventional Metal forming processes :

Unconventional metal forming processes such as explosive forming, electromagnetic, electro-hydraulic forming.

Powder Metallurgy :

Powder metallurgy manufacturing process. The need, process, advantage andapplications.

Jigs &Fixtures :

Locating & Clamping devices & principles. Jigs and Fixtures and its applications.

Manufacturing of Plastic components :

Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins& Adhesives.

UNIT-V

Casting (Foundry)

Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand. Elements of mould and design considerations, Gating, Riser, Runners, Core. Solidification of casting,. Sand casting, defects & remedies and inspection

Die Casting, Centrifugal casting. Investment casting, CO2 casting and Stir casting etc 8

BOOKS:-

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by P.C. Pandey
3. 3. Production Technology by R.K. Jain
4. Manufacturing Technology by P.N. Rao., TMH
5. Materials and Manufacturing by Paul Degarmo.
6. Manufacturing Science by KM Moeed.
7. Manufacturing Engineering & Technology by Kalpakjian, Pearson Pub.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME -403 : MEASUREMENT AND METROLOGY

L T P **Credits – 4**
3 1 0

UNIT-I

Mechanical Measurements

Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors.

Sensors and Transducers:

Types of sensors, types of transducers and their characteristics.

UNIT-II

Signal transmission and processing:

Devices and systems. Signal Display & Recording Devices

Time related measurements:

Counters, stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of pressure:

Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures.

UNIT-III

Strain measurement:

Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Measurements of force and torque:

Different types of load cells, elastic transducers, pneumatic& hydraulic systems.

Temperature measurement:

Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Vibration:

Seismic instruments, vibration pick ups and decibel meters, vibrometers, accelerometers.

UNIT-IV:

Metrology

Metrology and Inspection :

Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardization.

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator.

Limit gauges classification, Taylor's Principle of Gauge Design.

UNIT-V

Measurement of geometric forms like straightness, flatness, roundness. Tool makers microscope, profile project autocollimator. Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears.

Surface texture: quantitative evaluation of surface roughness and its measurement.

Measurement and Inspection: Dimensional inspection – Tolerance, Limit gauging, comparators, Surface roughness, Feature inspection.

BOOKS:-

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", DhanpatRai& Sons, New Delhi, 1994
6. Sirohi, "Mechanical Measurement" New Age Publishers
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publisher

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME – 451 : MACHINE DRAWING-II LAB

L T P **Credits – 4**
0 0 3

Review of Orthographic Projections (1 drawing sheet)

Orthographic Projection of solids in First angle of projection, missing lines views,interpretation of views **2**

Part and Assembly Drawing (2 drawing sheet)

Assembly drawing of eccentric, lathe tail stock, air valve, screw jack, connecting rod,safety valve etc. **2**

Specification of Materials (1 drawing sheet)

Engineering materials, representation, Code designation of steel, copper, aluminium etc. 1

Limits, Tolerance and Fits (1 drawing sheet)

Limit system, Tolerances, Method of placing limit dimensions, Fits-types **2**

Surface Roughness (1 drawing sheet)

Introduction, nomenclature, machining symbols, indication of surface roughness **1**

Production Drawing (1drawing sheet)

Types, Examples of simple machine elements like helical gear, bevel gear, crank, connecting rod, belt pulley, piston etc. **2**

Computer Aided Drafting (2 drawings)

Introduction, input, output devices, introduction to software like AutoCAD, ProE, basic commands and development of 2D and 3D drawings of simple parts **3**

BOOKS:

1. Machine Drawing - KL Narayana, P Kannaiah, KV Reddy - New Age
2. Machine Drawing - PS Gill - SK Kataria& sons
3. Machine Drawing -N. Siddeshswar, P Kannaiah, VVS Shastry -Tata McGraw Hill
4. Engineering Drawing - RK Dhawan - S. Chand
5. AutoCAD-S. Vishal - DhanpatRai
6. Engineering Graphics - BK Goel& PK Goel - SK Kataria
7. Computer Aided Engineering Graphics - RajashekharPatil - New Age
8. Engineering Drawing - Dhananjay A Jolhe - Tata McGraw Hill
9. Engineering Drawing - CM Agrawal - Tata McGraw Hill
10. Machine Drawing – Ajeet Singh – The McGraw Hill Companies

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-452 :MANUFACTURING SCIENCE-1&MEASUREMENT LAB

L T P **Credits – 1**
0 0 2

Note: minimum **Eight** experiments out of following (or such experiment).

1. Design of pattern for a desired casting (containing hole)
2. Pattern making
3. Making a mould (with core) and casting.
4. Sand testings (at least one such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

MEASUREMENT LAB

Note: minimum 5 experiments out of the following

1. Study & working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Study and understanding of limits, fits & tolerances
9. Study of Pressure & Temperature measuring equipment.
12. Strain gauge measurement.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-453: APPLIED THERMODYNAMICS LAB

L T P **Credits – 1**
0 0 2

Experiments: Minimum five experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study of Velocity compounded steam turbine
4. Study of Pressure compounded steam turbine
5. Study of Impulse & Reaction turbine
6. Study of steam Engine model.
7. Study of Gas Turbine Model
8. Any other suitable experiment on thermodynamics

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BEE – 459: ELECTRICAL MACHINES & AUTOMATIC CONTROL LAB

L T P **Credits – 1**
0 0 2

Experiments: Minimum five experiments out of following;
A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) fieldcontrol.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a singlephase transformer at full load and 0.8 p.f. loading.
6. To obtain 3-phase to 2-phase conversion using Scott connection.
7. To perform load test on a 3-phase induction motor and determine
(a) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control
(b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

Experiments: Minimum five experiments out of following;
B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an a.c. 2-phase servo motor.
4. To study and calibrate temperature using Resistance Temperature Detector(RTD)
5. To study dc servo position control system within P and PI configurations.
6. To study synchro transmitter and receiver system and determine output V/s input Characteristics.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

DEPARTMENTAL ELECTIVE-I

1. BME-011 Computer Graphics
2. BME-012 Unconventional manufacturing process
3. BME-013 Material Technology
4. BME-014 Metal Cutting -Theory and Practice
5. BME-015 Mechanical Behavior of Engineering Materials
6. BME-016 Manufacturing Engineering

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-011 COMPUTER GRAPHICS

L T P **Credits – 4**
3 1 0

UNIT-I

Recent development in Computer Graphics, Scope, Graphic standards and hardware requirements for interfacing. 8

UNIT-II

Raster scan graphics, fundamental requirement and plotting of a point, line drawing, DDA and Bresenham's line algorithm, circle generation using bresenham's algorithm 8

UNIT-III

Two-dimensional transformation, basic and inverse geometric transformations, clipping and clipping algorithms. Elements of 3-D Graphics, Projections, representations of polygons and solid modeling.8

UNIT-IV

Development of curves and surface using Bezier, Hermite and B-spline algorithms. Evaluation of Curves length, surface area and volume of objects of visual realism. Hidden line removals. And shading algorithms8

UNIT-V

Use of application software packages for drafting and Used of plotters, scanners drawing of simple. Assembly drawing using drafting packages. 8

BOOKS:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
5. Engineering Drawing - M.B. Shah, B.C.Rana, 2ndEdition,

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-012 UNCONVENTIONAL MANUFACTURING PROCESS

L T P
3 1 0 **Credits – 4**

UNIT-I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes and its classification. 6

UNIT-II

Un-conventional Machining Processes: Principle and working and applications of unconventional machining processes such as Electric Discharge machining (EDM), Electro- Chemical machining (ECM), Ultrasonic Machining (USM), Abrasive Jet machining (AJM) etc 10

UNIT-III

Un-conventional Welding Processes: Principle and working and applications of unconventional welding processes such as Laser Beam Welding, Electron Beam Welding, Ultrasonic Welding, Plasma Arc Welding processes. 8

UNIT-IV

Explosive Welding: Cladding etc. Under water welding, Metalizing Theory, Process and applications. 6

UNIT-V

Un-conventional forming processes: Principle and working and applications of high energy forming processes such as Explosive forming, Electromagnetic forming. Electro discharge forming Water hammer forming. Explosive Compaction Etc 10

BOOKS:

1. Modern Machining Process, P.C.Pandey
2. Un-conventional machining, V.K. Jain.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-013 METAL CUTTING: THEORY AND PRACTICE

L T P
3 1 0 **Credits – 4**

UNIT-I

Geometry of the cutting process, Single point cutting tool geometry, Nomenclature of multi point tools like drills and milling cutters 10

UNIT -II

Mechanics of chip formation, Merchant's analysis of orthogonal cutting process, Dynamometry, Friction in metal cutting, stress distribution at chip-tool interface, 10

UNIT -III

Chip control, Controlled contact cutting, Thermal aspects in machining, Cutting Fluids, Cutting tool materials, Machinability, Tool wear and Tool life 10

UNIT –IV

Machining economics, Mechanics of Milling and Grinding, Mechanics of Oblique cutting. 10

BOOKS:

