COURSE CURRICULUM

(UPDATED AFTER 8TH BOS)

DEPARTMENT OF COMPUTER ENGINEERING & APPLICATIONS

GLA UNIVERSITY, MATHURA (U.P.) INDIA

Head of the Department
Computer Engineering & Applications
Institute of Engineering & Technology
GLA University, Mathura

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COURSE STRUCTURE

B.TECH. (CSE)

First Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HRS/WK
			L	T	P		
1.	AHM101	Mathematics I	3	1	0	4	4
2.	AHP103/ AHC101	Engineering Physics/ Engineering Chemistry	3	1	0	4	4
3.	CSE101	Fundamentals of Computer & Programming	2	0	0	2	2
4.	MEE104/ MEE103	Basic Mechanical Engineering/ Applied Mechanics	3	1	0	4	4
5.	EEE101/ ECE101	Electrical Engineering / Electronics Engineering	3	1	0	4	4
6.	AHE103	English Language Skills for Communication - I	2	0	0	2	2
PRACTICALS							
7.	AHE185	English Language Lab – I	0	0	2	1	2
8.	MEE185/ MEE186	Engineering Workshop Practice Lab / Engineering Drawing	0	0	2	1	2
9.	AHP181/ AHC181	Engineering Physics Lab / Engineering Chemistry Lab	0	0	2	1	2
10	CSE181	Computer Programming Lab - I	0	0	2	1	2
11.	EEE181/ MEE183	Electrical & Electronics Lab / Applied Mechanics Lab	0	0	2	1	2
12.	ECE197	General Proficiency	0	0	0	1	0
		TOTAL	**15**	**5**	**10**	**26**	**30**

Second Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HRS/WK
			L	T	P		
1.	AHM102	Mathematics II	3	1	0	4	4
2.	AHC101/ AHP103	Engineering Chemistry/ Engineering Physics	3	1	0	4	4
3.	CSE102	Problem Solving using Computers	2	0	0	2	2
4.	MEE103/ MEE104	Applied Mechanics / Basic Mechanical Engineering	3	1	0	4	4
5.	ECE101/ EEE101	Electronics Engineering/ Electrical Engineering	3	1	0	4	4
6.	AHE104	English Language Skills for Communication - II	2	0	0	2	2
PRACTICALS							
7.	AHE186	English Language Lab – II	0	0	2	1	2
8.	MEE186/ MEE185	Engineering Drawing / Engineering Workshop Practice Lab	0	0	2	1	2
9.	AHC181/ AHP181	Engineering Chemistry Lab/ Engineering Physics Lab	0	0	2	1	2
10.	CSE182	Computer Programming Lab - II	0	0	2	1	2
11.	MEE183/ EEE181	Applied Mechanics Lab / Electrical & Electronics Lab	0	0	2	1	2
12.	ECE198	General Proficiency	0	0	0	1	0
		TOTAL	**15**	**5**	**10**	**26**	**30**

Third Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	AHM201	Mathematics-III	3	1	0	4	4
2.	CEE201/ AHE201	Environmental Studies/ Ethics & Values	2	0	0	2	2
3.	CSE211	Data Structures & Algorithms	3	1	0	4	4
4.	CSE212	Computer Organization	3	1	0	4	4
5.	CSE213	Discrete Mathematics	3	1	0	4	4
6.	ITE211	Object Oriented Programming	3	1	0	4	4
PRACTICALS							
7.	CSE281	Data Structures & Algorithms Lab	0	0	2	1	2
8.	CSE282	Computer Organization Lab	0	0	2	1	2
9.	ITE281	Object Oriented Programming Lab	0	0	2	1	2
10.	CSE297	General Proficiency	-	-	-	1	-
11.	AHE281	Soft Skills - I	0	0	2	1	2
		TOTAL	**17**	**5**	**8**	**27**	**30**

Fourth Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE221	Operating Systems	3	1	0	4	4
2.	CSE222	Introduction to Microprocessors	3	1	0	4	4
3.	CSE223	Computer Graphics	3	1	0	4	4
4.	CSE224	Computer Networks	3	1	0	4	4
5.	ITE221	Database Management System	3	1	0	4	4
6.	AHE201/ CEE201	Ethics & Values/ Environmental Studies	2	0	0	2	2
PRACTICALS							
7.	CSE291	Operating Systems Lab	0	0	2	1	2
8.	CSE292	Microprocessors Lab	0	0	2	1	2
9.	ITE291	Database Management System Lab	0	0	2	1	2
10.	CSE298	General Proficiency	-	-	-	1	-
11.	AHE282	Soft Skills - II	0	0	2	1	2
		TOTAL	**17**	**5**	**8**	**27**	**30**

Fifth Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	MBA301	Industrial Economics	2	0	0	2	2
2.	AHE301	Technical Writing	2	1	0	2	2
3.	CSE311	Design & Analysis of Algorithms	3	1	0	4	4
4.	ITE312	Software Engineering	3	1	0	4	4
5.	CSE313	Theory of Automata & Formal Languages	3	1	0	4	4
6.	ITE321	Web Technology	3	1	0	4	4
PRACTICALS							
7.	CSE381	Design & Analysis of Algorithms Lab	0	0	2	1	2
8.	CSE384	Mini Project –I	0	0	4	2	4
9.	ITE391	Web Technology Lab	0	0	2	1	2
10.	CSE397	General Proficiency	-	-	-	1	-
11.	AHE381	Soft Skills – III	0	0	2	1	2
		TOTAL	**16**	**4**	**10**	**26**	**30**

Sixth Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	MBA304	Industrial Management	4	0	0	4	4
2.	CSE321	Compiler Design	3	1	0	4	4
3.	CSE322	Optimization Techniques	3	1	0	4	4
4.	ITE311	Unix Operating System	3	1	0	4	4
5.	CSE323	Soft Computing	3	1	0	4	4
PRACTICALS							
6.	CSE391	Compiler Design Lab	0	0	2	1	2
7.	CSE393	Mini Project-II	0	0	4	2	4
8.	ITE381	Unix/Linux Lab	0	0	2	1	2
9.	CSE394	Colloquium	0	0	2	1	2
10.	CSE398	General Proficiency	-	-	-	1	-
11.	AHE382	Soft Skills – IV	0	0	2	1	2
		TOTAL	**16**	**4**	**12**	**27**	**32**

At the end of VI Semester each student has to undergo Industrial Training of four weeks minimum which will be evaluated in VII Semester under CSE 484.

Seventh Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE411	Digital Image Processing	3	1	0	4	4
2.	CSE412	Advanced Computer Architecture	3	1	0	4	4
3.	ITE411	Mobile Computing	3	0	0	3	3
4.		Elective – I	3	1	0	4	4
5.		Open Elective	3	1	0	4	4
PRACTICALS							
6.	CSE481	Digital Image Processing Lab	0	0	2	1	2
7.	CSE482	Advanced Computer Architecture Lab	0	0	2	1	2
8.	CSE483	Project - Part I	0	0	6	3	6
9.	CSE484	Industrial Training	0	0	2	1	2
10.	CSE497	General Proficiency	-	-	-	1	-
		TOTAL	**15**	**4**	**12**	**26**	**31**

ELECTIVE-I

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE431	Advanced Computer Networks	3	1	0	4	4
2.	ITE431	Data Mining & Warehousing	3	1	0	4	4
3.	ITE432	Service Oriented Architecture	3	1	0	4	4
4.	CSE433	Graph Theory	3	1	0	4	4
5.	CSE440	Information Retrieval Systems	3	1	0	4	4
6.	CSE446	Bisiness Intelligence	3	1	0	4	4

OPEN ELECTIVE

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE461	Human Computer Interaction	3	1	0	4	4
2.	CSE462	IT in Business	3	1	0	4	4
3.	CSE463	Soft Computing	3	1	0	4	4
4.	CSE464	Cyber Security	3	1	0	4	4

Eighth Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE421	Distributed Systems	3	1	0	4	4
2.	CSE422	Cryptography & Network Security	3	1	0	4	4
3.		Elective – II	3	1	0	4	4
4.		Elective – III	3	1	0	4	4
PRACTICALS							
5.	CSE491	Distributed Systems Lab	0	0	2	1	2
6	CSE492	Cryptography & Network Security Lab	0	0	2	1	2
7.	CSE493	Project - Part II	0	0	14	7	14
8.	CSE498	General Proficiency	-	-	-	1	-
		TOTAL	**12**	**4**	**18**	**26**	**34**

ELECTIVE-II

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE434	Data Compression	3	1	0	4	4
2.	ITE434	Advanced Concepts in Database Systems	3	1	0	4	4
3.	ITE435	Software Quality Engineering	3	1	0	4	4
4.	CSE442	Embedded Systems	3	1	0	4	4
5.	CSE435	Probability & Statistics	3	1	0	4	4

ELECTIVE-III

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HR/WK
			L	T	P		
1.	CSE436	Distributed & Parallel Database	3	1	0	4	4
2.	CSE437	Software Ontology & Web Semantics	3	1	0	4	4
3.	CSE438	Natural Language Processing	3	1	0	4	4
4.	CSE439	Computational Geometry	3	1	0	4	4
5.	CSE447	Agile Software Development	3	1	0	4	4

SYLLABUS
B.TECH. (CSE)

AHM 101: MATHEMATICS I

Prerequisite: *Knowledge of Intermediate level Mathematics*.

Credits: 04   **Semester I**   **L–T–P: 3–1–0**

Module No.	Contents	Teaching Hours (Approx.)
I	**Differential Calculus I** : Determination of nth derivative of standard functions, Leibnitz theorem, Expansion of function of one and several variables, Taylor's and Maclaurin's series, Partial differentiation, Euler's theorem for homogeneous functions, Total derivatives, Asymptotes (in cartesian coordinates).	15
II	**Differential Calculus II**: Jacobian and its properties, Extrema of functions of several variables by Lagrange's method of multipliers, Curvature, Envelopes of family of curves,. Curve tracing of some standard curves.	15
III	**Matrices:** Introduction, Inverse of a matrix by elementary transformations, rank of a matrix, solution of a system of linear equations, linearly dependent and independent vectors, complex matrices, eigen values and eigen vectors. Cayley–Hamilton theorem, Diagonalization of a matrix.	15

Text Books :
- N. P.Bali & M.Goyal, " *A Text Book of Engg. Mathematics*", (9th ed.), Laxmi Pub., Delhi.
- B.S. Grewal, " *Higher Engg. Mathematics*", Khanna Publishers, Delhi.
- B.V.Ramanna, " *Higher Engg. Mathematics*", TMH.

Reference Books:
- G. B. Thomas & R. Finney, " *Calculus & Analytic Geometry*", (9th Ed.), Addison Wesley.
- T. M. Apostol, "*Calculus, Volumes 1 and 2*" , Wiley Eastern, 1980.
- James Stewart, "*Calculus*, (5th Ed.)*, Thomson, 2003.

Outcome:

At the end of the course, students will be able to understand how to:
- *Apply the mathematical principles in various engineering disciplines.*

AHP103: ENGINEERING PHYSICS

Prerequisite: *Knowledge of Intermediate level physics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours (Approx.)
I	**Interference:** Principle of superposition ,Coherent Sources, Interference due to division of wavefront- biprism experiment and division of amplitude-Newton's rings. **Polarization:** Introduction to polarization fundamentals, Phenomenon of double refraction, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Quarter and half wave plates, Optical activity, Fresnel's theory for optical rotation, Specific rotation, Biquartz polarimeter. **Fiber Optics:** Principle of optical fiber, acceptance angle and acceptance cone, Numerical aperture, Relation b/w acceptance angle and Numerical aperture, Applications of optical fiber.	15
II	**Electrostatics and Magnetostatics:** Coulomb's law, Gauss theorem and its applications, Laplace and Poisson's equations, Biot Savart law and its applications, Lorentz force, Ampere's law, Faraday law, Lenz law. **Electromagnetics :** Maxwell's equations (Integral and Differential forms), Equation of continuity , Inconsistency in Ampere's law: Displacement current, Propagation of E-M waves in free space and in conducting media, Poynting theorem and Poynting vector. **Electric and magnetic fields in matter:** Dielectric behavior of materials, Dielectric Constant, Clausius-Mossotti relation, Piezoelectricity (qualitative), Magnetisation, dia, para and ferromagnetism, Langevin's theory for diamagnetism.	15
III	**Wave Mechanics & X-ray Diffraction:** Wave - particle duality, Photoelectric effect, de-Broglie hypothesis, Phase and group velocities: wave packet, Heisenberg's uncertainty principle and its applications, Wave function and its normalization, Schrödinger's wave equation: time dependent and time independent wave equations, particle in one dimensional potential box, Diffraction of X-rays by crystal planes, Bragg's law, Compton's effect. **Accoustics and Sound:** Intensity, Loudness, Echo, Absorption coefficient determination- Reverberation- Factor affecting Acoustics, Ultrasonic wave and p production and applications of ultrasonic in engineering. **Nanomaterials:** Basic principle of nanoscience and nanotechnology, Nanostructures, Buckyballs: Properties, Creation & uses, Synthesis & characterization of carbon nano-tube (CNT), Applications of carbon nano-tubes.	15

Text Books:
- Engineering Physics Vol. 1 & Vol 2-S.L. Gupta
- Engineering Physics Vol. 1 & Vol 2-S.K. Gupta

Reference Books / Cases:
- Ajoy Ghatak, "Optics", TMH.
- Anuradha De, "Optical Fibre & Laser", New Age.
- Resnick, Halliday & Walker, "Fundamentalof Physics", Wiley.
- Beiser , "Concept of Modern Physics", TMH.
- Rechard Booker and Earl Boysen , "Nanotechnology", Wiley International Publishing.

Outcome:
At the End of the Course, Students Will be Able to Understand How to:
- *Apply the principles of physics in various engineering disciplines.*

AHC101: ENGINEERING CHEMISTRY

Prerequisite: *Knowledge of Intermediate level Chemistry*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Chemical Kinetics:** order and molecularity of reactions, zero order, First and second order reactions. Integrated rate equations. Theories of reaction rates, factors affecting rate of reaction. **Chemical Bonding:** M.O. theory and its applications in homo & hetero diatomic molecules. Hydrogen bond, metallic bond and their applications. Semi-conductor **Reaction intermediates** (carbocation, carbanion & free radical). Types of isomerism (optical and geometrical) chirality, elements of symmetry, diastereomers, optically active compounds, R-S configuration and E-Z geometrical isomers, conformation of ethane, n-butane. **Functional materials:** Photovoltaic cells, Biomaterials, Smart materials (Piezoelectric, pyroelectrics & ferroelectrics) and Advanced materials.	14
II	Introduction, Definition and Explanation of the terms: phase, component and degree of freedom, Application of phase rule to one component system (water & CO_2 system), pH, buffer solution (Henderson equation). **Polymers:** Polymerization and its classification. Thermoplastic and Thermosetting resins. **Properties of Polymers**, **Molecular weights of Polymers,**Elastomers. Organic conducting and biodegradable polymers (PMMA, polystyrene, Teflon, neoprene, Buna-S, Buna-N Nylon 6, Nylon 66, Terylene, PLA, poly β hydroxy butyrate), vulcanization of rubber. **Water Treatment:** Introduction, Hardness and its units, , L-S Process, Calgon process, Zeolite and Ion-exchange resins, Treatment of Municipal Water, reverse Osmosis, Impurities in water, Characterstics of water, Treatment process Includes above deleted portions, boiler feed water, boiler troubles and remedial measures **Lubrication:** Introduction to lubrication, Classification, Properties & uses.	17
III	**Corrosion**: Introduction, Consequences, Types, Theories of Corrosion, (galvanic, pitting, stress, water line, intergranular & soil corrosion) and Protection of Corrosion. **Spectroscopy:** Elementary ideas and simple applications of UV, visible, infrared and NMR spectral techniques **Fuels**: Classification of fuels. Analysis of coal, determination of calorific values, *Synthetic petrol* **Glass:** Preparation, varieties & Uses. **Ceramics:** Introduction, classification, scope & application.	17

Text Book:
- Shashi Chawala, **"***Theory and practical of engineering chemistry***"**, 4th edition, Dhanpat Rai & Co. pvt Ltd.