1. M. C. Shaw, Metal Cutting Principles, Oxford & IBH Publication, New Delhi, 2008.
2. A. Bhattacharya, Principles of Metal Cutting, New Central Book Agency, Kolkata, 2009.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-014 MECHANICAL BEHAVIOUR OF ENGINEERING MATERIALS

L T P
3 1 0 **Credits – 4**

UNIT I-

STRUCTURE AND PROPERTIES

Structure of metals, Defects in crystals, Deformation, Relationship between structure and properties, Mechanical properties of metals, Strain hardening, Strengthening mechanisms. 8

UNIT II

TENSION AND TORSION

Stress - Strain curve, Measures of yielding , Measures of ductility, Toughness , Flow curve , Effect of temperature on flow properties , Anisotropy, mechanical properties in torsion , Method of measuring shear stress, Types of torsion failures, Torsion test Vs Tension test , Hot torsion test. 8

UNIT III

FATIGUE

Fatigue phenomena, Theories of fatigue failure, Evaluation of fatigue resistance, Methods of presenting fatigue data, Fatigue crake propagation, Parameters influencing fatigue , Cyclic stress strain behavior, Design against fatigue, Low cycle fatigue. 8

UNIT IV

CREEP

Description of creep, Creep curve, Stress-rupture test, Creep mechanisms - Dislocation glide, Diffusion flow, Dislocation and Diffusion, Creep in two phase alloys, Deformation Mechanism Maps, Materials aspects creep design, Estimates of creep behavior, Presentation of Engineering creep data Super plasticity. 8

UNIT V

FRACTURE MECHANICS

Types of fracture, Theoretical strength of a solid, Griffith's Theory, Irwin - Orowan Theory crack propagation Modes , Dislocation Theories of Brittle fracture , Ductile fracture, Analysis of crack propagation , Stress intensity factor , Crack opening displacement, J integrals - Fracture toughness measurement methods

BOOKS:

1. George E. Dieter, "Mechanical Metallurgy", McGraw Hill,1988.
2. Thomas H. Courtney, "Mechanical Behaviour of Materials", McGraw Hill 2000
3. Joseph Marin, "Mechanical Behaviour of Engineering Materials", Prentice-Hall of India Pvt. Ltd., 1966
4. Kennedy, A.J., "Process of Creep and fatigue of Metals", Industrial Press, 1958

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-015 MANUFACTURING ENGINEERING

L T P
3 1 0 **Credits – 4**

UNIT –I

Comparative study of various manufacturing process, Criteria in selection of manufacturing process, Technical and review, Cost of production, 10

UNIT -II

Accounting methods, Economic considerations, Make-buy decision, Capacity planning & review, Technological action, Sequence of operations selection of process parameters for various process of manufacturing machine assessors and attachments & indexing methods. 10

UNIT-III

Jigs and Fixtures in manufacturing principles of location & clamping of principle, Types of locators and clamps, Design of jigs and fixtures. 10

UNIT -IV

Press tools, Dies their classification materials and manufacture of casting and forging dies, Die inserts, Design of punching blanking, Piercing, Drawing & sheet metal dies. Die repair & maintenance. 7

Validation of processes, Authorization to start production 3

BOOKS :

1. Colvin, F. H. and Haas, L. L., Jigs and Fixtures – A Reference Book, McGraw Hill (1938).
2. Joshi, P. H., Jigs and Fixtures, McGraw Hill (1988).
3. Basu, Mukherjee, Mishra, Fundamentals of Tool Engg. Design, Oxford & IBH Publishing (1996).
4. Pandey and Shan, Modern Machining Processes, McGraw Hill (1980).

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

SEMESTER-V

BME-501 : MACHINE DESIGN-I

L T P **Credits – 4**
3 1 0

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads

Design against Static Load

Modes of failure, Factor of safety, Principal Stresses, Stresses due to bending and torsion, Theory of failure

UNIT II

Design against Fluctuating Loads

Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria

Riveted Joints-Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings-Design of rigid and flexible couplings

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading

UNIT V

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

Note: Design data book is allowed in the examination

BOOKS :

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Members-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Machine design-M.F. Spott, Prentice Hall India
4. Machine Design-Maleev and Hartman, CBS
5. Machine design -Black & Adams, McGraw Hill
6. Machine Design-Sharma and Agrawal, S.K. Katara& Sons
7. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME 502 : THEORY OF MACHINES – I

L T P **Credits – 4**
3 1 0

UNIT I

Introduction

Links-types, Kinematics pairs-classification, Constraints-types, Degrees of freedom of planar mechanism, Grubler's equation, linkage mechanisms, inversions of four bar chain, slider crank chain and double slider crank chain

Velocity in Mechanisms

Velocity of point in mechanism, relative velocity method, Velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, Rubbing velocity at a pin joint, Instantaneous center method, Types & location of instantaneous centers, Kennedy's theorem, Velocities in four bar mechanism & slider crank mechanism

UNIT II

Acceleration in Mechanisms

Acceleration of a point on a link, Acceleration diagram, Coriolis component of acceleration, Crank and slotted lever mechanism, Klein's construction for Slider Crank mechanism and Four Bar mechanism, Analytical method for slider crank mechanism

Mechanisms with Lower Pairs

Pantograph, Exact straight line motion mechanisms-Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms–Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hooke's joint, Davis and Ackermann steering gear mechanisms.

UNIT III

FRICTION

Laws of friction, Friction on inclined plane, Efficiency on inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear, Belt
and pulley drive, Length of open and cross belt drive, Ratio of driving tensions for flat belt drive, centrifugal tension, condition for maximum power transmission, V belt drive

Brakes & Dynamometers

Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers

UNIT IV

CAMS

Cams and Followers - Classification & terminology, Cam profile by graphical methods with knife edge and radial roller follower for uniform velocity, simple harmonic and parabolic motion of followers, Analytical methods of cam design – tangent cam with roller follower and circular cams with flat faced follower

UNIT V

Gears & Gear Trains

Classification & terminology, law of gearing, tooth forms & comparisons, Systems of gear teeth, Length of path of contact, contact ratio, interference & under cutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, Sun and planet gear.

Robotic Arm: Basic introduction to Kinematics of Robotic Arm.

BOOKS:

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh&Mallik
4. Theory of Machines and Mechanisms- Rao&Dukkipati
5. Theory of Machines-S.S. Rattan
6. Kinematics of Machines-Dr. Sadhu singh
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi& Gupta
9. Theory of Machines – R. K. Bansal
10. Theory of Machines – V. P. Singh
11. Theory of Machines – Malhotra& Gupta

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-503 : MANUFACTURING SCIENCE-II

L T P **Credits – 4**
3 1 0

UNIT-I

Metal Cutting and Machine Tools

Metal Cutting-

Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Mach inability. Dynamometer. Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

UNIT-II

Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, Semi/Automatic, Tool layout.

(ii) Shaper, slotter, planer: Construction, operations & drives.

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

UNIT-III

Grinding & super finishing

(v) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wears. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Center less grinding.

(vi) Super finishing: Honing, lapping, and polishing.

UNIT-IV

Metal Joining (Welding)

Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance **welding** - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding. Soldering & Brazing.

Thermodynamic and Metallurgical aspects in welding and weld,. Shrinkage/residual stress in welds. Distortions & Defects in welds and remedies. Weld decay in HAZ.

UNIT-V

Tool Design:

Jigs & Fixtures: Locating & Clamping devices & principles. Jigs and Fixtures and its applications

BOOKS:

1. Manufacturing science by Ghosh and Mallik
2. Fundamentals of Metal Cutting and Machine tools by Boothroyd
3. Production Technology by R.K. Jain
4. Production Engineering Science by P.C. Pandey
5. Modern Machining Processes by P.C. Pandey& H.S. Shan
6. Manufacturing science by Degarmo
7. Fundamentals of metal cutting & machine tools - Juneja&Shekhon
8. Process & materials of manufacturing - Lindburg.
9. Advanced Machining Process – V K Jain

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-504 HEAT & MASS TRANSFER

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction to Heat Transfer:

Concepts of the mechanisms of heat flows; Conduction, convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

Conduction:

One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial and boundary conditions.

Steady State one-dimensional Heat conduction:

Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation.

UNIT-II

Numerical methods in heat conduction:

Finite difference formulation of differential equation, One-dimensional steady-state heat conduction, Solution methods for systems of algebraic equations, Two-dimensional heat conduction, Transient heat conduction

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; unsteady state heat conduction in one dimension only, Heisler charts.

UNIT-III

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer

Natural Convection:

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere ; Combined free and forced convection.

UNIT-IV

Thermal Radiation:

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

UNIT-V

Heat Exchanger:

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method,Compact heat exchangers.

Condensation And Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Drop wise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convective boiling

Introduction To Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

BOOKS:

1. Heat Transfer By J.P. Holman, McGraw-Hill International edition.
3. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill International edition.
4. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
5. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt).Ltd.
6. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers
7. Heat Transfer, by Y.V.C. Rao, University Press.
8. Heat Transfer, by R. Yadav, Central Publishing House, Allahabad.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

DEPARTMENTAL ELECTIVE-II

1. BME-051 Plant Layout & design
2. BME-052 Optimization techniques
3. BME-053 Advanced Strength of Materials
4. BME-054 Advance Material Science
5. BME-055 Alternative Sources of Energy

DEPARTMENTAL ELECTIVE-II

BME-051 PLANT LAYOUT AND DESIGN

L T P
3 1 0 **Credits – 4**

UNIT-I

Introduction : Meaning of plant layout, design-importance and scope. Planning for plant design. `

Plant Location : Levels of location problems, factors influencing location of a plant, theories of plant location.

UNIT-II

Industrial Buildings : Relationship between building and the layout, building design and construction, ground and exterior facility. Building fundamentals.

Plant Layout and Planning : Purpose and classes of plant layout problems. Classical types of layout, objectives of a good layout, data collection, material and processes, equipment requirement product flow, determining and diagramming the flow, space requirements, building data.5

UNIT-III

Developing and Presenting Layout : Plot plans, detailed layouts, and visualizing layout. Evaluation of layout, cost comparison, pilot plant, productivity, space sequence demand, factor analysis, ranking pros. And cons. Optimising evaluation and line balancing. Checking, presenting and installing layout.

UNIT-IV

Materials Handling : Principles, Classification of Material handling systems, product flow, and material handling equipments. Characteristics of different types of handling - conveyor's , cranes, trolleys and forklifts.

UNIT-V

Employee Facilities : Services, working conditions, influence of organisation and incentives.

Plant Services and Industrial Layout : Electrical, water, sewage, compressed air and gases, steam and heating, and communication facilities. Hazards and prevention - prevention against noise, air and water pollution. Environment management plan.

BOOKS :

1. James Moore, “Plant Layout and Design”, Macmillan Co.
2. Apple, “Plant Layout and Materials Handling”
3. Richard Muther “Practical Plant Layout”, McGraw Hill
4. Richard Muther “Plant Engineering Handbook” McGraw Hill
5. Shubin and Madeheim, “Plant Layout” Prentice

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-052 OPTIMIZATION TECHNIQUES

L T P
3 1 0 **Credits – 4**

UNIT I

Scope of Operations Research: Introduction to linear and non-linear programming formulation of different models.

Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex and revised simplex methods, Exceptional cases in LP, Duality theory, Dual Simple method, Sensitivity analysis.

UNIT II

Network Analysis: Transportation problem (with transshipment), Assignment problem, Traveling-salesman problem, Shortest route problem, Minimal spanning tree, Maximum flow problem.

UNIT III

Integer Programming: Branch and bound algorithm, Traveling salesman problem.3

Dynamic programming: Forward recursions, General problem, Reliability problem, Capital budgeting problem, Cargo-loading problem.

UNIT IV

CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation.

UNIT V

Non-Linear Programming: Characteristics, Concepts of convexity, maxima and minima of functions of n-variables using Lagrange multipliers and Kuhn-Tuker conditions, One dimensional search methods, Fibonacci, golden section method and gradient methods for unconstrained problems.

BOOKS:

1. Taha, H.A., Operations Research: An Introduction, Prentice Hall of India (2007) 8thed.
2. Kasana, H.S., Introductory Operation Research: Theory and Applications, Springer Verlag (2005).
3. Rardin, Ronald L., Optimization in Operations research, Pearson Education (2005).
4. Ravindran A, Phllips D.T. and Solberg J.J. Operation Research: Principles and Practice,John Wiley (2007).

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-053 ADVANCED STRENGTH OF MATERIALS

Credits – 4

L T P
3 1 0

UNIT I-

INTRODUCTION

Stress-strain relations and general equations of elasticity in Cartesian, polar and spherical co-ordinates equations of equilibrium - compatibility - boundary conditions - representation of 3-dimentinal stress of tensor - generalized Hooke's law - St.Venant's principle - plane strain - plane stress - Airy's stress function - SHEAR CENTRE - Location of shear center for various sections - shear flow.

UNIT II-

UN-SYMMETRICAL BENDING

Stress and deflections in beams subjected to unsymmetrical loading - kern of a section - CURVED FLEXURAL MEMBERS - circumferential and radial stresses - deflections - curved beam with restrained ends - closed ring subjected to concentrated loading and uniform load - chain links and crane hooks

UNIT III-

STRESS IN FLAT

Stresses in circular and rectangular plates due to various types of loading and end conditions - buckling of plates.

UNIT IV-

TORSION OF NON-CIRCULAR SECTIONS

Torsion of rectangular cross section - St. Venant's theory - elastic membrane analogy - Prandtl's stress function - torsional stress in hollow thin-walled tubes - STREES DUE TO ROTATION - Radial and tangential stresses insolid disc and ring of uniform thickness and varying thickness – allowable speeds

UNIT V-
THEORY OF CONTACT STRESSES

Methods of computing contact stresses - deflection of bodies in points and line contact - applications.

BOOKS:

1. Seely and Smith, "*Advanced mechanics of materials*", John Wiley International Edn, 1952.
2. Rimoahwnko, "*Strength of Materials*", Van Nostrand., 1970
3. Den Hartong, "*Advanced Strength of Materials*", McGraw Hill Book Co., New York 1952.
4. Timoshenko and Goodier, "*Theory of Elasticity*", McGraw Hill., 1994
5. Wang, "*Applied Elasticity*", McGraw Hill., 1979
6. Case, "*Strength of Materials*", Edward Arnold, London 1957.
7. Robert D. Cook, Warren C. Young, "*Advanced Mechanics of Materials*", Macmillian Pub. Co. 1952
8. Durelli Phillips and Tso, "*Analysis of stress and strain*", 1967

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-054 ADVANCE MATERIALS TECHNOLOGY

L T P
3 1 0 **Credits – 4**

UNIT I

ELASTIC AND PLASTIC BEHAVIOUR: Elasticity in metals and polymers - Mechanism of plastic deformation - Role of yield stress, shear strength of perfect and real crystals - Strengthening mechanisms, work hardening - Solid solutioning, grain boundary strengthening, particle, fibre and dispersion strengthening - Effect of temperature, strain and strain rate on plastic behavior - Super plasticity - Deformation of non-crystalline material.

UNIT II

FRACTURE BEHAVIOUR: Griffith's theory, stress intensity factor and fracture toughness - Ductile to brittle transition - High temperature fracture, creep - Deformation mechanism maps - Fatigue, Low and high cycle fatigue test crack initiation and propagation mechanisms - Fracture of Non-metallic materials Failure analysis, Sources of failure, procedure of failure analysis.

UINT III

PHASE DIAGRAMS: Introduction - Solid solutions - Intermediate phases - Phase rules - Free energy in intermediate phases - Phase diagrams - Phase changes in alloys - Determination of phase diagrams - Ternary phase diagrams - Cooling curves - Equilibrium diagrams of Iron and Iron -Carbide diagram - Definition of structures.

UNIT IV

MODERN METALLIC MATERIALS: Dual phase alloys - Micro alloyed steels, High Strength Low alloy (HSLA) steel - Transformation induced plasticity (TRIP) steel, Maraging steel - Intermettalics, Ni and Ti aluminides - Smart materials - Shape memory alloys - Metallic glasses - Quasi crystals and nano crystalline materials. `

UNIT V

NON METALLIC MATERIALS: Polymeric materials - Formation of polymer structure - Production techniques of fibre, foams, adhesives and coating - structure and properties and applications of engineering polymers Advanced structure ceramics, WC, TIC, Al_2O_3, O_2, SiC, SI_2N_4, CBN and Diamond - Properties, processing and applications. Composite materials: Types, production techniques, structure, properties and applications..

BOOKS:

1. Dieter, G. E., *Mechanical Metallurgy*, McGraw Hill, Singapore, 2001
2. Thomas H. Courtney, *Mechanical Behaviour of Engineering materials*, McGraw Hill, Singapore, 2000
3. Flinn, R. A. and Trojan, P. K., *Engineering Materials and their applications*, Jaico, Bombay, 1989
4. Budinski K.G. and Budinski, M. K., *Engineering Materials Properties and selection*, Prentice Hall of India Private Limited, New Delhi, 2004
5. ASM Metals Hand book, *Failure analysis and prevention*, Vol: 10, 14th edition, New York, 2002

BME-055 ALTERNATIVE SOURCES OF ENERGY

L T P
3 1 0 **Credits – 4**

UNIT I - BIOMASS

Biomass, sources of biomass, thermo-chemical and bio-chemical conversion of biomass - pyrolysis, gasification, combustion and fermentation. Gasifiers – up draft, downdraft and fluidized bed gasifiers. Digesters - Fixed and floating digester biogas plants, economics of biomass power generation.

UNIT II - SOLAR ENERGY

Solar radiation and its measurements, types of solar thermal collectors - Flat and concentrating collectors, solar thermal applications - Water heaters, dryers, stills, refrigeration, air-conditioning, solar pond, central receiver power generation, thermal energy storage systems, solar photovoltaic components and solar photovoltaic power plants.

UNIT III - WIND ENERGY

Basic principle of wind energy conversion system, wind data and energy estimation, Site selection, components of wind energy conversion systems, design consideration of horizontal axis wind mill, aerofoil theory, analysis of aerodynamic forces acting on the blade, performance of wind machines. Introduction to solar - Wind hybrid energy systems.