References Books:
- Morrison & Boyd, *"Organic chemistry"*,6th edition ,Pearson education.
- I.L. Finar, *"Organic chemistry"*,5th edition, Longmans Green & Co ltd.
- Y.R. Sharma, *"Elementary organic spectroscopy: principles and chemical application "*,1st edition, S. Chand and Co.ltd.
- S.S.Dara, *"Text book of engineering chemistry and pollution control"*, 2nd edition, S. Chand and Co.ltd.
- Marsh G Fontana, *"Corrosion Engineering"* 3rd edition, Tata McGraw hill publishing Co ltd.
- Attkins & Others, *"Inorganic chemistry"*, 5th edition, Oxford university press.

- Attkins & Others, "*Physical chemistry*", 6th edition, Oxford University press
- Puri, Sharma and Pathania, "*Principles of physical chemistry*", 44th edition, Vishal publishing Co Jalandhar.
- K.J.Laidler, "*Chemical kinetics*", 3rd edition, Pearson education.
- Malik, Tuli and Madan, "*Selected topics in Inorganic chemistry*", 7th edition, S. Chand and Co.ltd.

Outcome:

At the end of the course, students will be able to understand how to:
- *Apply the concepts of chemistry in various engineering disciplines.*

CSE101: FUNDAMENTALS OF COMPUTER & PROGRAMMING

Credits: 02   **Semester I/II**   **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Computer System, Generations of Computers, Classification of Computers. **Introduction to Operating System:** Batch Processing, Multi Programming, Multi User, Multi Tasking and Real Time Operating Systems. **Computer Network:** Introduction, Types and Applications. **Number System:** Decimal, Binary, Hexadecimal and Octal Number Systems and Their Inter Conversions. **Generations of Programming Languages:** Low, Assembly, High and 4GL. **Language Processors:** Compiler, Interpreter and Assembler, Linker, Loader, Algorithms and Flowcharts.	7
II	**Introduction to The C Language:** Structure of a C Program, Standard Input and Output in C, Operators and Expression, Type Conversion. **Control Structures:** Switch- Case, If -Else, While, Do- While and For Loop, Break and Continue Statement, Nested Loops.	7
III	**Array:** Introduction, Single and Multidimensional Arrays- Declaration, Initialization, Address Calculation. **Operations on Arrays:** Insertion, Deletion, Searching and Sorting. **Strings:** Declaration, Initialization, Input and Output of Strings, String Handling Functions.	7

Text Book:

- Behrouz A. Forouzan and Richard F. Gilberg**:** "*Computer Science – A structured Programming Approach Using C*", C Language Learning, 2007.

Reference Books:

- K. N. King, "*C Programming A Modern Approach*", W. W. Norton, 2nd Edition, 2008.
- Kernighan and Ritche, "*The C Programming Language*", PHI, 2nd Edition, 2011.
- P. Dey and M. Ghosh, "*Programming in C*", Oxford University Press 1st Edition, 2000.

Outcome:

At the end of the course, students will be able to understand:
- *A new programming language well enough to implement simple algorithms.*
- *The strengths and weaknesses of programming languages as well as the domains for which they are intended.*
- *The implementation, testing, debugging, and documentation procedures of programs in C.*

MEE104: BASIC MECHANICAL ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Fundamentals of Thermal Engineering** Thermodynamic systems, State & properties, Thermodynamic equilibrium & processes, Heat & work, Work done for different polytrophic processes, Zeroth law of thermodynamics and its applications, First law of thermodynamics, Steady flow energy equation, Application of first law to various thermodynamic systems and its limitations.	13
II	**Applications of Thermal Engineering** Concept of heat engine, heat pump & refrigerator, Second Law of Thermodynamics, Carnot theorem. Clausius Inequality, Concept of entropy, Entropy change during various processes, Introduction to 2 stroke and 4 stroke SI & CI Engines. **Metal Forming & Casting Process** Introduction Hot & Cold working processes, forging, rolling, extrusion, types of patterns and their allowances, moulding sand and their properties, concept of gating system.	13
III	**Machining Processes** Working principles and operations of Lathe, Drilling Machine, Grinding Machine and Shaper. **Fabrication processes** Basic principles and applications of Arc welding, Gas welding, Spot welding, Soldering and Brazing.	14

Text Books:
- Nag P. K, "*Engineering Thermodynamics*", TMH.
- Yadav R., "*Thermodynamics and Heat Engines*", Vol I & II (Sl Edition), Central Publishing House Allahabad.
- Hajra Chowdhary SK and Hajra Chowdhary AK, "*Workshop Technology*", Media Promotors & Publishers.
- Raghuwanshi RS, "*Workshop Technology*", Dhanpat Rai and Sons, New Delhi.

Reference Books:

- VaWylen G.J. & Sonnlog R.E, "*Fundamentals of classical thermodynamics*", John Wiley & Sons, Inc. NY.
- WarkWenneth, "*Thermodynamics*", TMH.
- Joel R., Basic Engineering "*Thermodynamics*", Addison Wesley.
- Chapman WAJ, "*Workshop Technology*" Part 1-3, Viva Books Pvt. Ltd. New Delhi.

Outcome: *At the end of the course the student will be able to*
- *Understand the basic laws of thermodynamics and their applications in engineering*
- *Understand the processes and operations of metal joining ,fabrication casting and machining with applications*
- *Develop basic know how and awareness of various manufacturing processes to deal with real life applications in various fields of engineering*

MEE103: APPLIED MECHANICS

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction** Engineering Mechanics: Idealization of Bodies, concept of Rigid Body, External Forces, moments, couples, Laws of Mechanics. **Force Systems And Equilibrium** Concurrent forces in a plane, Parallel forces in a plane, Free Body Diagram, Equation of equilibrium and their applications to various systems of forces. **Friction** Concepts of friction, Dry friction, Laws of friction and their applications to wedge, ladder, screw, belt-pulley system, Rolling friction.	14
II	**Distributed Forces and Moment Of Inertia** Centroid of Composite figures, Area Moment of Inertia, Polar Moment of Inertia, Parallel axis theorem, Perpendicular axis theorem, Principle Moment of Inertia, Mass Moment of Inertia of circular ring, disc, cylinder, sphere and cone about their axis of symmetry. **Beams** Different support & load conditions, Shear Force and Bending Moment Diagrams for point load, uniformly distributed load, uniformly varying load.	12
III	**Analysis of Plane Trusses** Engineering structures, Perfect Truss, Determination of axial forces in the members, Method of Joints, Method of Section. **Kinematics of Rigid Body** Plain motion of rigid body, Velocity and acceleration under translation and rotational motion, Absolute motion, Relative motion. **Kinetics of Rigid Body** Force, Mass and Acceleration, Work, Power and Energy, Impulse and Momentum, D' Alembert's Principle and dynamic equilibrium.	14

Text Books:

- Dr. A.K. Tayal , "*Engineering Mechanics*"– Statics & Dynamics, Umesh Publications, Delhi
- V.S. Mokashi ,"*Engineering Mechanics*" – Statics Vol.I & Dynamics Vol-II, TMH.

Reference Books:

- I.H. Shames , "*Engineering Mechanics*", Prentice Hall of India Pvt. Ltd., New Delhi (EEE)
- F.P. Beer & E.R. Johnston, "Mechanics for Engineers" –Statics and Dynamics, TMH.
- J.L. Marriam& L.G. Kraig, "*Engineering Mechanics*" – Statics & Dynamics, John Wiley & Sons Ltd.

Outcome: *At the end of the course the student will be able to*

- *Understand the representation and analysis of forces, moments, and equilibrium of particles and rigid bodies, concept and principles of work and energy*
- *Comprehend the effect of friction and its role in engineering applications*
  Develop basic know how and awareness to deal with real life applications in various fields of
engineering.

EEE101: ELECTRICAL ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics***.**

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**DC circuit analysis & Network theorems:** Fundamentals of electric circuits, Kirchhoff's laws, mesh analysis, node analysis, Thevenin theorem, maximum power transfer theorem, superposition theorem. **Steady state AC analysis:** AC fundamentals, average & rms value of different AC waveforms, phasor algebra, analysis of series AC circuits, power triangle, concept of power factor, power factor improvement.	13
II	**Three phase AC circuits:** Generation & advantages of three phase system, star & delta connection, line & phase voltage/current relations. **Magnetic circuits:** Faraday's law, Self and mutual inductance**,** B-H characteristics, hysteresis & eddy current losses, basics of magnetic circuit. **Single phase Transformers: :** Constructional feature, Working Principle, EMF equation, Ideal transformer, Equivalent Circuit, Phasor diagram , Definition of voltage regulation and efficiency, introduction to autotransformer.	14
III	**Rotating Electrical Machines**: Introduction to Electromechanical Energy Conversion. DC Machine: Construction, Operating principle, EMF Equation, Types of DC Motor, Torque Equation, Characteristics and applications. Induction motor: 3-phase: Construction & principle, Torque Equation, Torque-slip Characteristics. Single Phase Induction motor: Principle and Starting methods. Synchronous Motor: Operating principle and applications. **Electrical Installation and Illumination:** Introduction to distribution of electrical energy, Types of cables & switches, Electrical wiring. Fluorescent sodium vapour and mercury lamp.	14

Text Book:
- D.C. Kulshrestha, *"Electrical Engineering"*, Tata McGraw Hill.

Reference Books:
- T.K. Nagsarkar & M.S.Sukhija, *"Basic Electrical Engineering"*, Oxford University Press, 2008.
- H. Cotton, *"Advanced Electrical Technology"*, 2nd Edition, Wheeler Publishing, 2009.
- I. J. Nagarath, *"Basic Electrical Engineering"*, 2nd Edition, Tata McGraw Hill.
- D. E. Fitzgerald & A. Grabel Higginbotham, *"Basic Electrical Engineering"*, 5th Edition, McGraw Hill.
- Edward Hughes, *"Electrical Technology"*, 3rd Edition, Pearson Education.

Outcome: *At the end of the course a student will know: principles of Electrical Engineering and how they are applied to different types of electrical machines and transformers. Domestic and industrial wiring-layout, cables and switches. Single-phase, three-phase: electrical systems and its distribution.*

ECE101: ELECTRONICS ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Contents	Teaching Hours
I	**Transport phenomenon in semiconductors:** Semiconductor materials; Intrinsic and Extrinsic semiconductors; Mass-action law, Drift and diffusion of charge carriers. **Junction diodes:** P-N Junction diode: construction, operation & characteristics; Zener and Avalanche breakdown mechanisms; Diode resistance and capacitance; Photo-diode and LED. **Diode applications:** Rectifiers: half wave, full wave : Centre-tapped and bridge type.; Filters; Clippers; Clampers; Voltage Multipliers; Zener diode as voltage regulator; Regulated power supply.	14
II	**Bipolar Junction Transistor (BJT):** Bipolar junction transistor: construction & operation; CB ,CE, CC configurations & their Characteristics; Operating point; Transistor as a switch; Need of biasing; Biasing methods: fixed bias, emitter bias, potential divider bias, voltage feedback bias; Bias stabilization; Stability factor; h-parameters; Small signal analysis of Single stage BJT amplifier. **Field Effect Transistor (FET):** Construction, operation & characteristics of JFET; Shockley's equation; Depletion& Enhancement type MOSFET; Biasing of JFET:-fixed bias, self bias and voltage divider bias; Biasing of depletion type & enhancement type MOSFET.	14
III	**Digital Electronics:** Number systems; Binary Addition & Subtraction;1's and 2's complement , Subtraction using 2's complement; Boolean algebra; Logic gates; Implementation of basic gates using universal gates; Realization of Boolean functions using basic & universal gates; Canonical forms(SOP & POS); Simplification of Boolean functions using Boolean postulates & K-map up to 4 variables with don't care condition. **Operational Amplifier (Op-Amp):** Operational amplifier: Block diagram, ideal and practical Op-Amp characteristics; Inverting, non-inverting and differential configurations (open loop and closed loop); Applications of Op-Amp as buffer, adder, subtractor, integrator and differentiator.	13

Text Book:
- Robert L. Boylestad and Louis nashel sky, "*Electronic devices and circuit theory*", Pearson Education/PHI, New Delhi.

Reference Books:

- Morris Mano, "*Digital design*", Pearson Education.
- R.A. Gayakwad, "*Op-amps & linear Integrated circuits*", PHI.
- R.J. Smith and R.C. Dorf, Circuits, "*Devices and System,*" Willey, 5th edition.
- Jacob Millman and Christos C. Halkias, "*Integrated Electronics*", TMH, New Delhi.
- H.S. Kalsi; "*Electronic Instrumentation*", TMH, New Delhi.

Outcome: *At the end of the course a student will know: principles of Electronics & Communication Engineering and how they are applied to different types of electronic devices and equipments.*

AHE103: ENGLISH LANGUAGE SKILLS FOR COMMUNICATION - I

Prerequisite: *Knowledge of English Grammer*.

Credits: 02   **Semester: I/II**   **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Grammar**: Parts of Speech: Noun, Pronoun, Adjective, Adverb, Verb; Sentence **Vocabulary**: Word Formation using prefixes & suffixes **Writing**: Developing story from the given clues **Study of Text**: "The Fly" by Katherine Mansfield (From the text prescribed); Comprehension of a given passage from the text	10
II	**Grammar**: Tense; Prepositions **Vocabulary**: Words Often Confused **Writing:** Picture Description **Study of Text**: "The Eyes Are Not Here" by Ruskin Bond (From the text prescribed); Comprehension of a given passage from the text	8
III	**Communication**: What is communication? Process of communication ; Forms of Communication **Grammar:** Articles; Subject –Verb Agreement Error corrections related to the topics covered in grammar. **Vocabulary**: Synonyms & Antonyms **Study of Text**: "The Lament" by Anton P. Chekov (From the text prescribed); Comprehension of a given passage from the text	8

Note: The lecture classes will be held in a batch of 30 students, i.e. half of one section.