UNIT IV - OCEAN, HYDRO AND GEOTHREMAL ENERGY

Wave and tidal energy, ocean thermal energy conversion - Principle, types, power plants - Small, mini and micro hydro power plants. Exploration of geothermal energy, geothermal power plants, challenges - Availability, geographical distribution, scope and economics.

UNIT V - DIRECT ENERGY CONVERSION SYSTEMS

Basic principle of thermo-electric and thermo-ionic power generations, fuel cell principle, types, conversion efficiency, applications. Magneto hydrodynamic power generation - Principle, open cycle and closed cycles, design considerations and recent developments. Hydrogen energy - Production, storage, transportation and **applications.**

BOOKS:

1. Rai.G.D, "Non-Conventional Energy Sources", Khanna Publishers, 4th edition, New Delhi, 2009.

2. Domkundwar.V.M, Domkundwar.A.V, "Solar energy and Non-conventional sources of energy", Dhanpat rai & Co. (P) Ltd, 1st edition, New Delhi, 2010.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-551 : MACHINE DESIGN-I LAB

L T P **Credits – 1**
0 0 3

Note: Eight experiments out of the following are to be performed. Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-552 : I.C. ENGINES AND AUTOMOBILE LAB

L T P **Credits – 1**
0 0 2

Experiments: Minimum **Ten** experiments out of following in depth and details**.**

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.
8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

BME-553 : MANUFACTURING SCIENCE &METROLOGYLAB

L T P **Credits – 1**
0 0 2

Note: minimum Seven experiments out of the following (or such experiment along-with study of the machines/processes)

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment
15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints, HAZ.

METROLOGY LAB

Experiments: Minimum **3**out of following (or such experiments)

1. Speed measurement using stroboscope.
2. Flow measurement experiment
3. Vibration/work measuring experiment.
4. Experiment on Dynamometers.

BME-554 : HEAT & MASS TRANSFER – LAB

L T P **Credits – 1**
0 0 2

Note: Minimum Ten experiment of the following

1. Conduction - Composite wall experiment
2. Conduction - Composite cylinder experiment
3. Convection - Pool Boiling experiment
4. Convection - Experiment on heat transfer from tube-natural convection.
5. Convection - Heat Pipe experiment.
6. Convection - Heat transfer through fin-natural convection .
7. Convection - Heat transfer through tube/fin-forced convection.
8. Any experiment on Stefan's Law, on radiation determination of emissivity, etc.
9. Any experiment on solar collector, etc.
10. Heat exchanger - Parallel flow experiment
11. Heat exchanger - Counter flow experiment
12. Any other suitable experiment on critical insulation thickness.
13. Conduction - Determination of thermal conductivity of fluids.
14. Conduction - Thermal Contact Resistance Effect.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

SEMESTER-VI

BHU-601: ENGINEERING ECONOMIC AND INDUSTRIAL MANAGEMENT

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology Managerial Economics and its scope in engineering perspective.

Basic Concepts Demand Analysis, Law of Demand, Determinates of Demand, Elasticity of Demand-Price, and Income and cross Elasticity .Uses of concept of elasticity of demand in managerial decision.

UNIT-II

Demand forecasting**:** Meaning, significance and methods of demand forecasting, production function, Laws of returns to scale & Law of Diminishing returns scale. An overview of Short and Long run cost curves – fixed cost, variable cost, average cost, marginal cost, Opportunity cost.

UNIT-III

Market Structure: Perfect Competition, Imperfect competition, features of price determination and various market conditions. National Income, Inflation and Business Cycles Concept of N.I. and Measurement. Meaning of Inflation, Type causes & prevention methods, Phases of business cycle.

UNIT-IV

Introduction: Concept, Development, application and scope of Industrial Management. Management Function: Principles Production requirements.

Productivity: Definition, measurement, productivity index, types of production system, Industrial of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Ownership.

UNIT-V

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain

Management.

Quality control: Meaning, process control, SQC control charts, single, double and Sequential sampling, Introduction to TQM.

Environmental Issues: Environmental Pollution – various management techniques to

Control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution.

BOOKS :

1. Koutsoyiannis A: Modern Microeconomics, ELBS.
2. Managerial Economics for Engineering: Prof. D.N. Kakkar
3. Managerial Economics: D.N. Dwivedi
4. Managerial Economics: Maheshwari.
5. Khanna O.P.: Industrial Engineering
6. T.R. Banga: Industrial Engineering and Management
7. Sharma B.R.: Environmental and Pollution Awareness.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-601 : THEORY OF MACHINES-II

L T P
3 1 0 **Credits – 4**

UNIT I

Static & Dynamic Force Analysis

Static equilibrium of two/three force members, Static equilibrium of member with two forces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalent offset inertia force, Dynamic force analysis of four link mechanism and slider crank mechanism, Engine force analysis-Piston and crank effort 8

UNIT II

Turning Moment & Flywheel

Turning moment on crankshaft, Turning moment diagrams-single cylinder double acting steam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation of energy, Flywheel

UNIT III

Balancing of Machines

Static and dynamic balancing, Balancing of several masses in the same plane and different planes, Balancing of reciprocating masses, Balancing of primary force in reciprocating engine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple, hammer blow

UNIT IV

Governors

Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter &Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, Stability, Hunting, Isochronisms, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors

UNIT V

Gyroscopic Motion

Introduction to gyroscope, processional motion and definitions. Effect of gyroscope couple in aero plane, effect of gyroscopic couple on naval ship during steering, pitching and rolling, Stability of Four wheel and two-wheel vehicle during turning.

Mechanical Vibrations

Types of vibrations, Degrees of freedom, Single degree free & damped vibrations, Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft

BOOKS :

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh&Mallik
4. Theory of Machines and Mechanisms- Rao&Dukkipati
5. Theory of Machines - S.S. Rattan
6. Theory of Machines – R.K. Bansal

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-602 : MACHINE DESIGN-II

L T P **Credits – 4**
3 1 0

UNIT I

Spur Gears

Tooth forms, System of gear teeth, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

UNIT -II

Helical Gears

Terminology, Proportions for helical gears, Beam strength and wear strength of helical gears, herringbone gears, crossed helical gears, Design of helical gears.

UNIT -III

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing .

UNIT IV

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

UNIT V

IC ENGINE PARTS

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin; Design of connecting rod; Design of centre crankshaft

BOOKS:

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Members-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Machine design-M.F. Spott, Prentice Hall India
4. Machine Design-Maleev and Hartman, CBS
5. Machine design -Black & Adams, McGraw Hill
6. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons
7. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME 604 : REFRIGERATION & AIR CONDITIONING

L T P **Credits – 4**
3 1 0

UNIT-I

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

UNIT-II

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system, Cryogenics refrigeration.

UNIT-III

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium-Bromide water vapour absorption system, Comparison.

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.

UNIT-IV

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).

UNIT-V

Refrigeration Equipment & Application:

Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Air washers, Cooling towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

BOOKS:

1. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
2. Refrigeration and Air conditioning by C.P Arora.
3. RajputR.K, "*Thermal Engineering"*, Laxmi Publications, 8th Edition, New Delhi, 2010.

DEPARTMENTAL ELECTIVE-III

1. BME-061 Fluid Machinery
2 BME-062 Unconventional Manufacturing Processes
3 BME-063 Design of Hydraulic and Pneumatic Systems
4 BME-064Advanced Manufacturing Processes
5 BME-065 . Advanced Processing of Materials

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-061: FLUID MACHINERY

L T P
3 1 0

Credits – 4

UNIT-I

Introduction:

Classification of Fluid Machines & Devices, Application of momentum and momentum equation to flow through hydraulic machinery, Euler's fundamental equation.

Impact of jet:

Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve),Effect of inclination of jet with the surface.

Hydraulic Turbines:

Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel.

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Model testing, Cavitation & separation and their control, Performance characteristics.

UNIT-IV

Positive Displacement Pumps:

Reciprocating pump theory, Slip and coefficient of discharges, Indicator diagram, Effect and acceleration, Work saved by fitting air vessels, Comparison of centrifugal and reciprocating pumps, Positive rotary pumps, Gear and Vane pumps, Performance characteristics.

UNIT-V

Other Machines:

Hydraulic accumulator, Special duty pumps, Intensifier, Hydraulic press, Lift and cranes, Theory of hydraulic coupling and torque converters, Performance characteristics.

Water Lifting Devices :

Hydraulic ram, Jet pumps, Air lift pump

BOOKS:

1. Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
3. Applied Hydraulics by Addison
4. Hydraulic Machines by R K Rajput, S.Chand& co Ltd.
5. Hydraulic Machines by D S Kumar

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-062 : UNCONVENTIONAL MANUFACTURING PROCESSES

L T P
3 1 0 **Credits – 4**

UNIT-I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes & its classification and its future possibilities.

UNIT-II

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electrochemical machining, ultrasonic machining, Abrasive jet machining etc.

UNIT-III

Unconventional Machining Process (continued) : Principle and working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining etc. (these can also be used for welding).

UNIT-IV

Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma are welding/cutting etc.

UNIT-V

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc.

Electronic-device Manufacturing: Brief description of Diffusion and Photo- Lithography process for electronic-device manufacturing.

BOOKS:

1. Modern Machining Processes – P.C. Pandey
2. Unconventional Machining – V.K. Jain

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-063 DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS

L T P
3 1 0 **Credits – 4**

UNIT I

PUMPS AND ACTUATORS

Pumps: Introduction to fluid power controls, Properties of Hydraulic fluid, Pumps - Gear Pumps, Vane Pumps - Radial & Axial Pumps - Piston pumps, Capacity rating, Selection of Pumps, Pump characteristics.

Motors: Motors -fixed &Variable displacement motors, Hydraulic Motor Performance, Electro Hydraulic Stepping motors.

Actuators (Cylinder): Different types of cylinders, Types of mounting, Computations of force.

Power Pack: Reservoir & its capacity, Power pack designs.

UNIT II-

VALVES AND BOOSTERS

Valves: Pressure control valves, direction control valves, flow control valves, servo valves, and pressure compensated flow control valves, flow divider valves, valve actuation techniques.

Pressure Boosters: Pressure applied in one direction, Pressure applied in both directions, Pressure applied & intensified in both directions, Advantages of pressure boosters.

UNIT III

HYDRAULIC CIRCUIT

Regenerative circuit, Circuit for speed control - meter in - meter out Bleed of, Different types of Circuit employed in Hydraulic press, Pumps, Pump unloading Circuit, Sequencing Circuit, Automatic reciprocation, Cylinder Synchronizing Circuit, Locked cylinder using pilot check valves, Hydraulic Motor Breaking System, Hydrostatic Transmission, Safety & Emergency Mandrels, Low cost Automation.

Accumulators: Accumulator types& its circuits 2

UNIT IV

HYDRAULIC CIRCUIT DESIGN

Electrical controls for fluid power Circuits, Design of hydraulic & Pneumatic circuit for specific application - Cascading - Ladder diagram (Electrical controls), Microprocessor controlled design of Circuits, Circuits for Copying Lathe, Broaching Machines & Milling Machines.

Fluid Logic Controls Systems: Principles of Fluid Logic Control, Basic Fluidic Devices Fluidic Sensors, Fluidic Logic Circuits.

UNIT V

PNEUMATIC SYSTEMS

Pneumatic, Fundamentals, Merits & Demerits Over Hydraulic systems, Pneumatic Conditioners - Filters - Regulators - Lubricators - Mufflers – Air dryers, Types of Air Compressors, Pneumatic Actuators, Design of Pneumatic Circuits.

Fluid Circuit Failures: Common causes of failure dirt - Heat - Misapplication - Improper fluids - Faulty Installation - Improperly designed Circuits.

Maintenance: Maintenance of Hydraulic &Pneumatic Circuits.

BOOKS:

1. Antony Espossito , " *Fluid Power With Applications* ", Prentice Hall , 1980
2. Harry L. Stewart " *Pneumatics& Hydraulics* ", D.B.Taraporevala sons & co Pvt Ltd, Bombay
3. Andrew Parr "*Hydraulics and Pneumatics*", Jaico Publishing House, 1999.
4. John Pippenger, Tyler Hicks, "*Industrial Hydraulics*", McGraw Hill International Editions

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-064 ADVANCED MANUFACTURING PROCESSES

L T P
3 1 0 **Credits – 4**

UNIT I

Advanced Machining Processes:

Classification of Advanced Machining Process. Mechanical energy based processes: AJM, WJM, AWJM and USM Working

Principles, Equipment, Process parameters, Applications. Electrical energy based processes: EDM & WEDM - Working Principles, Equipment,

UNIT II

Process parameters, Applications. chemical and electro-chemical energy based processes: CHM and ECM Working Principles, Equipment,

Process parameters, Applications. thermal energy based processes: LBM, PAM, EBM- Working Principles, Equipment, Process parameters, Applications.

UNIT III

Advanced Casting Processes: Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting.

UNIT IV

Advanced Welding Processes: Electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW).

UNIT V

Advanced Metal Forming Processes: Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming

BOOKS:

1."Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York.

2.“Advanced Machining Processes” Vijay.K. Jain, Allied Publishers Pvt. Ltd., New Delhi.

3.“Manufacturing Engineering & Technology”, Kalpakjian. S., Pearson Education Asia.

4."Materials and Processes in Manufacturing", E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi

5."Manufacturing Science" A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd.
New Delhi.

6.“Modern Machining Processes” Pandey P.C. and Shan H.S. Tata McGraw-Hill, New Delhi.

7.“Material and Processes in manufacturing” Paul De Garmo, J.T.Black, and Ronald.A.Kohser, Prentice Hall of India Pvt. Ltd., New Delhi. Production Technology by TMH.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-651 : FLUID MACHINERY LAB

L T P **Credits – 1**
0 0 2

Note:Minimum 8 experiments from following

1. Impact of Jet experiment.
2. Turbine experiment on Pelton wheel.
3. Turbine experiment on Francis turbine.
4. Turbine experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through detailed visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-652 : MACHINE DESIGN-II Lab

L T P **Credits – 1**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme **(*3practical turns*)**

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject**(*5practical turns*)**

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-653 : THEORY OF MACHINES LAB

L T P
0 0 3

Credits – 1

Note: Eight experiments out of the following are to be conducted

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-654 : REFRIGERATION & AIR CONDITIONING LAB

L T P **Credits – 1**
0 0 2

Note: Minimum Eight experiments out of following;

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. To study different types of expansion devices used in refrigeration system.
3. To study different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Study of window air conditioner.
7. Study & determination of volumetric efficiency of compressor.
8. Experiment on Ice-plant.
9. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , P-V diagram and effect of intercooling.
10. Study of Hermetically sealed compressor.
11. Experiment on Desert coolers.

SEMESTER-VII

BME-701 : COMPUTER AIDED DESIGN (CAD)

L T P **Credits – 4**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications

Computer Graphics-I

CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters.

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm

Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation.

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation andits properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves.

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Super quadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models ,Application commands for AutoCAD &Pro-E software

UNIT-V

Numerical Methods: Introduction, Errors in numbers, Binary representation of numbers, Root finding-Bisection method, Newton Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method

Finite Element Method: Introduction, Principles of Finite elements modeling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2Dspace (truss element)

BOOKS:

1. Computer Graphics Hearn & Baker Prentice Hall
2. CAD/CAM Theory and Practice, Ibrahim Zeid&R Sivasubramaniam, McGraw Hill
3. CAD/CAM ,HP Groover& EW Zimmers, Jr. Prentice Hall India Ltd

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME -702: AUTOMOBILE ENGINEERING

L T P **Credits – 4**
3 1 0

UNIT-I

Power Unit and Gear Box:

Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

UNIT-II

Transmission System:

Requirements. Clutches. Torque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc..Steering geometry.Ackerman mechanism, Understeer and Oversteer.

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes.Vacuum and air brakes.

Suspension System:

Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; leaf springs, various suspension systems.

UNIT-IV

Electrical System:

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI

UNIT-V

Automobile Air Conditioning: Requirements, Cooling & heating systems.

Cooling & Lubrication System: Different type of cooling system and lubrication system

Maintenance system: Preventive maintenance, break down maintenance and over hauling.

BOOKS:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-703 : POWER PLANT ENGINEERING

L T P **Credits – 4**
3 1 0

UNIT I

FUEL COMBUSTION EQUIPMENTS

Types of combustion, stokers, fuel and ash handling equipments. Draft - forced, induced and balanced drafts. Selection of fans. Heat recovery equipments economisers, air preheaters and reheaters, different types of superheaters and desuperheaters. Emission control, flue gas cleaning, particulate and gaseous emission control methods.

UNIT II

THERMAL POWER PLANT SYSTEMS

Steam generators - forced circulation, high-pressure boilers and super critical boilers, fluidized bed boiler, boiler accessories and mountings. Boiler testing. Condensers**:** Different types, design factors, air removal, performance calculation. Cooling towers - natural and mechanical draft types.

UNIT III –

NUCLEAR, DIESEL AND GAS TURBINE POWER PLANTS

General nuclear fuels used in reactors, elements of nuclear reactor, moderator, control rods, coolants, description of different types of reactors. Radiation hazards, radioactive waste disposal. Diesel power plant - Classifications, components, selection of engine type. Gas turbine plant - closed and open cycles. Combined power cycles.

UNIT IV

RENEWABLE ENERGY SOURCES Solar energy - measurement, methods of utilization, flat plate and concentrating collectors, water heater, air driers, photovoltaic cell. Wind energy - Horizontal and vertical axis wind turbines. Geothermal plants, tidal power plant, biomass and biogas plants, OTEC plants.

UNIT V

POWER PLANT ECONOMICS Plant load factor and utilization factor, cost economics - Tariff rates, demand changes, load distributions. Energy conservation and audit. Maintenance aspects of power plants.