Text Book:
- RP Singh, *"An Anthology of Short stories"*, Oxford University Press, New Delhi

Reference Books:

- Wren & Martin, "*High School English Grammar and Composition*", S.Chand & Co. Ltd., New Delhi.
- Allen, W., "*Living English Structure*", Pearson Education, New Delhi.
- *"Collins English Dictionary"*, Harper Collins Publication Ltd.
- *"Longman Dictionary of Contemporary English"*, Pearson Longman, England.
- Murphy, Raymond, "*Intermediate English Grammar"*, Cambridge University Press.
- Norman Lewis, "*Word Power Made Easy"*, Goyal Publications & Distributers, Delhi.
- Mohan, Krishan & N.P. Singh, "*Speaking English Effectively"*, Macmillan India Ltd., New delhi.

AHE185: ENGLISH LANGUAGE LAB - I

Keeping in mind the diverse set of students in the undergraduate programmes of the University, this syllabus focuses on communication activities in functional and situational contexts. It encourages students to develop their skills of listening and speaking. It proposes to train the students to learn the art of speaking English as standard Indian English speakers without the interference of their mother tongues.

Credit: 01   **Semester: I/II**   **L–T–P: 0–0–2**

Module No.	Content	Teaching Hours
I	**Audio Visual Material for Listening and Speaking:** 'First Day at English Class' – Video clip Recording by students 'Vocabulary With Fun' – English Learning Software 'India on Four Wheels' - Documentary **Speaking Activities:** Identifying objects and speaking on similarities and differences between them Describing self, persons & places Describing daily routines Sharing unforgettable past experiences	10
II	**Audio Visual Material for Listening and Speaking:** 'Ancient India's Engineering skills' - Documentary 'Robot' – Video Clips Mr. Duncan's Spoken English (Any two out of the mentioned videos: No. 1 'Introduction'; No. 45 'Describing Things'; No.17 'Time') **Speaking Activities:** Describing future plans Role Plays on real life situations; Small Talks Describing festivals Process Description	9
III	**Audio Visual Material for Listening and Speaking:** 'Natural World of the Himalayas' – Documentary 'Freedom is not Free' – A speech by Shiv Khera 'Stress Management' – Documentary Recording by students **Speaking Activities:** Newspaper Reading Extempore	8

Audio-Visual Material:
- Raman, Meenakshi & Sangeeta Sharma, "*Technical Communication CD*", Oxford University Press.
- Material available in the language Lab.

Reference Books:
- Allen, W., "*Living English Structure*", Pearson Education, New Delhi.
- *"Collins English Dictionary"*, Harper Collins Publication Ltd.
- *"Longman Dictionary of Contemporary English"*, Pearson Longman, England.
- Norman Lewis, "*Word Power Made Easy*", Goyal Publications & Distributers, Delhi.
- Mohan, Krishan & N.P. Singh, "*Speaking English Effectively*", Macmillan India Ltd., New Delhi.

MEE185: ENGINEERING WORKSHOP PRACTICE LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**List of Experiments** • To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c. • To perform the following operations on Centre Lathe: • Turning, Step turning and Taper turning • Facing, Grooving and Knurling • To perform the operations of Marking, Filing and Sawing on the given metallic work-piece (M.S.) as per given dimensions. • To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of Drilling machine. • To perform the operations of making external and internal threads by use of Tapes and Dies. • To develop the blank dimensions for the given product using development process. • To prepare a Funnel of required dimensions using joining processes. • To prepare Lap/Butt joint by an Electric Arc welding. • To prepare Lap/Butt joint by Gas welding. • To perform different operations in Carpentry shop such as cutting, planning and chiseling on the given wooden piece. • To prepare a joint (Lap/T) by using wooden specimen/piece. • To prepare a Sand mould for solid casting with the help of given pattern. • To prepare the mould for hollow casting with the help of pattern and core. • To prepare square bolt head by upsetting process in Black Smithy shop.	36

Outcome: At the end of the course the student will be able to

- Know the practical skills to work with the range of various machining operations
- Understand and comply with workshop safety regulations.

MEE186: ENGINEERING DRAWING

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Introduction:** Introduction to drawing instruments, sheet layout, types of lines and their uses, lettering, types of dimensioning, application of symbols and conventions in drawing practice, geometrical construction. Concepts of scales in drawing and their types **Theory of projections:** Introduction of projections, Orthographic & Pictorial projection, **Orthographic projection:** Projection of points, lines, planes and solids. Section of solids, **Isometric projection:** Concepts of isometric and perspective views. Conversion of pictorial views to orthographic views and vice versa. Development of surfaces & Computer Aided Drawing using Auto CAD.	24

Text Books:
- Bhatt N.D., Panchal V.M., "*Elementary Engineering Drawing*", Charothar Publishing, Gujarat.
- Dhawan R.K.; "*A Text book of Engineering Drawing*", S. Chand.

Reference Books:

- Gopalkrishna K.R, "*Engg. Graphics*"; Subhash Publishers, Bangalore.
- Trymbaka Murty. S, "*Computer Aided Engineering Drawing*"; T.K. International Publishing House Pvt. Ltd. New Delhi.
- Luzadder Warren J., Duff John M., "*Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production*", Practice-Hall of India Pvt. Ltd, New Delhi.
- Singh Ajit, "*Machine Drawing*" Tata McGraw Hill, New Delhi.

Outcome: *At the end of the course the student will be able to*
- *Use common drafting tools to construct engineering drawings and apply dimensions on engineering drawings. Create, construct and Interpret views, sectional views and projections. Create isometric and oblique sketches and identify standard features*
- *Use SI units, and standards scales to produce engineering drawings. Produce engineering drawings using computer aided drafting (CAD) system to improve visualization skills*

AHP181: ENGINEERING PHYSICS LAB

Credits: 01　　　　　**Semester I/II**　　　　　**L–T–P: 0–0–2**

Any twelve experiments, at least five from each group

Module No.	Content	Lab Hours
I	**Group -A** • To determine the wavelength of monochromatic light by Newton's rings. • To determine the wavelength of monochromatic light with the help of Fresnel's biprism. • To determine the focal length of two lenses by nodal slide and to locate the position of cardinal points. • To determine the specific rotation of cane sugar solution using polarimeter. • To determine the wavelength of spectral lines using plane transmission /diffraction grating. • Measurement of wavelength of laser (He- Ne) light using single slit diffraction • To verify Stefan's law by electrical method. • To determine the coefficient of viscosity of water by Poiseuille's method. **Group – B** • To determine the specific resistance of the material of a given wire using Carey Foster's bridge. • To study the variation of magnetic field along the axis of current carrying circular coil and then to estimate the radius of the coil. • To calibrate the given ammeter by potentiometer. • To calibrate the given voltmeter by potentiometer. • To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor. • To determine the energy band gap of a given semiconductor material. • To determine E.C.E. of copper using Tangent or Helmholtz galvanometer. • To draw hysteresis curve of a given sample of ferromagnetic material and then to determine the magnetic susceptibility and permeability of the given specimen. • To determine the ballistic constant of a ballistic galvanometer. • Measurement of fiber attenuation and aperture of optical fiber. • To determine high resistance by leakage method.	24

AHC181: ENGINEERING CHEMISTRY LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Any Twelve Experiments are to be performed

Module No.	Content	Lab Hours
I	- Preparation of standard solution of sodium hydroxide N/10 and standardize with the help of standard solution of oxalic acid. - To determine the strength of the given HCl solution using pH meter. - Determination of temporary and permanent hardness of water sample by complexometric method using EDTA as complexing agent. - Determination of constituents and amount of alkalinity in a given water sample. - To determine the chloride ion in the given water sample by Argentometric method (Mohr's method). - Determination of neutralization of a lubricant oils or Iodine number of unsaturated oil. - Determine of viscosity and surface tension of the given liquid. - Determination of rate constant for acid catalyzed hydrolysis of ethyl acetate through titration. - Determination of iron concentration in the sample of water by colorimetric method. The method involves the use if KCNS as color developing agent and the measurement are carried out at λ_{max} 480 nm. - To determine the ferrous ion content in the given iron ore by titrimetric analysis against standard K_2CrO_7 solution using $K_3[Fe(CN)_6]$ as external indicator. - Determination of moisture content in a given sample of coal. - To determine the free CO_2 in the given sample of water. - To find out the percentage of available chlorine in a given sample of bleaching powder by Iodometric method. - Show that inversion of cane sugar is the example of first order reaction by polari meter.	26

CSE181: COMPUTER PROGRAMMING LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Arithmetic operations** • WAP to perform arithmetic operation over the variables. • WAP to calculate area of the circle. • WAP to find the sum of digits of a number. • WAP to find the reverse of a string.. • WAP to implement perimeter of a rectangle **Function** • WAP to call a function by reference. • WAP to call a function by value. • WAP to calculate factorial of a number. • WAP to print a table of a user define number. • WAP to generate Fibonacci Series **Pointer** • WAP to display the contents of 2D array using pointer. • WAP to sort an array in ascending order using dynamic memory allocation and pointers. **Microsoft Office** • MS Word Introduction. • MS Excel Introduction • MS PowerPoint Introduction. • MS Paint brush Introduction. **Pattern** • **WAP to Design the Following Pattern** * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *	24

EEE181: ELECTRICAL & ELECTRONICS LAB

Credits: 01 **Semester I/II** **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**LIST OF EXPERIMENTS:** • To verify the Thevenin's theorem (DC circuits). • To verify the maximum power transfer theorem (DC circuits). Also draw graph between power and load resistance. • To verify the Superposition Theorem (DC circuits). • To study the phenomenon of resonance in R-L-C series circuit and to draw graph between frequency and current. Also show half power points. • To determine the V-I characteristics of a semiconductor diode. Also calculate forward and reverse static and dynamic resistances. • To study the half wave and full wave (center tapped) rectifier with and without filter. Also to calculate the ripple factor in both cases (without filter). • To study single phase (induction type) energy meter. • To study various logic gates such as OR, AND, NOT, NAND, NOR. • Study of CRO and measurement of voltage and frequency using CRO. • V-I characteristics of Zener diode. • Identification of active and passive components. • V-I characteristics of bipolar junction transistor in common base mode.	24

MEE183: APPLIED MECHANICS LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**List of Experiments** • Study of functioning of gear trains. • Deflection of simply supported beam and verification of theoretical values. • To determine the modulus of rigidity of rod with the help of torsion testing machine. • To study functioning of belt pulley systems. • To find the mechanical advantages, velocity ratio and efficiency of worm and worm wheel. • To find the coefficient of friction between the surface of a given wood slide bar and an inclined plane. • To find the coefficient of friction between belt and pulley using belt pulley system. • To find reaction at the supports of a simply supported beam with different types of loading. • To find moment of inertia of a fly wheel about the axis of rotation using electronic counter machine. • To find centre of gravity of different geometrical objects. • To find forces in members of a truss for different load conditions. • To study conversion of momentum. • To verify the law of conservation of energy. • To verify law of polygon of forces. • To verify law of parallelogram of forces. • Demonstration for centrifugal forces.	24

Outcome: *At the end of the course the student will be able to*

- *Know the practical skills to analyze the forces, moments, and their equilibrium*
- *Know the practical skills to analyze the effect of friction*
- *Develop basic know how and awareness to deal with practical aspects of applied mechanics*

AHM102: MATHEMATICS – II

Prerequisite: *Knowledge of Intermediate level Mathematics & Mathematics I (AHM 101)*.

Credits: 04   **Semester II**   **L–T–P: 3–1–0**

Module No.	Contents	Teaching Hours (Approx.)
I	**Integral Calculus:** Beta and Gamma functions, Double and triple integrals, change of order of integration, change of variables, Application of double and triple integrals to area and volume of solids, Dirichlet integrals and its Liouville's extension. Evaluation of improper integrals.	15
II	**Vector Calculus**: Vector differentiation, Gradient, Divergence and curl, Vector Identities, Vector integration, Line, surface and volume integrals, work done by a force, Green, Gauss' divergence and Stoke's theorem (without proof). **Fourier series**: Fourier series of period 2π, Even and Odd functions, Half range sine and cosine series, Change of interval.	15
III	**Ordinary Differential Equations** : Ordinary differential equations of I order and I degree – variable separable, linear, exact forms, trajectories, n^{th} order linear differential equations with constant coefficients, simultaneous differential equations, method of variation of parameters. Applications of linear differential equations of II order to engineering problems involving electrical circuits and mechanical systems.	15

Text Books :

- Manish Goyal and N. P. Bali, "*A Text Book of Engg. Maths" (*9th Ed.), Laxmi Pub., Delhi.
- B.S. Grewal, " *Higher Engg. Mathematics*", Khanna Publishers, Delhi.
- B.V.Ramanna, "*Higher Engg. Mathematics*", TMH.

Reference Books/ Text Books / Cases:

- W. E. Boyce and R. Di Prima, "*Elementary Diff. Equations*" (8th Ed.), John Wiley.
- Jain, Iyengar and Jain, " *Advanced Engg. Mathematics*", Narosa Publishing House.
- R. V. Churchill and J. W. Brown, "*Fourier series and boundary value problems*", (7th ed.), TMH, 2006.

Outcome:

At the End of the Course, Students Will be Able to Understand How to:
- *Apply the mathematical principles in various engineering disciplines.*

AHC101: ENGINEERING CHEMISTRY

Prerequisite: *Knowledge of Intermediate level Chemistry*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Chemical Kinetics:** order and molecularity of reactions, zero order, First and second order reactions. Integrated rate equations. Theories of reaction rates, factors affecting rate of reaction. **Chemical Bonding:** M.O. theory and its applications in homo & hetero diatomic molecules. Hydrogen bond, metallic bond and their applications. Semi-conductor **Reaction intermediates** (carbocation, carbanion & free radical). Types of isomerism (optical and geometrical) chirality, elements of symmetry, diastereomers, optically active compounds, R-S configuration and E-Z geometrical isomers, conformation of ethane, n-butane. **Functional materials:** Photovoltaic cells, Biomaterials, Smart materials (Piezoelectric, pyroelectrics & ferroelectrics) and Advanced materials.	14
II	Introduction, Definition and Explanation of the terms: phase, component and degree of freedom, Application of phase rule to one component system (water & CO_2 system), pH, buffer solution (Henderson equation). **Polymers:** Polymerization and its classification. Thermoplastic and Thermosetting resins. **Properties of Polymers**, **Molecular weights of Polymers**, Elastomers. Organic conducting and biodegradable polymers (PMMA, polystyrene, Teflon, neoprene, Buna-S, Buna-N Nylon 6, Nylon 66, Terylene, PLA, poly β hydroxy butyrate), vulcanization of rubber. **Water Treatment:** Introduction, Hardness and its units, , L-S Process, Calgon process, Zeolite and Ion-exchange resins, Treatment of Municipal Water, reverse Osmosis, Impurities in water, Characterstics of water, Treatment process Includes above deleted portions, boiler feed water, boiler troubles and remedial measures **Lubrication:** Introduction to lubrication, Classification, Properties & uses.	17
III	**Corrosion**: Introduction, Consequences, Types, Theories of Corrosion, (galvanic, pitting, stress, water line, intergranular & soil corrosion) and Protection of Corrosion. **Spectroscopy:** Elementary ideas and simple applications of UV, visible, infrared and NMR spectral techniques **Fuels**: Classification of fuels. Analysis of coal, determination of calorific values, *Synthetic petrol* **Glass:** Preparation, varieties & Uses. **Ceramics:** Introduction, classification, scope & application.	17

Text Book:

- Shashi Chawala, **"***Theory and practical of engineering chemistry***",** 4th edition, Dhanpat Rai & Co. pvt Ltd.

References Books:

- Morrison & Boyd, *"Organic chemistry"*,6th edition ,Pearson education.
- I.L. Finar, *"Organic chemistry"*,5th edition, Longmans Green & Co ltd.
- Y.R. Sharma, *"Elementary organic spectroscopy: principles and chemical application "*,1st edition, S. Chand and Co.ltd.
- S.S.Dara, *"Text book of engineering chemistry and pollution control"*, 2nd edition, S. Chand and Co.ltd.
- Marsh G Fontana, *"Corrosion Engineering"* 3rd edition, Tata McGraw hill publishing Co ltd.
- Attkins & Others, **"***Inorganic chemistry***"**, 5th edition, Oxford university press.

- Attkins & Others, "*Physical chemistry*", 6th edition, Oxford University press
- Puri, Sharma and Pathania, "*Principles of physical chemistry*", 44th edition, Vishal publishing Co Jalandhar.
- K.J.Laidler, "*Chemical kinetics*", 3rd edition, Pearson education.
- Malik, Tuli and Madan, "*Selected topics in Inorganic chemistry*", 7th edition, S. Chand and Co.ltd.

Outcome:

At the end of the course, students will be able to understand how to:
- *Apply the concepts of chemistry in various engineering disciplines.*

AHP103: ENGINEERING PHYSICS

Prerequisite: *Knowledge of Intermediate level physics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours (Approx.)
I	**Interference:** Principle of superposition ,Coherent Sources, Interference due to division of wavefront- biprism experiment and division of amplitude-Newton's rings. **Polarization:** Introduction to polarization fundamentals, Phenomenon of double refraction, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Quarter and half wave plates, Optical activity, Fresnel's theory for optical rotation, Specific rotation, Biquartz polarimeter. **Fiber Optics:** Principle of optical fiber, acceptance angle and acceptance cone, Numerical aperture, Relation b/w acceptance angle and Numerical aperture, Applications of optical fiber.	15
II	**Electrostatics and Magnetostatics:** Coulomb's law, Gauss theorem and its applications, Laplace and Poisson's equations, Biot Savart law and its applications, Lorentz force, Ampere's law, Faraday law, Lenz law. **Electromagnetics :** Maxwell's equations (Integral and Differential forms), Equation of continuity , Inconsistency in Ampere's law: Displacement current, Propagation of E-M waves in free space and in conducting media, Poynting theorem and Poynting vector. **Electric and magnetic fields in matter:** Dielectric behavior of materials, Dielectric Constant, Clausius-Mossotti relation, Piezoelectricity (qualitative), Magnetisation, dia, para and ferromagnetism, Langevin's theory for diamagnetism.	15
III	**Wave Mechanics & X-ray Diffraction:** Wave - particle duality, Photoelectric effect, de-Broglie hypothesis, Phase and group velocities: wave packet, Heisenberg's uncertainty principle and its applications, Wave function and its normalization, Schrödinger's wave equation: time dependent and time independent wave equations, particle in one dimensional potential box, Diffraction of X-rays by crystal planes, Bragg's law, Compton's effect. **Accoustics and Sound:** Intensity, Loudness, Echo, Absorption coefficient and its determination- Reverberation- Factor affecting Acoustics, Ultrasonic wave and pr production and applications of ultrasonic in engineering. **Nanomaterials:** Basic principle of nanoscience and nanotechnology, Nanostructures, Buckyballs: Properties, Creation & uses, Synthesis & characterization of carbon nano-tube (CNT), Applications of carbon nano-tubes.	15

Text Books:
- Engineering Physics Vol. 1 & Vol 2-S.L. Gupta
- Engineering Physics Vol. 1 & Vol 2-S.K. Gupta

Reference Books / Cases:
- Ajoy Ghatak, "Optics", TMH.
- Anuradha De, "Optical Fibre & Laser", New Age.
- Resnick, Halliday & Walker, "Fundamentalof Physics", Wiley.
- Beiser , "Concept of Modern Physics", TMH.
- Rechard Booker and Earl Boysen , "Nanotechnology", Wiley International Publishing.

Outcome:
At the End of the Course, Students Will be Able to Understand How to:
- *Apply the principles of physics in various engineering disciplines.*

CSE102: PROBLEM SOLVING USING COMPUTERS

Prerequisite: *Knowledge of Fundamentals of Computer & Programming (CSE101).*

Credits: 02   **Semester II**   **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Pointers:** Declaration and Initialization of Pointer Variables, Accessing a Variable Through its Pointer, Pointer Arithmetic, Array of Pointers, Pointer to an Array. **Functions:** Declaration and Definition, Category of Functions, Parameter Passing Techniques – Call by Value and Call By Reference, Passing Arrays to Functions. **Introduction To Storage Classes** – Auto, Static, Extern and Register.	7
II	**Recursion:** Mechanics of Recursive Call, Implementation of Recursion, Recursion vs. Iteration. **User Defined Types:** Enum, Typedef, Union and Structure - Declaration, Initialization, Nested Structures, Arrays of Structures, Structure and Pointer, Passing Structure Through Function. Difference Between Structures and Union.	7
III	**The C Preprocessor:** Introduction, Macro Expansion and File Inclusion. **File Handling:** Data And Information, File Concepts, File Organization, Files In C, File Operations: Open, Read, and Close, Trouble in Opening a File. File Opening Modes, Working with Text Files. **Introduction to Data Structures** – Stack, Queue and Linked List and its Basic Operation.	7

Text Book:

- Behrouz A. Forouzan and Richard F. Gilberg, "*Computer Science – A Structured Programming Approach Using C*", C Language Learning, 2007.

Reference Books:

- K. N. King, "*C Programming a Modern Approach*", W. W. Norton, 2nd Edition, 2008.
- Kernighan and Ritche, "*The C programming Language*", PHI, 2nd Edition, 2011.
- P. Dey and M. Ghosh, "*Programming in C*", Oxford University Press 1st Edition, 2000.

Outcome:

At the end of the course, students will be able to understand how to:
- *Write Programs that Perform Explicit Memory Management.*
- *Create Programs that Measure or Simulate Performance and Use Them to Analyze Behavior. Write The Programs for Compiler and Operating Systems.*

MEE104: BASIC MECHANICAL ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Fundamentals of Thermal Engineering** Thermodynamic systems, State & properties, Thermodynamic equilibrium & processes, Heat & work, Work done for different polytrophic processes, Zeroth law of thermodynamics and its applications, First law of thermodynamics, Steady flow energy equation, Application of first law to various thermodynamic systems and its limitations.	13
II	**Applications of Thermal Engineering** Concept of heat engine, heat pump & refrigerator, Second Law of Thermodynamics, Carnot theorem. Clausius Inequality, Concept of entropy, Entropy change during various processes, Introduction to 2 stroke and 4 stroke SI & CI Engines. **Metal Forming & Casting Process** Introduction Hot & Cold working processes, forging, rolling, extrusion, types of patterns and their allowances, moulding sand and their properties, concept of gating system.	13
III	**Machining Processes** Working principles and operations of Lathe, Drilling Machine, Grinding Machine and Shaper. **Fabrication processes** Basic principles and applications of Arc welding, Gas welding, Spot welding, Soldering and Brazing.	14

Text Books:
- Nag P. K, "*Engineering Thermodynamics*", TMH.
- Yadav R., "*Thermodynamics and Heat Engines*", Vol I & II (Sl Edition), Central Publishing House Allahabad.
- Hajra Chowdhary SK and Hajra Chowdhary AK, "*Workshop Technology*", Media Promotors & Publishers.
- Raghuwanshi RS, "*Workshop Technology*", Dhanpat Rai and Sons, New Delhi.

Reference Books:

- VaWylen G.J. & Sonnlog R.E, "*Fundamentals of classical thermodynamics*", John Wiley & Sons, Inc. NY.
- WarkWenneth, "*Thermodynamics*", TMH.
- Joel R., Basic Engineering "*Thermodynamics*", Addison Wesley.
- Chapman WAJ, "*Workshop Technology*" Part 1-3, Viva Books Pvt. Ltd. New Delhi.

Outcome: *At the end of the course the student will be able to*
- *Understand the basic laws of thermodynamics and their applications in engineering*
- *Understand the processes and operations of metal joining ,fabrication casting and machining with applications*
- *Develop basic know how and awareness of various manufacturing processes to deal with real life applications in various fields of engineering*

MEE103: APPLIED MECHANICS

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04　　　　　　**Semester I/II**　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction** Engineering Mechanics: Idealization of Bodies, concept of Rigid Body, External Forces, moments, couples, Laws of Mechanics. **Force Systems And Equilibrium** Concurrent forces in a plane, Parallel forces in a plane, Free Body Diagram, Equation of equilibrium and their applications to various systems of forces. **Friction** Concepts of friction, Dry friction, Laws of friction and their applications to wedge, ladder, screw, belt-pulley system, Rolling friction.	14
II	**Distributed Forces and Moment Of Inertia** Centroid of Composite figures, Area Moment of Inertia, Polar Moment of Inertia, Parallel axis theorem, Perpendicular axis theorem, Principle Moment of Inertia, Mass Moment of Inertia of circular ring, disc, cylinder, sphere and cone about their axis of symmetry. **Beams** Different support & load conditions, Shear Force and Bending Moment Diagrams for point load, uniformly distributed load, uniformly varying load.	12
III	**Analysis of Plane Trusses** Engineering structures, Perfect Truss, Determination of axial forces in the members, Method of Joints, Method of Section. **Kinematics of Rigid Body** Plain motion of rigid body, Velocity and acceleration under translation and rotational motion, Absolute motion, Relative motion. **Kinetics of Rigid Body** Force, Mass and Acceleration, Work, Power and Energy, Impulse and Momentum, D' Alembert's Principle and dynamic equilibrium.	14

Text Books:

- Dr. A.K. Tayal , "*Engineering Mechanics*" – Statics & Dynamics, Umesh Publications, Delhi
- V.S. Mokashi ,"*Engineering Mechanics*" – Statics Vol.I & Dynamics Vol-II, TMH.

Reference Books:

- I.H. Shames , "*Engineering Mechanics*", Prentice Hall of India Pvt. Ltd., New Delhi (EEE)
- F.P. Beer & E.R. Johnston, "Mechanics for Engineers" –Statics and Dynamics, TMH.
- J.L. Marriam& L.G. Kraig, "*Engineering Mechanics*" – Statics & Dynamics, John Wiley & Sons Ltd.

Outcome: *At the end of the course the student will be able to*

- *Understand the representation and analysis of forces, moments, and equilibrium of particles and rigid bodies, concept and principles of work and energy*
- *Comprehend the effect of friction and its role in engineering applications*
  Develop basic know how and awareness to deal with real life applications in various fields of
engineering.

ECE101: ELECTRONICS ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics.*

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Contents	Teaching Hours
I	**Transport phenomenon in semiconductors:** Semiconductor materials; Intrinsic and Extrinsic semiconductors; Mass-action law, Drift and diffusion of charge carriers. **Junction diodes:** P-N Junction diode: construction, operation & characteristics; Zener and Avalanche breakdown mechanisms; Diode resistance and capacitance; Photo-diode and LED. **Diode applications:** Rectifiers: half wave, full wave : Centre-tapped and bridge type.; Filters; Clippers; Clampers; Voltage Multipliers; Zener diode as voltage regulator; Regulated power supply.	14
II	**Bipolar Junction Transistor (BJT):** Bipolar junction transistor: construction & operation; CB ,CE, CC configurations & their Characteristics; Operating point; Transistor as a switch; Need of biasing; Biasing methods: fixed bias, emitter bias, potential divider bias, voltage feedback bias; Bias stabilization; Stability factor; h-parameters; Small signal analysis of Single stage BJT amplifier. **Field Effect Transistor (FET):** Construction, operation & characteristics of JFET; Shockley's equation; Depletion& Enhancement type MOSFET; Biasing of JFET:-fixed bias, self bias and voltage divider bias; Biasing of depletion type & enhancement type MOSFET.	14
III	**Digital Electronics:** Number systems; Binary Addition & Subtraction;1's and 2's complement , Subtraction using 2's complement; Boolean algebra; Logic gates; Implementation of basic gates using universal gates; Realization of Boolean functions using basic & universal gates; Canonical forms(SOP & POS); Simplification of Boolean functions using Boolean postulates & K-map up to 4 variables with don't care condition. **Operational Amplifier (Op-Amp):** Operational amplifier: Block diagram, ideal and practical Op-Amp characteristics; Inverting, non-inverting and differential configurations (open loop and closed loop); Applications of Op-Amp as buffer, adder, subtractor, integrator and differentiator.	13

Text Book:
- Robert L. Boylestad and Louis nashel sky, "*Electronic devices and circuit theory*", Pearson Education/PHI, New Delhi.

Reference Books:

- Morris Mano, "*Digital design*", Pearson Education.
- R.A. Gayakwad, "*Op-amps & linear Integrated circuits*", PHI.
- R.J. Smith and R.C. Dorf, Circuits, "*Devices and System,*" Willey, 5th edition.
- Jacob Millman and Christos C. Halkias, "*Integrated Electronics*", TMH, New Delhi.
- H.S. Kalsi; "*Electronic Instrumentation*", TMH, New Delhi.

Outcome: *At the end of the course a student will know: principles of Electronics & Communication Engineering and how they are applied to different types of electronic devices and equipments.*

EEE101: ELECTRICAL ENGINEERING

Prerequisite: *Knowledge of Intermediate level Physics & Mathematics*.