BOOKS:

1. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
2. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
3. “Power Plant Engineering” F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

DEPARTMENTAL ELECTIVE-IV

1. BME- 071 Computer Aided Manufacturing
2. BME-072 Finite Element Method
3. BME-073 Advanced Dynamics of Machines
4. BME -074.Management Information System
5. BME -075Advanced Materials Technology
6. BME -076 Rapid Prototyping & Tooling
7. BME -077Metal Forming Technology

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-071 : COMPUTER AIDED MANUFACTURING (CAM)

Credits – 4

L T P
3 1 0

UNIT-I

Automation

Introduction to CAM; Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages &disadvantages of automation, Historical development and future trends.

Features of NC Machines-

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity.

UNIT-II

NC Part Programming-

(a) Manual (word address format) programming. Examples Drilling, Turning and Milling; Canned cycles, Subroutine, and Macro.

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement.

UNIT-III

System Devices

Introduction to DC motors, stepping motors, feed back devices such as encoder, counting devices, digital to analog converter and vice versa.

Interpolators

Digital differential Integrator-Principle of operation, exponential decelarion; DDA Hardware Interpolator-Linear, Circular; DDA Software Interpolator.

Control of NC Systems

Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control.

UNIT-IV

Computer Integrated Manufacturing system

Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection.

UNIT-V

Robotics

Types and generations of Robots, Structure and operation of Robot, Robot applications. Economics, Robot programming methods.VAL and AML with examples.

Intelligent Manufacturing. Introduction to Artificial Intelligence for Intelligent manufacturing.

BOOKS -

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P.Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. Computer control of Manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-072 : FINITE ELEMENT METHOD

L T P
3 1 0

Credits – 4

A

UNIT-I

Introduction

Introduction to finite difference method and finite elements method, Advantages and limitations, Mathematical formulation of FEM, Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayliegh Ritz method, Weighted Residual methods, Point Collocation method, Galerkin method - Steps involved in FEM.

UNIT-II

Types of Elements Used

Interpolation Polynomials - Linear elements Shape function – Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.

UNIT-III

Finite Element Formulation of Field Problems

1-D and 2-D heat transfer, fluid flow (incompressible and non viscous fluid) in ducts, Simple electrical and magnetic field problems. Simple Numerical examples

UNIT-IV

Finite Element Formulation of Solid Mechanics Problems

1-D problem of shaft; Truss element analysis of pinned truss, Plane stress/strain problems, Axi-symmetric problems, thin plate problems; Vibration of shafts & beams.

UNIT-V

Numerical Methods in FEM

Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature -Solution of finite element equations – Gauss Elimination Method, Chole sky decomposition.

BOOKS:

1. The Finite Element Method O.C. Zienkiewicz and R.L. Taylor McGraw Hill
2. An Introduction to Finite Element Method J. N. Reddy McGraw Hill
3. Finite Element Procedure in EngineeringAnalysis, K.J. Bathe McGraw Hill
4. Finite Element Analysis C.S. Krishnamoorthy Tata McGraw Hill
5. Concepts and Application of Finite Element Analysis, R.D. Cook, D.S. Malcus and M.E.Plesha John Wiley
6. Introduction to Finite Elements in Engineering T.R Chandragupta and A.D Belegundu, Prentice Hall India
7. Finite Element and Approximation O.C. Zenkiewicy& Morgan -
8. Numerical Methods E Balagurusamy Tata McGraw Hill

BME-073 : ADVANCED DYNAMICS OF MACHINERY

L T P
3 1 0

Credits – 4

UNIT I

Dynamic Analysis of Mechanisms and Machines: Introduction, Motion of Rigid Body under a System of Forces, Principle of Virtual Work, D'Alembert's Principle and Dynamic Equilibrium, Dynamic Force Analysis, Stresses in Moving Members, Motion Analysis, Equivalent Force and Mass Method.

UNIT II

Dynamics of Direct Acting Engine Mechanisms: Introduction, Piston Motion, Turning Moment on Crank-Shaft, Dynamically Equivalent Link, Approximate Expression for Turning Moment, Correction to the Approximate Expression, Turning Moment Diagram, Fluctuation of Crank-Shaft Speed, Flywheel Analysis.

UNIT III

Balancing of Inertia Force and Moments in Machines: Introduction, Balancing of Rotating Masses, Two-Plane Balancing, Determination of Balancing Masses, Balancing of Internal Combustion Engines.

UNIT IV

Gyroscopic action in Machines: Introduction, Motion of a Rigid Body in Three-Dimensions, Principal Axes, Angular Velocity and Momentum about Principal Axes, Euler's Equation of Motion, Euler's Modified Equation, Simple Precession of a Symmetrical Gyroscope in Angular Precession, Gyroscopic Effects in Machines, Gyroscopic Stabilization.

UNIT V

Dynamics of Rotating Shafts: Introduction, Critical Speed, Shaft with an Unbalanced Disc at Mid-Span, Generalized Forces, Lagrange's Equation of Motion, Gyroscopic Effect on Critical Speed.

BOOKS:

1. Theory of Mechanisms and Machines by Amitabh Ghosh and Ashok Kumar Malik, Affiliated East- West Press Pvt. Ltd, New Delhi.

2. Theory of Machines and Mechanisms by Joseph Edward Shigley and John Joseph Uicker, J.R. International Student Edition, Mc-Graw Hill International Company.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-074 : MANAGEMENT INFORMATION SYSTEM

L T P
3 1 0

Credits – 4

UNIT-I

Organisation & Types, Decision Making, Data & information, Characteristics &Classification of information, Cost & value of information, Various channels of information & MIS.

UNIT-II

Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc.

UNIT-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

UNIT-IV

Managing Information Technology, Enterprise & Global Management, Security &Ethical Challenges, Planning & Implementing Change.

Reports: Various types of MIS reports, GUI & Other Presentation tools.

UNIT-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production& Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies.

BOOKS:

1. O.Brian, “Introduction to Information System”, Mc-Graw Hill.
2. O.Brian, “Management Information System”, TMH.
3. Alter, “Information Systems : A Management Perspective”, Addison Wesley.
4. Arora& Bhatia, “Information Systems for Managers”, Excel
5. Bansal, “Information System Analysis & Design”, TMH.
6. Jawadegar, “Management Information System”, TMH.
7. Murdick, “Information System for Modern Management”, PHI.
8. Alexis Leon, “Enterprise Resource Planning”, TMH.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-075*:* ADVANCED MATERIALS TECHNOLOGY

L T P
3 1 0

Credits – 4

UNIT-I: Introduction to Ferrous Materials

Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons. Recognized patterns of distribution of graphite flakes in grey cast iron.

8

UNIT-II: Heat Treatment of Steels

TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austempering and mar tempering of steel. Surface hardening of steel-Carbonizing nit riding carbon nitriding cyaniding, flues and induction hardening microscopic determination of case depth and depth of hardening.

Unit-III: Nonferrous materials

Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials. Heat treatment of nonferrous materials– soputionizing, Aging and precipitations hardening.

Composites

Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites

Refractory materials and coatings for high temperature applications.

Smart Materials-introduction, types and applications. Thin film shape memory alloys.

UNIT-IV: Biomaterials

Classes and application of materials in medicine and dentistry. Stress strain behavior of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion.

UNIT-V: Nuclear Materials

Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials. Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers. Radiation proof materials. Brief discussion of safety and Radioactive waste disposal.

BOOKS:

1. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, A.S.Hoffman, F.J. Sckoen, and J.E.L Emons, Academic Press, second edition, 2004.
2. Biomaterials: An Introduction (second edition) JoonB.Park&RodericS.Lakes, Plenum Press,1992.
3. Handbook of Materials for Medical Devices, Edited by J. R. Davis, ASM international, 2003.
4. Introduction to Nuclear Engineering, by J.R Lamarsh.
5. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.& Sons.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-076 RAPID PROTOTYPING & TOOLING

L T P
3 1 0

Credits – 4

UNIT-I:

Introduction

Need - Development of RP systems – RP process chain - Impact of Rapid Prototyping and Tooling on Product Development – Benefits- Applications – Digital prototyping – Virtual prototyping.

UNIT-II:

Liquid based and solid based rapid prototyping systems

Stereolithography Apparatus, Fused deposition Modeling, Laminated object manufacturing, Three dimensional printing: Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

UNIT-III:

Powder based rapid prototyping systems:

Selective Laser Sintering, Direct Metal Laser Sintering, Three Dimensional Printing, Laser Engineered Net Shaping, Selective Laser Melting, Electron Beam Melting: Processes, materials, products, advantages, applications and limitations – Case Studies.

UNIT-IV:

Reverse Engineering and CAD Modeling

Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT-V:

Rapid Tooling

Classification: Soft tooling, Production tooling, Bridge tooling; direct and indirect –Fabrication processes, Applications. Case studies - automotive, aerospace and electronic industries.

BOOKS:

1. Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F., and Lim C.S., World Scientific Publishers, 2003.
2. Rapid Tooling: Technologies and Industrial Applications, Peter D.Hilton, Hilton/Jacobs, Paul F.Jacobs, CRC press, 2000.
3. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003.
4. Rapid Prototyping and Engineering applications : A tool box for prototype development, LiouW.Liou, Frank W.Liou, CRC Press, 2007.
5. Rapid Prototyping: Theory and practice, Ali K. Kamrani, EmadAbouel Nasr, Springer, 2006

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-077 METAL FORMING TECHNOLOGY

L T P
3 1 0 **Credits – 4**

UNIT I:

Fundamentals of Metal Forming: Classification of forming processes, mechanism of metal forming, temperature of metal working, hot working, cold working, friction and lubricants.