Credits: 04   **Semester I/II**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**DC circuit analysis & Network theorems:** Fundamentals of electric circuits, Kirchhoff's laws, mesh analysis, node analysis, Thevenin theorem, maximum power transfer theorem, superposition theorem. **Steady state AC analysis:** AC fundamentals, average & rms value of different AC waveforms, phasor algebra, analysis of series AC circuits, power triangle, concept of power factor, power factor improvement.	13
II	**Three phase AC circuits:** Generation & advantages of three phase system, star & delta connection, line & phase voltage/current relations. **Magnetic circuits:** Faraday's law, Self and mutual inductance**,** B-H characteristics, hysteresis & eddy current losses, basics of magnetic circuit. **Single phase Transformers: :** Constructional feature, Working Principle, EMF equation, Ideal transformer, Equivalent Circuit, Phasor diagram , Definition of voltage regulation and efficiency, introduction to autotransformer.	14
III	**Rotating Electrical Machines**: Introduction to Electromechanical Energy Conversion. DC Machine: Construction, Operating principle, EMF Equation, Types of DC Motor, Torque Equation, Characteristics and applications. Induction motor: 3-phase: Construction & principle, Torque Equation, Torque-slip Characteristics. Single Phase Induction motor: Principle and Starting methods. Synchronous Motor: Operating principle and applications. **Electrical Installation and Illumination:** Introduction to distribution of electrical energy, Types of cables & switches, Electrical wiring. Fluorescent sodium vapour and mercury lamp.	14

Text Book:
- D.C. Kulshrestha, "Electrical Engineering", Tata McGraw Hill.

Reference Books:
- T.K. Nagsarkar & M.S.Sukhija, "Basic Electrical Engineering", Edition 2008, Oxford University Press.
- H. Cotton, "Advanced Electrical Technology", 2nd Edition 2009, Wheeler Publishing.
- I. J. Nagarath, "Basic Electrical Engineering", 2nd Edition, Tata McGraw Hill.
- D. E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering", 5th Edition, McGraw Hill.
- Edward Hughes, "Electrical Technology", 3rd Edition, Pearson Education.

Outcome: *At the end of the course a student will know: principles of Electrical Engineering and how they are applied to different types of electrical machines and transformers. Domestic and industrial wiring-layout, cables and switches. Single-phase, three-phase: electrical systems and its distribution.*

AHE 104: ENGLISH LANGUAGE SKILLS FOR COMMUNICATION-II

Keeping in mind the diverse set of students in the undergraduate programmes of the University, this syllabus focuses on communication activities in functional and situational contexts. It encourages students to develop their skills of reading and writing.

Credits: 02   **Semester: II**   **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Grammar**: Active Passive Voice **Vocabulary**: One Word Substitutions **Writing**: Letter writing: Applications and Complaint letters **Study of Text**: "Science and Human Life" by JBS Haldane (From the text prescribed); Comprehension of a given passage from the text	9
II	**Grammar**: Modal Auxiliaries; Connectives **Vocabulary**: Homophones & Homonyms **Writing:** Description of Technical Objects **Study of Text**: "The Heritage of India" by A.L. Basham (From the text prescribed); Comprehension of a given passage from the text.	9
III	**Listening**: Importance of Listening; Listening & Hearing, Active & Passive Listening **Grammar:** Conditionals; Error correction related to the topics covered in grammar. **Vocabulary**: Technical Vocabulary **Writing**: Paragraph Writing: Features & methods of Development; writing paragraph on given topic **Study of Text**: "Of Studies" by Francis Bacon	8

Note: The lecture classes will be held in a batch of 30 students, i.e. half of one section.

Prescribed Text: *An Anthology of English Essay,* Ed. RP Singh, Oxford University Press, New Delhi.

Reference Books:

- **Wren & Martin**, "*High School English Grammar and Composition"*, S.Chand & Co. Ltd., New Delhi.
- **Allen, W.,** *Living English Structure*, **Pearson Education, New Delhi.**
- *"Collins English Dictionary",* **Harper Collins Publication Ltd.**
- *"Longman Dictionary of Contemporary English",* **Pearson Longman, England.**
- **Murphy, Raymond, "***Intermediate English Grammar",* **Cambridge University Press.**
- **Norman Lewis, "***Word Power Made Easy",* **Goyal Publications & Distributers, Delhi.**
- **Mohan, Krishan & N.P. Singh, "***Speaking English Effectively",* **Macmillan India Ltd., New Delhi.**

AHE 186: ENGLISH LANGUAGE LAB-II

Keeping in mind the diverse set of students in the undergraduate programmes of the University, this syllabus focuses on communication activities in functional and situational contexts. It encourages students to develop their skills of listening and speaking. It proposes to train the students to learn the art of speaking English as standard Indian English speakers without the interference of their mother tongues.

Credit: 01 **Semester: II** **L–T–P: 0–0–2**

Module No.	Content	Teaching Hours
I	**Audio Visual Material for Listening and Speaking:** 'Sky Pronunciation' - Pronunciation Learning Software 'You can if you think you can' – A speech by Kiran Bedi 'Mind Control' - Documentary Group Discussion Videos **Speaking Activities** : Words commonly mispronounced Power Point Presentation on Contemporary Issues Group Discussion	10
II	**Audio Visual Material for Listening and Speaking:** 'Mr. Duncan's Spoken English' (Any two out of the mentioned videos: No. 42 'Action'; No. 'Thank you'; No.17 'All About Yourself') 'Light Fantastic'– Documentary 'Water Horse' – Video clips **Speaking Activities:** Technical Description of Engineering objects Hot Seat – Activity on asking questions Interpretation of pictures	8
III	Mock Interview Videos 'The Secrets of The Taj Mahal' – Documentary Ideas Worth Spreading – A demonstration speech by Pranav Mistry Recording by Students **Speaking:** Presentation of Advertisements Mock Interview	8

Audio-Visual Material:

- Material available in the language Lab.
- Raman, Meenakshi & Sangeeta Sharma, *Technical Communication CD,* Oxford University Press, New Delhi.

Reference Books:

- Allen, W., *"Living English Structure"*, Pearson Education, New Delhi.
- *"Collins English Dictionary"*, Harper Collins Publication Ltd.
- *"Longman Dictionary of Contemporary "English*, Pearson Longman, England.
- Norman Lewis, *"Word Power Made Easy"*, Goyal Publications & Distributers, Delhi.
- Mohan, Krishan & N.P. Singh, *"Speaking English Effectively"*, Macmillan India Ltd., New Delhi.

MEE186: ENGINEERING DRAWING

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Introduction:** Introduction to drawing instruments, sheet layout, types of lines and their uses, lettering, types of dimensioning, application of symbols and conventions in drawing practice, geometrical construction. Concepts of scales in drawing and their types **Theory of projections:** Introduction of projections, Orthographic & Pictorial projection, **Orthographic projection:** Projection of points, lines, planes and solids. Section of solids, **Isometric projection:** Concepts of isometric and perspective views. Conversion of pictorial views to orthographic views and vice versa. Development of surfaces & Computer Aided Drawing using Auto CAD.	24

Text Books:
- Bhatt N.D., Panchal V.M., "*Elementary Engineering Drawing*", Charothar Publishing, Gujarat.
- Dhawan R.K.; "*A Text book of Engineering Drawing*", S. Chand.

Reference Books:

- Gopalkrishna K.R, "*Engg. Graphics*"; Subhash Publishers, Bangalore.
- Trymbaka Murty. S, "*Computer Aided Engineering Drawing*"; T.K. International Publishing House Pvt. Ltd. New Delhi.
- Luzadder Warren J., Duff John M., "*Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production*", Practice-Hall of India Pvt. Ltd, New Delhi.
- Singh Ajit, "*Machine Drawing*" Tata McGraw Hill, New Delhi.

Outcome: *At the end of the course the student will be able to*
- *Use common drafting tools to construct engineering drawings and apply dimensions on engineering drawings. Create, construct and Interpret views, sectional views and projections. Create isometric and oblique sketches and identify standard features*
- *Use SI units, and standards scales to produce engineering drawings. Produce engineering drawings using computer aided drafting (CAD) system to improve visualization skills*

MEE185: ENGINEERING WORKSHOP PRACTICE LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**List of Experiments** • To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c. • To perform the following operations on Centre Lathe: • Turning, Step turning and Taper turning • Facing, Grooving and Knurling • To perform the operations of Marking, Filing and Sawing on the given metallic work-piece (M.S.) as per given dimensions. • To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of Drilling machine. • To perform the operations of making external and internal threads by use of Tapes and Dies. • To develop the blank dimensions for the given product using development process. • To prepare a Funnel of required dimensions using joining processes. • To prepare Lap/Butt joint by an Electric Arc welding. • To prepare Lap/Butt joint by Gas welding. • To perform different operations in Carpentry shop such as cutting, planning and chiseling on the given wooden piece. • To prepare a joint (Lap/T) by using wooden specimen/piece. • To prepare a Sand mould for solid casting with the help of given pattern. • To prepare the mould for hollow casting with the help of pattern and core. • To prepare square bolt head by upsetting process in Black Smithy shop.	36

Outcome: At the end of the course the student will be able to

• Know the practical skills to work with the range of various machining operations
• Understand and comply with workshop safety regulations.

AHC181: ENGINEERING CHEMISTRY LAB

Credits: 01   **Semester II**   **L–T–P: 0–0–2**

Any Twelve Experiments are to be performed

Module No.	Content	Lab Hours
I	- Preparation of standard solution of sodium hydroxide N/10 and standardize with the help of standard solution of oxalic acid. - To determine the strength of the given HCl solution using pH meter. - Determination of temporary and permanent hardness of water sample by complexometric method using EDTA as complexing agent. - Determination of constituents and amount of alkalinity in a given water sample. - To determine the chloride ion in the given water sample by Argentometric method (Mohr's method). - Determination of neutralization of a lubricant oils or Iodine number of unsaturated oil. - Determine of viscosity and surface tension of the given liquid. - Determination of rate constant for acid catalyzed hydrolysis of ethyl acetate through titration. - Determination of iron concentration in the sample of water by colorimetric method. The method involves the use if KCNS as color developing agent and the measurement are carried out at λ_{max} 480 nm. - To determine the ferrous ion content in the given iron ore by titrimetric analysis against standard K_2CrO_7 solution using $K_3[Fe(CN)_6]$ as external indicator. - Determination of moisture content in a given sample of coal. - To determine the free CO_2 in the given sample of water. - To find out the percentage of available chlorine in a given sample of bleaching powder by Iodometric method. - Show that inversion of cane sugar is the example of first order reaction by polari meter.	26

AHP181: ENGINEERING PHYSICS LAB

Credits: 01   **Semester II**   **L–T–P: 0–0–2**

Any twelve experiments, at least five from each group

Module No.	Content	Lab Hours
I	**Group -A** • To determine the wavelength of monochromatic light by Newton's rings. • To determine the wavelength of monochromatic light with the help of Fresnel's biprism. • To determine the focal length of two lenses by nodal slide and to locate the position of cardinal points. • To determine the specific rotation of cane sugar solution using polarimeter. • To determine the wavelength of spectral lines using plane transmission /diffraction grating. • Measurement of wavelength of laser (He- Ne) light using single slit diffraction • To verify Stefan's law by electrical method. • To determine the coefficient of viscosity of water by Poiseuille's method. **Group – B** • To determine the specific resistance of the material of a given wire using Carey Foster's bridge. • To study the variation of magnetic field along the axis of current carrying circular coil and then to estimate the radius of the coil. • To calibrate the given ammeter by potentiometer. • To calibrate the given voltmeter by potentiometer. • To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor. • To determine the energy band gap of a given semiconductor material. • To determine E.C.E. of copper using Tangent or Helmholtz galvanometer. • To draw hysteresis curve of a given sample of ferromagnetic material and then to determine the magnetic susceptibility and permeability of the given specimen. • To determine the ballistic constant of a ballistic galvanometer. • Measurement of fiber attenuation and aperture of optical fiber. • To determine high resistance by leakage method.	24

CSE182: PROBLEM SOLVING LAB - II

Credits: 01　　　　　**Semester II**　　　　　**L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Recursion** • WAP to calculate factorial of a number. • WAP to generate table of any number. • WAP to find GCD of two numbers. • WAP to calculate nth term of Fibonacci Series 1,1,2,3,5,8. • WAP to find the sum of digits of a number. • WAP to find the reverse of a string. **Structure** • WAP to enter 10 records of student. Structure fields are Name, Roll no, Marks. Calculate the average of their marks. • Declare a structure which will contain the following data for three employees. 　i. Emp_code 3 characters, 　ii. First_name 20 characters, 　iii. Middle_initial 1 character, 　iv. Last_name 20 characters. 　v. The employee code to be stored in the structure is E01, E02, E03. Write a program to input names for 3 employees and printout initials of each.(e.g. Anil K Nehra will be printed as AKN) along their codes. • WAP to demonstrate, how structure is passed to a function. • WAP to perform arithmetic operations using functions and switch case and enumeration. **Pointer** • WAP to display the contents of 2D array using pointer. • WAP to sort an array in ascending order using dynamic memory allocation and pointers. **File handling** • WAP to copy the contents of a given file into another file. • WAP to read the characters from a file and display the uppercase on a console. **Introduction to Data Structure** • WAP to demonstrate various operations (create, push, pop, overflow, underflow, peek, display) of STACK using array implementation. • WAP to demonstrate various operations (create, enqueue, dequeue, overflow, underflow, peek, display) of Queue using array implementation. • WAP to demonstrate various operations [(create, Traversing, Searching, Inserting an element (at beginning, at end, after a given element), Deleting an element (from beginning, from end, after a given element)] of a linked List. • WAP to demonstrate various operations (create, Traversing, Searching, Inserting an element at beginning, Deleting an element from end) of a doubly linked List.	24

MEE183: APPLIED MECHANICS LAB

Credits: 01   **Semester I/II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**List of Experiments** • Study of functioning of gear trains. • Deflection of simply supported beam and verification of theoretical values. • To determine the modulus of rigidity of rod with the help of torsion testing machine. • To study functioning of belt pulley systems. • To find the mechanical advantages, velocity ratio and efficiency of worm and worm wheel. • To find the coefficient of friction between the surface of a given wood slide bar and an inclined plane. • To find the coefficient of friction between belt and pulley using belt pulley system. • To find reaction at the supports of a simply supported beam with different types of loading. • To find moment of inertia of a fly wheel about the axis of rotation using electronic counter machine. • To find centre of gravity of different geometrical objects. • To find forces in members of a truss for different load conditions. • To study conversion of momentum. • To verify the law of conservation of energy. • To verify law of polygon of forces. • To verify law of parallelogram of forces. • Demonstration for centrifugal forces.	24

Outcome: *At the end of the course the student will be able to*

- *Know the practical skills to analyze the forces, moments, and their equilibrium*
- *Know the practical skills to analyze the effect of friction*
- *Develop basic know how and awareness to deal with practical aspects of applied mechanics*

EEE181: ELECTRICAL & ELECTRONICS LAB

Credits: 01   **Semester II**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**LIST OF EXPERIMENTS:** • To verify the Thevenin's theorem (DC circuits). • To verify the maximum power transfer theorem (DC circuits). Also draw graph between power and load resistance. • To verify the Superposition Theorem (DC circuits). • To study the phenomenon of resonance in R-L-C series circuit and to draw graph between frequency and current. Also show half power points. • To determine the V-I characteristics of a semiconductor diode. Also calculate forward and reverse static and dynamic resistances. • To study the half wave and full wave (center tapped) rectifier with and without filter. Also to calculate the ripple factor in both cases (without filter). • To study single phase (induction type) energy meter. • To study various logic gates such as OR, AND, NOT, NAND, NOR. • Study of CRO and measurement of voltage and frequency using CRO. • V-I characteristics of Zener diode. • Identification of active and passive components. • V-I characteristics of bipolar junction transistor in common base mode.	24

CEE201: ENVIRONMENTAL STUDIES

Credits: 02   **Semester III/IV**   **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Basics of Environmental Studies**: Environmental Studies: Introduction, Scope and Importance Environment: Concept, Natural and Anthropogenic Environment Natural Environment: Structure & Function of Atmosphere, Hydrosphere, Lithosphere and Biosphere Ecology and Ecosystem: Definitions Types, Structure & Functions of Ecosystem. Natural Resources: Introduction, Classification, Concept of Conservation Present Status and Major Issues Related to Water Resources, Forest Resources and Mineral Resources.	9
II	**Current Environmental Problems**: Energy Resources: Introduction, Classification, Energy Use Patterns, Energy Crisis, Alternative Energy Resources Present Status and Major Issues Related to Fossil Fuels, Hydroelectricity, Nuclear Energy, Solar Energy and Biomass Energy. Effects of Human Activities on Environment: Effect of Agriculture, Housing, Mining, Transportation and Industries Environment Pollution: Causes, Effects and Control of Air Pollution, Water Pollution, Land Pollution and Noise Pollution Introduction and Management of Solid Wastes and Hazardous Wastes Global Environmental Challenges: Global Warming, Ozone Layer Depletion, Acid Rain, Urbanization, Overpopulation and Biodiversity Depletion.	9
III	**Environmental Protection:Environmental Protection**: Role of Citizens, Role of Government, Initiatives by NGOs, Contribution of International Agencies and Conventions Approaches to Environmental Protection: Public Awareness, Environmental Education, Environmental Ethics, Environmental Laws and Environmental Economics Tools and Strategies: Environmental Impact Assessment, Life Cycle Assessment, Ecological Footprints and Sustainable Development Efforts towards Environmental Protection in India.	8

References:

- Benny Joseph , **Environmental Studies.**
- Deswal & Deshwal , **Textbook on Environmental Studies.**
- AK De , **Environmental Studies.**
- Shashi K Singh and Anisha Singh , **Environmental Science & Ecology.**
- Agarwal and Sangal , **Environment & Ecology.**

CSE211: DATA STRUCTURES & ALGORITHMS

Prerequisite: *Fundamentals of Computer Programming (CSE 101), Problem Solving using Computers* (CSE 102).

Credits: 04　　　　　　　　**Semester III**　　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic Notations - Big Oh; Operations on Data Structure, Abstract Data Types (ADT). **Stacks:** 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, Implementation of Queue Using Array and Linked List, Circular Queues, Dequeue and Priority Queue, Application of Queue. **Linked Lists:** Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circular Linked List, Operations on a Linked List - Insertion, Deletion, Traversal; Polynomial Representation and Addition, Generalized Linked List, Heterogeneous Linked List Versus Homogeneous Linked List.	13
II	**Trees:** Basic Terminology, Binary Trees, Binary Tree Representation - Array Representation and Dynamic Representation; Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Tree Traversal Algorithms - Inorder, Preorder and Postorder; Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm. **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. **Searching:** Sequential Search, Binary Search, Comparison and Analysis. **Sorting:** Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, Radix Sort. Heap Sort & their Time Complexities.	14
III	**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 Dijkstra Algorithm, Introduction to Activity Networks. **Hashing:** Hash Function, Collision Resolution Strategies. **File Structures**: Physical Storage Media, File Organization, Organization of Records into Blocks, Sequential Files, Indexing and Hashing, Primary Indices, Secondary Indices, B+ Tree Index Files, B Tree Index Files, Indexing and Hashing Comparisons.	13

Text Book:
- Aaron M. Tanenbaum, Yedidyah Langsam and Moshe J. Augenstein (2009), "*Data Structures Using C and C++",* 2nd Edition, PHI.

Reference Books:
- Horowitz and Sahani (2004-05), "*Fundamentals of Data Structures*", 3rd Edition, W H Freeman & Co.
- Jean Paul Trembley and Paul G. Sorenson (2007), "An Introduction to Data Structures with Applications", 2nd Edition, TMH.
- R. Kruse, "Data Structures and Program Design in C" (2004), 2nd Edition, Pearson Education.
- Lipschutz Schaum's Outline Series (2010), "Data Structures", 12th Reprint, TMH.
- G A V Pai (2009), "*Data Structures and Algorithms",* TMH.

Outcome:
After completion of course, student will be able to implement the structuring of data in desired manner

CSE212: COMPUTER ORGANIZATION

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Electronics Engineering (ECE101).*

Credits: 04　　　　　　　**Semester III**　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Number representation; fixed and floating-point number representation, IEEE standard for floating point representation. Error detection and correction codes. Basic organization of the computer and block level description of the functional units, Introduction to Assembly language, instruction set, instruction cycles. Register, bus and memory transfer. **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 register organization, stack organization and addressing modes.	13
II	**Multiprogramming and Multiprocessing**; Introduction to pipelined operation. Control Unit: Instruction types, formats, micro-operations, execution of a complete instruction. Hardwired and micro programmed control: micro programmed sequencing, Microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	14
III	**Memory:** Basic concept and hierarchy, RAM memories, 2D, 2 & 1/2D memory organization. ROM memories. Cache memories: concept and design issues, performance, address mapping and replacement. Auxiliary memories: magnetic disk, magnetic tape and optical disks. Virtual memory: concept and implementation. **Input / Output**: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Buses, bus architecture, types of buses and bus arbitration. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Standard communication interfaces.	13

Text Book:

- M. Mano (1996), "*Computer System Architecture*", 3rd Edition, PHI.

Reference Books:

- D.W. Patterson (2008), "*Computer Organization and Design*", 4th Edition, Elsevier Publication.
- William Stalling (2011)*, "Computer Organization",* 8th Edition, PHI
- V. Carl Hamacher, Zaky (1996), "*Computer Organization",* 4th International Edition, TMH.
- John P Hays, *"Computer Organization"*, 2nd Edition, TMH.
- Tannenbaum (2005), "*Structured Computer Organization*", 5thEdition, PHI.
- P Pal Chaudhry (2002), "*Computer Organization & Design*", 2nd Edition, PHI.

Outcome:

After completion of the course, the student will be:
- *Familiar with the organization of major subsystems.*
- *Familiar with the basic knowledge of design of digital logic circuits and apply to computer organization.*

CSE213: DISCRETE MATHEMATICS

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Mathematics – I (AHM101).*

Credits: 4   **Semester III**   **L T P: 3 1 0**

Module No.	Content	Teaching Hours
I	**Sets and Relations:** Introduction to Set Theory, Venn diagrams, algebra of Sets, Inclusion-Exclusion Principle, Partitions, Proof Techniques, Relations, Properties and their types. Recurrence Relations and Generating Functions **Introduction to Counting Principle**: Permutation, Combination, Permutation with Repetition, Combination with Repetition, Pigeonhole Principle.	13
II	**Probability Theory**: Introduction to Probability Theory, Conditional Probability, Baye's Theorem. **Propositional Logic** - Logical Connectives, Truth Tables, Normal Forms(Conjunctive and Disjunctive), Validity; **Predicate Logic** - Quantifiers, Inference Theory, Methods of Proof.	14
III	**Algebra**: Motivation of Algebraic Structures, Finite Groups, Subgroups and Group Homomorphism; Lagrange's Theorem; Commutative Rings and Elementary Properties; **Graph Theory:** Introduction to Graphs, Types, Operations on Graphs, Connectivity.	13

Text Book:

- Kenneth H Rosen (2012), "*Discrete Mathematics and Its Applications", 7th edition,* TMH.

Reference Books:

- J.P.Tremblay (1997)*, "Discrete Mathematical Structures with Applications to Computer Science",* TMH, New Delhi.
- V. Krishnamurthy (1986), "*Combinatorics: Theory and Applications",* East-West Press, New Delhi.
- Ralph P. Grimaldi (2004), "*Discrete and Combinatorial Mathematics- An Applied Introduction"*, 5th Edition, Pearson Education.
- C.L.Liu (2000), "*Elements of Discrete Mathematics"*, 2nd Edition, TMH.

Outcome:

After the completion of the course, the student will be able to:
- *Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.*
- *Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem solving.*
- *Use effectively algebraic techniques to analyze basic discrete structures and algorithms.*

ITE211: OBJECT ORIENTED PROGRAMMING

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Problem Solving using Computers* (CSE 102).

Credits: 04   **Semester III**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction To UML**: Conceptual Model of the UML, Architecture; Object Oriented Techniques, Structural Modeling - Classes, Relationships, Class & Object Diagrams, Collaboration Diagrams, Sequence Diagrams; 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. **Java Fundamentals:** Introduction to Java, Features, Objects, Methods & Classes, Constructors, Abstract Classes, Polymorphism.	13
II	**Object Design Implementation:** Inheritance, Packages and Interfaces, Exception Handling, Multithreaded Architecture and Thread Control Methods, I/O, String Handling, Introduction to Wrapper Classes & Generic Class, Collection Framework. **GUI Programming**: Java Applet, Graphics & Animations, Controlling Animations through Threads, Introduction to AWT Programming, Basic UI Components, Layout and Component Managers, Event Handling, Swing Components – Creating a Swing Applet and Application.	14
III	**JDBC:** Types of Drivers, The Connectivity Model, JDBC/ODBC Bridge, Communicating with Database. **Multimedia Experience:** Processing Image using Java, Java Cryptography, Java Security API, Introduction to Java Web Services, Composite Computing Model. **Remote Method Invocation:** RMI Architecture, Creating RMI Client/ Server Application, Java Beans & Introduction to Enterprise Java Beans, Java Servlets - Servlet Basics, Servlet API.	13

Text Book:

- Michael R Blaha, James R. Rumbaugh, *"Object Oriented Modeling and Design with UML"*, 2nd Edition, Pearson Education.
- Naughton, Schildt, "*The Complete Reference JAVA2",* 7th Edition, TMH.

Reference Books:

- Cay Horstmann, "*Big Java",* 5th Edition, Wiley India Edition.
- Loy & Wood, "*Java Swing"*, O'Reilly.
- Bhave & Patekar, "*Programming with Java",* Pearson Education.

Outcome:

After the completion of the course, students will be able to develop programs based on OOP features.

CSE281: DATA STRUCTURES & ALGORITHMS LAB

Credits: 01   **Semester III**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- Program to demonstrate the various operations on array based stack. - Program to convert an infix expression into postfix expression. - Program to evaluate a given postfix expression. - Program to generate fibonacci series using Recursion. - Program to demonstrate the implementation of various operations on linear queue represented using an array. - Program to implement various operations in a singly linked list. - Program to implement insertion, deletion and traversal in a doubly linked List. - Program to implement polynomial addition using linked list. - Program to demonstrate the implementation of insertion and traversals on a binary search tree. - Program to implement Dijkstra's Algorithm to find the shortest path between source and destination. - Program to search a given element as entered by the user using sequential search. - Program to demonstrate the use of binary search to search a given element as entered by the user. - Implementation of various sorting algorithms like Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort and Heap Sort.	24

CSE282: COMPUTER ORGANIZATION LAB

Credits: 01　　　　　　　　**Semester III**　　　　　　　　**L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	• Bread Board Implementation of Flip-Flops. • Experiments with clocked Flip-Flops. • Design of Counters. • Bread Board implementation of Counters & Shift Registers. • Implementation of Arithmetic Algorithms. • Bread Board implementation of Adder/Subtractor (Half, Full). • Bread Board implementation of Binary Adder. • Bread Board implementation of Seven Segment Display.	24

ITE281: OBJECT ORIENTED PROGRAMMING LAB

Credits: 01　　　　　　　　**Semester III**　　　　　　　　**L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- Programs based on the concepts of: Java Classes, Constructors, Polymorphism and Keyword Static. - Programs based on the concepts of: Inheritance Using Java, Multithreading Using Thread Class & Interface Runnable, String Handling, Generic Classes and Collection API. - Programs based on the concepts of: ○ Applet Programming, Combining Multithreading with Graphics, ○ UI Development Using AWT and Swings, Handling Events on UI Components. - Handling Database Connectivity with Java. - Concepts of Image Processing Using Java. - Implementation of Distributed Computing using RMI.	24

AHE281: SOFT SKILLS-I

After two courses on spoken English namely Spoken English - 1 & 2, this course focuses more on the use of English, specifically in business situations. The course is based on diverse range of business themes which help students visualize the expectations from a professional.

Course Objective:

Soft Skills-I programme will ensure that the students gain confidence and belief in what they are doing and do not overly doubt themselves. Being aware of learning what they need both in and out of the classroom, they will acquire clarity on what is expected from them.

Credit: 01   **Semester III**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	Who am I and why am I here, Change is the only Constant, Learning to Learn, Technology know–how for a Fresher, Knowledge on Tools, Application Orientation, Career Management (Journey and options).	10
II	Business Communication, Service Mindset, Customer Mindset, Myths about Business, Values in Business, Business Etiquette, Email Etiquette, Telephone Etiquette, Team Building, Role of a Manager.	10
III	Attitude for Success, Role Models, Handling Peer Competition, Building Relationships, Branding Yourself.	10

References:

- Cook, S. *The Effective Manager(e-book).* IT Governance Publishing.
- Lesikar, R. V., & Pettit J. B..*Business Communication: Theory and Application.* New Delhi: All India Traveller Book Seller.
- Bhatnagar, Nitin & Mamta Bhatnagar, *Effective Communication and Soft Skills: Strategies for Success.* New Delhi, Pearson (Dorling Kindersley, India Ltd.).
- Mohan, Krishan & NP Singh, *Speaking English Effectively*, New Delhi: Macmillan Publishers India Ltd.
- Pillalamarri, J. K. *Management of Soft Skills* Chennai: Schitech Publications.
- Rao, M.S. & Ramana, P.S.V., *Soft Skills for Better Employability*. ICFAI University Press.

CSE221: OPERATING SYSTEMS

Credits: 04   **Semester IV**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Operating System and its Classification - Batch, Interactive, Multiprogramming, Time sharing, Real Time System, Multiprocessor Systems, Multithreaded Systems, System Protection, System Calls, Reentrant Kernels, Operating System Structure- Layered structure, Monolithic and Microkernel Systems, Operating System Components, Operating System Functions and Services. **Processes**: Process Concept, Process States, Process State Transition Diagram, Process Control Block (PCB), Process Scheduling Concepts, Threads and their management. **CPU Scheduling:** Scheduling Concepts, Performance Criteria, Scheduling Algorithms, Multiprocessor Scheduling.	14
II	**Process Synchronization:** Principle of Concurrency, Producer / Consumer Problem, Inter Process Communication models and Schemes, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Synchronization Hardware. **Classical Problem in Concurrency:** Dining Philosopher Problem, Readers Writers Problem. **Deadlock:** System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock, Combined Approach.	13
III	**Memory Management**: Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Paging, Segmentation, Paged segmentation. **Virtual memory concepts:** Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Locality of reference. **I/O Management and Disk Scheduling**: I/O devices, I/O subsystems, I/O buffering, Disk storage and disk scheduling. **File System:** File concept, File organization and access mechanism, File directories, File system implementation issues, File system protection and security.	13

Text Book:

- Silberschatz, Galvin and Gagne (2005), *"Operating Systems Concepts",* 7th Edition, Wiley.