UNIT II:

Rolling of metals: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging.

UNIT III:

Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, production of seamless pipes.

Drawing: Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process,analysis of wire, deep drawing and tube drawing.

UNIT IV:

Sheet Metal forming: Forming methods, Bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, defect in formed parts. Advanced Metal forming processes: HERF, Electromagnetic forming, residual stresses, in-process heat treatment and computer applications in metal forming.

UNIT V:

Introduction to Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

Analysis of Forming Process, Slab method, Upper & lower bound, FEM based simulation ,slip line theory, Use of CAE platform for Die Design & Simulation

BOOKS:

1. Mechanical Metallurgy / G.E. Dieter / Tata McGraw Hill, 1998. III Edition 2. Principles of Metal Working / Sunder Kumar

2. Principles of Metal Working processes / G.W. Rowe

3. ASM Metal Forming Hand book

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-751 : CAD/CAM LAB

L T P **Credits – 1**
0 0 2

Note: Total ten Experiments are to carried out. Five Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study orretrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mechatronics and controls

OPEN ELECTIVE-I

1. BOE001 Quality Management
2. BOE-002 Operation Research
3. BOE-003Non Conventional Energy Resources
4. BOE-004 Product Development
5. BOE-005 Total Quality Management

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BOE-001: QUALITY MANAGEMENT

L T P
3 1 0 **Credits – 4**

UNIT-I

Quality Concepts:

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type**.**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure**.**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims**.**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program**.**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods**.**

UNIT-III

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts**.**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle**.**

UNIT –V

ISO-9000 and its concept of Quality Management ,ISO 9000 series, Taguchi method, JIT in some details**.**

BOOKS:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

BOE-002: OPERATIONS RESEARACH

L T P
3 1 0 **Credits – 4**

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathematical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models. (12)

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

BOOKS:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. PanneerSeevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BOE-003: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0 **Credits – 4**

UNIT-I

Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells: Theory of solar cells.solar cell materials, solar cell array, solar cell power plant, limitations. 4

UNIT-II

Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations.2

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations. Waste Recycling Plants.

BOOKS:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. KoteswaraRao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BOE- 004: PRODUCT DEVELOPMENT

L T P

3 1 0 **Credits – 4**

UNIT-1

Concept of Product, definition and scope. Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical reliability & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour. Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, More phological techniques.Utility Concept, Utility Value, Utility Index, Decision making under Multiple Criteria. Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations. Design of display and controls, Man-machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthro prometric data and its importance in design. Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product. Innovation versus Invention.Technological Forecasting.Use of Standards for Design.

BOOKS:

1. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
2. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
3. C.D. Cain, “Product Design & Decision” Business Books.
5. C.D. Cain, “Engg. Product Design” Business Books.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BOE-005 :TOTAL QUALITY MANAGEMENT (TQM)

L T P
3 1 0

Credits – 4

UNIT-I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

UNIT-II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

UNIT-III

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart. 3

UNIT-IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT-V

IS0-9000 and its concept of Quality Management:

ISO 9000 series, Taguchi method, JIT in some details

BOOKS:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .

2. Greg Bounds. “Beyond Total Quality Management”.McGraw Hill, 1994.

3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

DEPARTMENTAL ELECTIVE-V

1BME -080 Thermal Turbo Machines

2. BME -081 Mechanical System Design

3. BME-082 Tribology

4. BME -083 Simulation and modeling

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-080: THERMAL TURBOMACHINES

Credits – 4

L T P
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbo machinery, Energy transfer in turbo machines, Euler's equation, Definition of various efficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology, Cascade testing, Velocity diagrams for axial and radial turbo machinery and pumps.

UNIT-II

Centrifugal compressors-

Principle of operation, work done and pressure rise, Velocity diagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient, Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guide vanes, Centrifugal Compressor characteristic curves.

Axial flow compressor- Principle of operation and working, Energy transfer, Velocity diagram for axial compressor, Factors affecting stage pressure ratio, Blockage in compressor annulus, Degree of reaction, 3-D flow, Design process, blade design, calculation of stage performance, Axial compressor performance characteristic curves.

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocity diagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord, Estimation of stage performance, Characteristic curves.

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

Pumps : Classification of Pumps, Main components, indicator diagram and modification due to piston acceleration, Performance characteristics, Cavitation and its control, Miscellaneous types of pumps.

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropy diagram, State losses, Estimation of stage performance, Performance characteristics.

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustion system types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparative evaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Design with traditional materials.

BOOKS:

1. Gas turbine theory : Cohen & Rogers, Addison Wesley Longman Ltd.

2. Design of high efficiency turbomachinery and gas turbines, David Gordon Wilson, TheodosiosKorakianitis, Prentice Hall International.

3. Turbomachinery : S.M. Yahya.

4. Turbine, Compressors and Fans, S.M. Yahya, Tata McGraw Hill.

5. Gas Turbine- Ganeshan, Tata McGraw Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-081 : MECHANICAL SYSTEM DESIGN

L T P **Credits – 4**
3 1 0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, system types, Application of system concepts in Engineering, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing

Problem Formulation

Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study:heating duct insulation system, high speed belt drive system

UNIT-II

System Theories

System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

System modeling

Need of modeling, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, Acase study: Manufacture of maize starch system

Calculus Method for Optimization

Model with one decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye'stheorem, A case study: Installation of machinery

System Simulation

Simulation concepts, simulation models, computer application in simulation, spreadsheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant

BOOKS -

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Design Engineering-JR Dixon, TMH, New Delhi
3. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
4. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
5. Optimization Techniques-SS Rao
6. System Analysis and Project Management-David I Cleland, William R King, McGraw Hill.

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-082*:* TRIBOLOGY

L T P
3 1 0

Credits – 4

UNIT-I

Introduction to Tribology

Definition, Scope, Applications, Friction, Definition, Scope, Laws of friction. Frictiontheories. Surface contaminants, Effect of sliding speed on friction

UNIT-II: Wear

Definition, Scope, wear of metals, Types, Classification. Mechanism of wear, Quantitative laws. Hypothesis of Holm. Hypothesis of Burwell and Strang.Hypothesis ofArchard, Rawe, Rabinowicz. Quantitative law for Abrasive wear, Bayerku surface fatigue theory. Delamination theory & Fatigue theory of wear, wear resistant materials. Introduction to wear of Polymers and Ceramics. Wear reduction by Surface Improvements, Pitting, Erosion& Stress Corrosion.

UNIT-III: Surface Interactions

Elastic & Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies. Formulae for calculation of contact area.Physico-Mechanical properties of surface layers, Characteristics of Surface Geometry. Classes of surface roughness.Contact of rough surfaces. Interaction of surface peaks. Real and contour area of contact.

UNIT-IV: Lubrication

Definition & Scope. Generalized Reynold's equation.Flow and shear stress, energy equation.Mechanism of pressure development in bearings.Concept of Boundry Layer.

UNIT-V: Bearing design considerations & characteristics

Bearing design procedure & steps. Plain slider bearing. Step (Rayleigh step) bearing. Infinitely long journal bearing.Infinitely short journal bearing.Future scope and applications**.**

BOOKS:

1. Introduction to Tribology of bearings by - B. C. Majumdar., S Chand & Co.
2. Hand Book of Tribology -- WHILEY
3. Fundamentals of Fluid film lubrication by – Bernard Hamrock, McGraw Hill International Edition.
4. Tribology in Industries by Sushil. K. Srivastava, S Chand & Publications.
5. Basic Lubrication theory by Alastair Cameron.-+

BME-083 SIMULATION AND MODELING

L T P
3 1 0

Credits – 4

UNIT-1

PHYSICAL MODELING

Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of Systems, iconic analog. Mathematical Modeling

UNIT-1I

COMPUTER SYSTEM SIMULATION

Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, continuous system models, analog and hybrid simulation, feedback systems, Buildings simulation models of waiting line system, Job shop, material handling and flexible manufacturing systems

UNIT-1II

PROBABILITY CONCEPTS IN SIMULATION

Stochastic variables, discrete and continuous probability functions, random numbers, generation of random numbers, variance reduction techniques, Determination of the length of simulation runs, Output analysis.

UNIT-IV

SYSTEM DYNAMICS MODELING

Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship.Simulation of system dynamics model.

UNIT-V

VERIFICATION AND VALIDATION

Design of simulation experiments, validation of experimental models, testing and analysis. Simulation languages comparison and selection, study of SIMULA, DYNAMO, STELLA, POWERSIM. Simulation softwares

BOOKS:

1. Gordon G., System simulation, Prentice Hall.
2. Payer T., Introduction to system simulation, McGraw Hill.
3. Spriet, Computer Aided Modeling and Simulation, W.I.A.
4. Sushil, System Dynamics, Wiley Eastern Ltd.
5. Shannon R.E., System simulation, Prentice Hall.
6. Allan Carrie, " Simulation and Manufacturing", John Wiley & Sons
7. Simulation & Modelling: Kelton&Law.McGraw Hill.