Reference Books:

- Sibsankar Halder and Alex A Aravind (2009)*,"Operating Systems"*, 6th Edition, Pearson Education.
- Harvey M Dietel (2002), *"An Introduction to Operating System"*, 2nd Edition, Pearson Education.
- D M Dhamdhere (2006), "*Operating Systems: A Concept Based Approach"*, 2nd Edition.
- M. J. Bach. (1986)*, "Design of the Unix Operating System"*, PHI.

Outcome:

After the completion of the course, the student will be able to:
- *Identify the services provided by operating systems.*
- *Understand the internal structure of an operating system and be able to write programs using system calls.*
- *Understand and solve problems involving process control, mutual exclusion, deadlock and synchronization.*

CSE222: INTRODUCTION TO MICROPROCESSORS

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Computer Organization (CSE212).*

Credits: 04   **Semester IV**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction**: Microprocessors Evolution and Types, Overview of 4004, 8080, 8085, 8086, 80286, 80386, 80486 and Pentium Microprocessor, Microprocessor Application, **8-Bit Microprocessor:** 8085 Microprocessor and its Architecture, Addressing Modes, The 8085 Programming Model, Instruction Classification, Instruction Format, Overview of Instruction Set - Data Transfer Operation, Arithmetic Operation, Logic Operations and Branch Operations; Introduction to Assembly Language Program.	13
II	**Programming Technique with Additional Instruction**: Looping, Counting, Indexing, Additional Data Transfer and 16-Bit Arithmetic Instruction, Counters and Time Delays, Stack and Subroutine. **16 Bit Microprocessor:** Architecture of 8086 – Register Organization, Execution Unit, Bus Interface Unit, Signal Description, Physical Memory Organization, Mode of Operation, I/O Addressing Capabilities.	14
III	**Peripheral Interfacing:** I/O Programming, Programmed I/O, Interrupt Driven I/O, DMA I/O, Memory-Mapped I/Os. **Peripheral Devices:** 8237 DMA Controller, 8255 Programmable Peripheral Interface, 8253/8254 Programmable Timer/Counter, 8259 Programmable Interrupt Controller.	13

Text Book:

- N Senthil Kumar, M Saravanan, and S Jeevananthan (2010), "*Microprocessors and Microcontrollers*", Oxford University Press India.

Reference Books:

- Ramesh S. Gaonkar (2000), "*Microprocessor Architecture Programming and Applications with 8085*", 4th Edition, Penram International Publishing.
- Ray A.K.Bhurchandi.K.M (2002), "*Advanced Microprocessor and Peripherals*", TMH.
- D. V. Hall (1992), "*Microprocessors and Interfacing: Programming and Hardware*", 2nd Edition, TMH.
- Y.C. Liu and G.A. Gibson (2003), "*Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design*", 2nd Edition, PHI.

Outcome:

After the completion of the course, the student will be able to:
- *Analyze, specify, design, write and test assembly language programs of moderate complexity.*
- *Select an appropriate 'architecture' or program design to apply to a particular situation.*

CSE223: COMPUTER GRAPHICS

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Computer Organization (CSE212).*

Credits: 04　　　　　　　**Semester IV**　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Graphics Systems**: Refresh CRT, Raster-Scan Displays, DVST, Plasma Displays, LCD, Input Devices - Functions Provided by Input Devices, Basic Working of these Input Devices. **Output Primitives**: Lines DDA, Bresenham & Circle Drawing Algorithms; Filled Area Primitives - Scan Line Polygon Fill Algorithm, Inside Outside Tests, Boundary Fill & Flood Fill Algorithm. **Line Clipping Algorithms**: Cohen Sutherland Line Clipping Algorithm, Liang Barsky Algorithms. **Polygon Clipping Algorithms:** Sutherland Hodgeman, Weiler Atherton Algorithms.	13
II	**Transformation:** Translation, Rotation, Scaling, Mirror Images, Transformation About an Arbitrary Point; 3D - Transformation, Rotation About an Arbitrary Axis. **Projection:** Orthogonal Projections, Multiple Views, Isometric Projection, Perspective Projections (One, Two and Three Vanishing Points); Quadric Surfaces, Spline Representation, Spline Specification. Bezier Curves and Surfaces, B-Splines and Surfaces, Displaying Spline Curves and Surfaces.	14
III	**Hidden Line and Surface Removal Algorithms**: Back Face Detection, Depth-Buffer and A-Buffer Methods; Introduction to Shading. **Graphics Standards**: GKS/PHIGS. **Multimedia:** Multimedia Architecture, Multimedia File Formats. **Compression:** Image Compression, Video Compression, Audio Compression. **DVI Technology**: Video & Audio Codecs, Virtual Reality, GUI Design - Playback, Hypermedia Linking and Embedding.	13

Text Book:

- D. Hearn and M. P. Baker (1996), "*Computer Graphics"*, PHI.

Reference Books:

- W.K. Gilloi (2007)*, "Interactive Computer Graphic*s", PHI.
- D.F. Rogers (1998), "*Procedural Elements for Computer Graphics"*, TMH.
- J.D. Foley and A.D. Van (1982)*, "Fundamentals of Interactive Computer Graphics"*, Addison-Wesley.
- Rogers and Adam (1976)**, "***Mathematical Elements for Computer Graphics",* TMH.
- R. Steinmetz and K. Nahrstedt (1995), "*Multimedia: Computing, Communications and Applications",* PHI, PTR.

Outcome:

After the completion of the course, the student will be able to understand, appreciate and follow the development and advancement of computer graphics technologies.

CSE224: COMPUTER NETWORKS

Prerequisite: *Fundamentals of Computer & Programming (CSE 101).*

Credits: 04   **Semester IV**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design, connecting devices, Physical Layer Transmission Media, Line coding scheme, Basic idea of modulation and multiplexing, Switching methods. **Medium Access sub layer:** Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols, CSMA, CSMA/CD, Overview of IEEE standards	13
II	**Data Link Layer –** HDLC and point to point protocol, Error detection and correction, Flow control (sliding window protocol) **Network Layer:** Network Layer –IP addressing, Internetworking, Address mapping, introduction to IPv6, transition from IPv4 to IPv6, routing.	14
III	**Transport Layer:** Transport Layer - Design issues, connection management, Flow control, TCP window management, congestion control-slow start algorithm **Session Layer-** Design issues, remote procedure call. **Presentation Layer-**Design issues, Data compression techniques, cryptography A**pplication Layer:** Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals	13

Text Book:

- Forouzan B. A. (2004), "*Data Communication and Networking"*, 4th Edition, McGrawHill.

References:

- Kurose, J.F. and Ross K.W. *(*2005), *"Computer Networking: A Top-Down Approach Featuring the Internet"*, 3rd Edition*,* Addison-Wesley.
- A.S.Tanenbaum (2006), "*Computer Networks"*, 2nd Edition*,* Prentice Hall India.

Outcome:

After the completion of the course, the student will be able to:
- *Understand the terminology and concepts of the OSI reference model and the TCP/IP reference model.*
- *Apply the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.*

ITE221: DATABASE MANAGEMENT SYSTEM

Prerequisite: *Fundamentals of Computer & Programming (CSE 101), Problem Solving using Computers* (CSE 102).

Credits: 04   **Semester IV**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**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 (DDL, DML, DCL), Overall Database Structure, Database Users. **Data Modeling using the Entity Relationship Model:** ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Specialization, Generalization, Aggregation, Reduction of an ER Diagram to Tables, Extended ER Model, Relationship of Higher Degree. **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.	13
II	**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/PL SQL. **Data Base Design & Normalization:** Functional Dependencies, Primary Key, Foreign Key, Candidate Key, Super Key, Normal Forms, First, Second, Third Normal Forms, BCNF, 4th Normal Form, 5th Normal Form, Lossless Join Decompositions, Canonical Cover, Redundant Cover, Synthesis the Set of Relation, MVD, and JDs, Inclusion Dependence.	14
III	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Deadlock Handling. **Distributed Database:** Introduction of Distributed Database, Data Fragmentation, Replication, 2PC Protocol. **Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, 2PL, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of ORACLE.	13

Text Book:

- Elmasri and Navathe (2010), "*Fudamentals of Database Systems"*, 6th Edition, Addision Wesley.

References:

- Date C J*," An Introduction to Database Systems"*, 8th Edition, Addision Wesley.
- Korth, Silbertz and Sudarshan (1998), "*Database Concepts"*, 5th Edition*,* TMH.
- Bipin C. Desai, "*An Introduction to Database Systems"*, Galgotia Publications.
- Majumdar & Bhattacharya, *"Database Management System",* TMH.

Outcome:

After the completion of the course, the student will be:

- *Familiar with the relational database theory, and be able to write relational algebra expressions for queries.*
- *Master sound design principles for logical design of databases, including the E-R method and normalization approach.*

AHE201: ETHICS & VALUES

Credits: 02　　　　　　　　**Semester IV**　　　　　　　　**L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	**Conceptual Foundations:** Foundations of Morality; Professional Ethics; Professional Standards in Engineering Practice; Major Theories of Ethics and Different Ethical Approaches; Normativity of Science and Technology. **Professions and Moral Dilemmas:** Contemporary Ethical Issues; Conflict of Interests; Contracts; Rights and Violations; Consent and Dissent; Privacy and Confidentiality; Consultancy; Allocation of Burdens and Benefits; Direct and Indirect Responsibility; Patents, Piracy and Clones.	14
II	**Decision Making:** Theoretical Bases; Foundational Values; Greater Welfare Approach; Risk-Benefit Analysis; Right-based Approach; Priority Allocation; Binding Grounds of Decisions; Public Norms and Professional Guidelines.	14
III	**Social Responsibility:** Individual and Collective Responsibility; Corporate Social Responsibility; Justice and Fairness; Beneficence and Safety; Respect for Humanity, Life, and Nature; Sustainable Development.	11

CSE291: OPERATING SYSTEMS LAB

Credits: 01   **Semester IV**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- Write a Program in C to Implement CPU Scheduling Algorithm A) FCFS b) SJF c) Priority d) Round- robin. - Simulation of Bankers Deadlock Avoidance and Prevention Algorithms. - Implementation of Process Synchronization a) Reader-Writer b) Producer-Consumer - Simulation of Page Replacement Algorithms a) FIFO b) LRU c) LFU - Simulation of Disk Scheduling Algorithms a) FCFS b) SSTF c) SCAN d) C-SCAN e) LOOK f) C-LOOK - Simulation of File Organization Techniques a) Single-Level Directory b) DAG	24

CSE292: MICROPROCESSORS LAB

Credits: 01   **Semester IV**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- To study 8085 microprocessor System. - To study 8086 microprocessor System. - To develop and run a program to find out largest and smallest number. - To develop and run a program for converting temperature from ^{0}F to ^{0}C. - To develop and run a program to compute square root of a given number. - To develop and run a program for computing ascending/ descending order of the numbers. - To perform interfacing of RAM chip to 8085/8086. - To perform interfacing of keyboard controller. - To perform interfacing of DMA controller. - To perform interfacing of UART/USART.	24

ITE291: DATABASE MANAGEMENT SYSTEM LAB

Credits: 01   **Semester IV**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- Write the queries for Data Definition and Data Manipulation Language. - Write SQL queries using logical operations (=, <, >, etc). - Write SQL queries using SQL operators. - Write SQL query using character, number, date and group functions. - Write SQL queries for relational algebra. - Write SQL queries for extracting data from more than one table. - Write SQL queries for sub queries, nested queries. - Concepts for ROLL BACK, COMMIT & CHECK POINTS. - Create VIEWS - Write Program by the use of PL/SQL. - Understand the concept of CURSORS - Create FUNCTION, PROCEDURE and TRIGGERS.	24

AHE282: SOFT SKILLS- II

Objectives:

- To make the students aware of the primary skills and sub skills involved in using English effectively at the contemporary corporate workplace with a global presence.
- To provide practice and guidance to enhance skills to the proficiency level expected by any organization.

Credit-01   **Semester IV**   **L-T-P: 0-0-2**

Module No.	Content	Lab Hours
I	• Introduction to English and Grammar. • Speaking face to face vs. over the phone. • Auxiliary and Modal verbs. • 4 Techniques of reading- Skim, Scan, Intensive, Extensive. • ABC of writing, The KISS concept. • Presenting ideas, information and opinions with clarity. • Listening for information and making inferences. • Intonation, Word stress, Pacing, Sound clarity.	10
II	• Second level of reading to interpret information • Subject Verb Agreement • Understanding ideas and making inferences • Indianism, Question Tags, Phrasal verbs • Prepositions, Active and Passive voice • Third level reading and data interpretation • Sentence stress, connected speech • Tenses	10
III	• Adverbs, Adjectives, Modifiers, Collocation • Discussing data and coming to conclusions • Link expressions, Compound nouns • Negotiation skills • Business quiz, idioms and phrases • Individual presentation on speaking and writing • Feedback and Poster creation	10

References:

- Hornby, A.S., An Advanced Learners' Dictionary of Current English, OUP.
- Murphy, Raymond, Intermediate English Grammar, Cambridge University Press.
- Rizvi, Ashraf, M. *Effective Technical Communication.* New Delhi: Tata McGraw Hill.
- Infosys modules on English lab.
- PPT slides & videos provided by Infosys.

Material:

- Audio-Video Material available in the Language Lab.

MBA301: INDUSTRIAL ECONOMICS

Preamble: The Course of Industrial Economics Aims to Familiarize Students with the Basic Concepts of Economics Used in the Analysis of Firms and Industries and Act as a Guiding Tool in Decision Making with the Availability of Limited Resources in the Organization.

Objectives:

1. To Familiarize Students with the Basic Concepts of Economics.
2. To Enable the Students to Make Better Decisions in their Course of Action.

Credits: 02   **Semester V**   **L- T -P : 2-0-0**

Module No.	Content	Teaching Hours
I	**Basic Economic Concepts:** Meaning, Nature and Scope of Economics, Methodology of Economics - Deductive vs Inductive, Economics - Statics & Dynamics, Basic Economic Problems - Scarcity & Choice, Relation among Science, Engineering, Technology and Economics. **Market Demand**: Demand, Meaning and Types, Law of Demand, Exceptions to the Law of Demand, Elasticity of Demand, Methods of Measuring Elasticity of Demand, Marginal Utility Analysis.	07
II	**Demand Forecasting:** Meaning, Significance and Methods, Production Function, Laws of Returns to Scale & Diminishing Returns to Scale. **Cost Concepts**: - Meaning and Types of Costs, Short Run and Long Run Cost Curves.	07
III	**Market Structure:** Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition. **Inflation and Business Cycles**: Causes, Effects and Methods to Control Inflation, Concepts of Business Cycles, Concept of National Income and Measurement.	07

Reference Books:

1. Dewett, K.K.(2005).*Modern Economic theory.* New Delhi. S. Chand.
2. Geetika, G.,Ghosh, Piyali., & Choudhray,Purba.(2008).*Managerial Economics*.TMH.
3. Dwivedi, D, N. (2005).*Managerial Economics*. New Delhi: Vikas Publishing House.
4. Peterson, Craig, H. Lewis, Cris, W. & Jain, Sudhir, K. (2008).*Managerial Economics.* New Delhi: Pearson Education.