DEPARTMENTAL ELECTIVE-VI

1. BME - 084 Mechatronics
2. BME -085 Advanced Welding Technology
3. BME-086 Mechanical Vibration
4. BME -087 Industrial safety and Environment
5. BME-088 Composite Material and Mechanics

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BME-084 MECHATRONICS

L T P
3 1 0

Credits – 4

UNIT I - INTRODUCTION TO MECHATRONICS

Introduction to Mechatronics systems, Mechatronics system components - Measurement Systems, Control Systems, Open and Closed Loops Systems, Sequential Controllers with examples- Water level controller, Shaft speed control, Washing machine control, Automatic camera and Engine management systems.

UNIT II - SENSORS AND TRANSDUCERS

Introduction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- solid state sensors and transducers-magnetic measurements, temperature measurements, Chemical measurements-piezoelectric – accelerometers -ultrasonic sensors and transducers-flow, distance, velocity measurements

UNIT III - ELECTRICAL DRIVES AND CONTROLLERS

Introduction, Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors. Signal processing- Multiplexer, operation alamplifier - A/D and D/A converters – Introduction to Data acquisition system -Proportional, Integral, Derivative and PID controller, Micro controller

UNIT IV - PROGRAMMABLE LOGIC CONTROLLERS

Programmable logic controller – Basic structure - Programming units - Memory -Input - Output Modules - Mnemonics – Latching- Timers – Internal relays -Counters - Shift Registers - Master and Jump Controls - Programming the PL Cusing Ladder diagram - Simple example of PLC application.

UNIT V - MECHATRONICS SYSTEM DESIGN AND APPLICATION

Mechatronics in Engineering Design, Traditional and mechatronics design,Applications - Pick and Place robots, Car park barriers, Bar code reader, Windscreen wiper wing stepper motor control. Case studies - Coin counters, Robotwalking machine.

BOOKS:

1. Bolton.W, "*Mechatronics"*, Addison Wesley, 4th Edition, New Delhi, 2010.

2. Bradley.D.A, Dawson.DBurdN.C.and Loader A.J, "*Mechatronics"*, Chapmanand Hall Publications, New York, 1993.

3. Jacob Fraden, "*Handbook of Modern Sensors Physics, Designs, andApplications"*, Third Edition, Springer-Verlag New York, 200

RAMA UNIVERSITY UTTAR PRADESH KANPUR

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BME-085 : ADVANCED WELDING TECHNOLOGY

L T P
3 1 0

Credits – 4

UNIT-I

Introduction : Importance and application of welding, classification of welding process. Selection of welding process.

Brief review of conventional welding process : Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding ofMS.CI, Al, Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing.

UNIT-II

Advanced welding Techniques- Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc.

UNIt-III

Advanced welding Techniques (continued) : Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing.

UNIT-IV

Weld Design : Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels. Life predication.

UNIT-V

Thermal and Metallurgical consideration.: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves. Metallurgical consideration of weld, HAZ and Parent metal, micro & macrostructure. Solidification of weld and properties.

Books:

Welding Hand Book

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BME-086 : MECHANICAL VIBRATION

L T P
3 1 0

Credits – 4

UNIT - I

Introduction

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis

Single Degree Freedom System

Free vibration, Natural frequency, Equivalent systems, Energy method for determining natural frequency, response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement

UNIT - II

Single Degree Freedom: Forced Vibration

Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

UNIT- III

Two Degree Freedom systems

Introduction, Principal modes, Double pendulum, Torsional system with damping, coupled system, undamped dynamic vibration absorbers, Centrifugal pendulum absorbers, Dry friction damper

UNIT- IV

Multi Degree Freedom system: Exact Analysis

Undamped free and forced vibrations of multi-degree freedom systems, influence number, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts

UNIT- V

Multi Degree Freedom system: Numerical Analysis

Rayleigh's, Dunkerely's, Holzer's ad Stodola methods, Rayleigh-Ritz method

CRITICAL SPEED OF SHAFTS

Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

BOOKS:

1. Mechanical Vibrations – P. Srinivasan, TMH
2. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
3. Mechanical Vibrations – W. T. Thomson
4. Mechanical Vibrations – JS Rao& K Gupta, New Age
5. Mechanical Vibrations – Tse, Morse & Hinkle
6. Mechanical Vibrations – V. Rama Murthy, Narosa Publications

RAMA UNIVERSITY UTTAR PRADESH KANPUR

Faculty of Engineering and Technology

BME-087 INDUSTRIAL SAFETY AND ENVIRONMENT

L T P
3 1 0

Credits – 4

UNIT I - ACCIDENT PREVENTION

Definitions and theories.- Accident - Injury - Unsafe act - Unsafe condition -Dangerous occurrence -Theories and principles of accident causation - Cost of accidents - Accident reporting and investigations - Safety committees - Need -Types - Advantages. Safety education and training - Importance - Various training methods - Accident prevention - Motivating factors - Safety suggestion schemes. Safety performance - Definitions connected with measuring safety performance as per Indian and International standards

UNIT II - SAFETY IN MATERIAL HANDLING

General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears - Prime movers. Ergonomic consideration in material handling, design, installation, operation and maintenance of conveying equipments, hoisting, traveling and slewing mechanisms. Selection, operation and maintenance of industrial trucks - Mobile cranes - Tower crane.

UNIT III - SAFETY IN CHEMICAL INDUSTRIES

Safety in the design process of chemical plants - Safety in operational and maintenance - Exposure of personnel - Operational activities and hazards – Safety in storage and handling of chemicals and gases - Hazards during transportation -Pipeline transport - Safety in chemical laboratories. Specific safety consideration for cement, paper, pharmaceutical, petroleum, petro - chemical, rubber, fertilizer and distilleries

UNIT IV - ENVIRONMENTAL IMPACT ASSESSMENT Evolution of EIA - Concepts - Methodologies - Screening - Scoping - Checklist -Rapid and Comprehensive EIA - Legislative and environmental clearance procedure in India - Prediction tools for EIA. - Assessment of Impact - Air - Water -Soil - Noise- Biological. Socio cultural environment - Public participation

Resettlement and Rehabilitation. - Documentation of EIA .

UNIT V - REGULATIONS FOR HEALTH, SAFETY AND ENVIRONMENT Factories act and rules; - Indian explosive act - Gas cylinder rules – Environmental pollution act - Indian petroleum act and rules - Oil industry safety directorate(OISD) - Indian Electricity act and rules. - Mines act and rules - Indian motorvehicles act and rules.

BOOKS:

1. Handlin.W, "*Industrial Hand Book"*, McGraw-Hill, 2000.
2. Anton.T.J, "*Occupational safety and health management"*, (2nd Edition).New York, McGraw Hill, 1989.
3. Heinrich.H.W, "*Industrial Accident Prevention"*, McGraw-Hill, 1980.
4. Rudenko.N, "*Material Handling Equipments"*, Mir Publishers, Moscow, 1981.
5. Lees.F.P, "*Loss "Prevention in Process Industries"*, Butterworths, NewDelhi,1986.
6. Canter.R.L, "*Environmental Impact Assessment"*, McGraw Hill
7. IS CODES: IS 5903, IS 807, IS 2760, IS 14469, IS 13367-1, IS 5324, IS7167, IS 7155, IS 1800.1, IS 3521 of Oil Industry Safety Directorate, Govt. of

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Faculty of Engineering and Technology

BME-088 COMPOSITE MATERIALS AND MECHANICS

L T P
3 1 0

Credits – 4

UNIT I-INTRODUCTION

Definition - Need-General characteristics, Applications, Fibers-Glass, Carbon, Ceramic and Aramid fibers. Matrices-Polymer, Graphite, Ceramic and Metal Matrices-Characteristics of fibers and matricesSmart materials - types and Characteristics.8

UNIT II-MECHANICS AND PERFORMANCE

Characteristics of fiber-reinforced Lamina-Laminates-Intelaminar stresses- Static Mechanical Properties - fatigue and Impact properties – Environmental effects - Fracture Behavior and Damage Tolerance.

UNIT III-MANUFACTURING

Bag Moulding - Compression moulding - Pultrusion-Filament winding - other Manufacturing Processes - Quality Inspection method

UNIT IV-ANALYSIS

Stress analysis of laminated composite Beams, Plates, Shells - Vibration and Stability Analysis - Reliability of Composites - Finite Element Methods of Analysis - Analysis of Sandwich structures

UNIT V-DESIGN

Failure predictions - Laminated Design Consideration - Bolted and Bonded Joints. Design examples

BOOKS:

1. Mallick,P.K., " Fibre Reinforced composites: Materials", Manufacturing and Design:, Marcel Dekker Inc., 1993

2. Halpin,J.C., "Primer on Composite Materials, Analysis", Techomic Publishing Co., 1984

3. Agarwal,B.D., and Broutman L.J., " Analysis and Performance of Fibre Composites", John Wiley and Sons, New York, 1990

4. Malick,P.K. and Newman, S., (eds), " Composite Materials Technology: Processes and Properties", Hansen Publisher, Munich, 1990.