AHE301: TECHNICAL WRITING

The syllabus aims to develop the writing skills of students in order to equip them with techniques of writing messages formally. The learners will be trained to use various modes of written communication generally used to disseminate information within and outside an organization.

Credits: 03   **Semester V**   **L- T -P: 2-1-0**

Module No.	Content	Teaching Hours
I	• **Vocabulary**: One Word Substitutions, Idioms & Phrases, Synonyms & Antonyms. • **Correspondence Related to Meetings**: Agenda & Minutes of A Meeting. • **Summarizing**: Précis Writing. • **Technical Reports:** Objectives, Characteristics & Significance, Types, Structure & Format, Writing of Report.	18
II	• **Business Letters**: Principles, Important Features & Structure. Types - Inquiry Letters, Quotation & Placing Orders, Claim & Complaint Letters, Sales & Credit Letters. • **Official Correspondence**: Memos, Circular Letters, E-Mail, D.O. Letters. • **Correspondence Related to Recruitment**: Job Application & Resume/Bio-Data.	15
III	• **Technical Proposal:** Objectives, Characteristics & Significance; Types, Structure & Writing of Proposals. • **Study Skills**: Note Making & Note Taking. • **Technical Articles:** Nature, Significance and Essentials, Journal Articles/ Research Papers.	12

Reference Books:

- Rizvi, Ashraf. *Effective Technical Communication*, New Delhi: Tata McGraw Hill.
- Raman, Meenakshi; Sangeeta Sharma, *Technical Communication: Principles and Practice*, New Delhi, Oxford University Press.

CSE311: DESIGN & ANALYSIS OF ALGORITHMS

Prerequisite*: This course requires basic knowledge of Data structures and Algorithms (CSE211).*

Credits: 04   **Semester V**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Algorithms:** Analyzing algorithms, Complexity of Algorithms. Growth of Functions: Asymptotic Notations, Recurrence Relations, Performance Measurements. **Sorting And Order Statistics:** Shell Sort, Heap Sort, Comparison Of Sorting Algorithms. **Sorting In Linear Time:** Counting Sort, Radix Sort.	14
II	**Advanced Data Structures:** B – Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets, Augmenting Data Structures. **Divide And Conquer:** Quick Sort, Merge Sort. **Elementary Graph Algorithms**: DFS, BFS. Single Source Shortest Path Algorithms: Dijkstra's & Bellman Ford Algorithms, Maximum Flow Problem.	13
III	**Greedy Approach:** Activity Selection Problem, Huffman Codes, Minimum Spanning Trees, Fractional Knapsack. **Dynamic Programming:** 0/1 Knapsack Problem, Longest Common Subsequence (LCS). **Back Tracking and Branch& Bound:** N Queen Problem, TSP Problem,0/1 Knapsack Problem **String Matching:** Naïve, Rabin Karp, Knuth-Morris-Pratt, Automata Matcher, NP-Completeness.	13

Text Book:

- Thomas H. Coremen, Charles E. Leiserson and Ronald L. Rivest (2008), *Introduction to Algorithms,* Third edition, Prentice Hall of India.

Reference Books:

- Gilles Brassard Paul Bratley (1996)," *Fundamentals of Algorithms",* Prentice Hall.
- Ellis Horowitz, Sartaj Sahni*,* Sanguthevar Rajasekaran (2008), "*Fundamentals of Computer Algorithms",* Orient Longman Pvt. Ltd.
- Levitin (2008), "*An Introduction to Design and Analysis of Algorithms"*, Pearson.

Outcome:

After completion of this course student will be able to design and analyze the algorithms to solve any problem and proper use of the data structure to improve the efficiency of the algorithms.

ITE312: SOFTWARE ENGINEERING

Prerequisite*: Understanding of programming principles and concepts of computer and software.*

Credits: 04   **Semester V**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introductory Concepts**: The evolving role of software – characteristics, components and applications. **Process Models:** Waterfall Model, Prototyping, Incremental, Spiral, RAD. **Software Requirement Specification**: Requirement Process, SRS Components, Requirement Specifications with Use Cases Diagram, Requirements Validation. **Software Project Planning:** Project Planning Objectives. **Software Metrics:** Size, Function Point, Staffing, Project Estimation Methods– Decomposition Techniques; Empirical Estimation Models – COCOMO Model.	14
II	**Function-Oriented Design**: Problem Partitioning, Abstraction, Top Down and Bottom Up Design. **Module-Level Concepts:** Coupling, Cohesion, Design Notation and Specification - Structure Charts; Structured Design Methodology - Data Flow Diagram. **OO Analysis and OO Design:** OO Concepts, Introduction to UML Design Patterns. **Design Verifications:** Design Walkthroughs, Critical Design Review, Consistency Checkers. **Coding:** Coding Process, Verification - Code Inspections, Static Analysis, Proving Correctness; Metrics- Size Measures and Complexity Metrics.	13
III	**Testing Fundamentals**: Test Case Design, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing Strategies, Unit Testing, Integration Testing, Validation Testing, Reliability Estimation, Basic Concepts and Definitions, Reliability Model. Software Quality, ISO 9000 Certification for Software Industry, SEI Capability Maturity Model. **Software Configuration Management:** Introduction to SCM, Version Control and Change Management. **Risk Management:** Risk Mitigation, Monitoring, and Management. **Software Maintenance**: Models, Cost of Maintenance, Re-engineering, Reverse Engineering.	13

Text Book:

- R. S. Pressman (2010), "*Software Engineering: A Practitioners Approach*", 7th Edition, McGraw Hill.

Reference Books:

- K. K. Aggarwal and Yogesh Singh (2008), "*Software Engineering*", 3rd Edition, New Age International Publishers.
- Rajib Mall (2009), "*Fundamentals of Software Engineering*", 3rd Edition, PHI Publication.
- R.E Fairley (2004), "*Software Engineering*", McGraw Hill.
- Sommerville (2010), "*Software Engineering*", 9th Edition, Pearson Education.

Outcome*:*

- *The ability to apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to the development and maintenance of complex software systems.*
- *The ability to design and experiment with software prototypes and to select and use software metrics.*
- *Effective communications skills through oral and written reports and software documentation evaluated by both peers and faculty.*
- *The ability to elicit, analyze and specify software requirements through a productive working relationship with project stakeholders.*

CSE313: THEORY OF AUTOMATA & FORMAL LANGUAGES

Prerequisite***:*** *This course requires basic knowledge of Discrete Mathematics (CSE 213).*

Credits: 04   **Semester V**   **L-T-P: 3-1-0**

Module No.	Content	Teaching Hours
I	**Introduction:** Alphabets, Strings and Languages; Automata and Grammars, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Myhill-Nerode Theorem; FA with Output - Moore and Mealy machine, Applications and Limitations of FA. **Regular expression (RE):** Regular Expression to FA, DFA to Regular Expression, Arden Theorem, Non Regular Languages, Pumping Lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages.	13
II	**Context Free Grammar (CFG) and Context Free Languages (CFL):** Introduction, Derivation Trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Simplification of CFGs, Normal Forms for CFGs - CNF and GNF; Pumping lemma for CFLs. **Push Down Automata (PDA):** Introduction, Language of PDA, Acceptance by Final State, Acceptance by Empty Stack, Deterministic PDA, Equivalence of PDA and CFG.	14
III	**Turing machines (TM):** Basic Model, Definition and Representation, Variants of Turing Machine and their equivalence, TM for Computing Integer Functions, Universal TM, Church's Thesis, Recursive and Recursively Enumerable Languages, Halting Problem, Introduction to Computational Complexity	13

Text Book:

- K.L.P. Mishra and N.Chandrasekaran (2006), "*Theory of Computer Science: Automata, Languages and Computation"*, 3rd Edition, PHI.

Reference Books:

- Hopcroft, Ullman (2013), **"***Introduction to Automata Theory, Languages and Computation"*, 3rd Edition, Pearson Education.
- Martin J. C (2011), *"Introduction to Languages and Theory of Computations"*, 4th Edition, TMH.

Outcome***:***

At the end of this course, the students should be able to distinguish between the different mathematical models and be able to use these models in solving different types of problems.

ITE321: WEB TECHNOLOGY

Prerequisite*: UML design patterns, Internet architecture and Java programming concepts.*

Credits: 04   **Semester V**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction to Client Server Architecture**: Components of Client-Server Application, Client-Server Models and their Benefits, Server Side Component Architecture, Multitier Architecture, Web Portal Development & Testing. **Client Side Implementation:** HTML - List, Table, Frame, Image, Form and Other Tags with their Usage, Formatting using CSS, DHTML; JavaScript - DOM Basics, Statements, Integrating JavaScript with Various Elements of HTML, XHTML.	13
II	**XML:** Domain Languages, Comparison with HTML, DTD, CSS, XSL, Content Creation - Entities, Attributes, XML Schema, XML Parsing Techniques, XML and Data Binding, JAXB, Integrating XML with Other Applications, XLINK, XPOINTER; Introduction to AJAX and Applications. **Distributed Object Computing**: ActiveX, COM & DCOM.	14
III	**Web Servers & Application Servers:** Web Security, Middleware Standards - CORBA, Enterprise Java Beans and DNA, Web Services and SOA. **Server Side Implementation:** CGI Background, Overview of PERL, Introduction to ASP, Objects, Components, Connecting with Databases, JSP Architecture Objects, JSP Directive Elements, Variables & Methods, Sharing Session & Application Data; Introduction to PHP – Basics, Array and Functions.	14

Text Book:

- Chris Bates, (2007), **"***Web Programming – Building Internet Application***"**, 2nd Edition, Wiley - Dreamtech India Pvt. Ltd.

Reference Books:

- Holzener, Steven, (2001), "*Inside XML",* Techmedia Publication.
- Bergstan, Hans, (2004), "*Java Server Pages",* O'Reilly Publication.
- Nicholas C. Zakas, (2011), "Professional JavaScript for Web Developers", Wiley Publication.
- Leon Shklar, Rich Rosen (2009),"Web Application Architecture: Principles, Protocols and Practices", 2nd Edition, Wiley Publication.
- Burdman, Jessica, (2000),"*Collaborative Web Development",* Addison Wesley.

Outcome:

Web based applications development and deployment on web server. Operational knowledge of middleware technologies and security issues related to web.

CSE381: DESIGN & ANALYSIS OF ALGORITHMS LAB

Prerequisite*: This lab requires basic knowledge of Data Structures and Algorithms (CSE211). Student must have the knowledge of any high-level programming language (CSE101, CSE102).*

Credits: 01　　　　　　　　　**Semester V**　　　　　　　　　**L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Sorting Technique:** • Implementation of Insertion sort. • Implementation of Bubble sort. • Implementation of Heap sort. • Implementation of Counting Sort. **Divide and Conquer Approach**: • Implementation of Quick sort. • Implementation of Merge sort. **Greedy Algorithms**: • Implementation of Prim's Algorithm for minimum spanning tree. • Implementation of Kruskal's Algorithm for minimum spanning tree. • Implementation of single source shortest path problem using Dijkstra's Algorithm. **Dynamic Programming**: • Implementation of 0/1 Knapsack problem. **Backtracking Approach:** • Implementation of 4-queen problem.	24

Text Book:

• Thomas H. Coremen, Charles E. Leiserson and Ronald L. Rivest (2003), "*Introduction to Algorithms",* 3rd Edition, Prentice Hall of India.

Reference Book:

• Behrouz A. Forouzan and Richard F. Gilberg (2007), "*Computer Science – A Structured Programming Approach Using C"*, Cengage Learning.

Outcome*:*

After completion of this lab work student will be able to design and implement the algorithms to solve any problem and uses of different data structures to store the information.

CSE384: MINI PROJECT –I

Prerequisite*: Sound knowledge of C and Data Structures.*

Credits: 02   **Semester V**   **L–T–P: 0–0–4**

Module No.	Content	Lab Hours
I	A project comprising of minimum 1500 LOC in a modular structure has to be developed in C language. Each module is to be based on any of the topics/concepts studied in the previous semesters and should have a proper Graphical User Interface (GUI).	48

Outcome*:*

After completing the project, the students should be able to develop logical thinking. They should gain an insight into the nuances of C programming.

ITE391: WEB TECHNOLOGY LAB

Prerequisite*: Familiarity with Java programming constructs.*

Credits: 01   **Semester V**   **L–T–P : 0–0–2**

Module No.	Content	Lab Hours
I	- Web page design using following HTML elements: Font, Color - Background & Foreground, Margins, Lists, Links, Graphics – Image scaling, Alignments, Text wrapping between images, Table, Bordering, Image, Cell color, Cell alignment. - Apply various types of CSS to above experiment. - Web form designing for user registration with some constraints using JavaScript. - Working with JavaScript functions. - Designing of XML document using DTD concept and applying CSS. - Working with XML data binding using JavaScript/Java. - Implementation of XML parsing using javaScript/Java. - Working with ASP objects. - Working on database connectivity model. - Working on JSP objects and database access model.	24

Text Book:

- Chris Bates (2007), **"***Web Programming – Building Internet Application***"**, 2nd Edition, Wiley - Dreamtech India Pvt. Ltd.

Reference Books:

- Holzener, Steven (2001), "*Inside XML",* Techmedia Publication.
- Bergstan, Hans (2004), "*Java Server Pages",* O'Reilly Publication.

Outcome*:*

After completing the course, the students should be able to do web application development and deployment using various technologies.

AHE 381: SOFT SKILLS-III

This course focuses on the use of English, specifically in industry situations. The course is based on diverse range of business themes which help students visualize the expectations from a professional.

Course Objectives:

- Gain a functional understanding of Basic English.
- Practice language skills to eliminate errors in pronunciation and sentence construction.
- Understand and enhance interpersonal communication process.

Credit: 01   **Semester V**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	Business Communication Skills English Language Enhancement Verbs, Tenses, Phrasal Verbs, Synonyms, Antonyms and homonyms Descriptive Words, Combining Sentences, Business Idioms	10
II	Indianisms in English, Frequently Mispronounced Words, Signposts in English. The Art of Communication: The communication Process, Effective Listening, Non Verbal Communication.	10
III	Intrapersonal & Interpersonal Relationship Skills Self-Awareness, Self Esteem & Confidence, Assertiveness and Confidence Dealing with Emotions, The Team Concept, Elements of Teamwork, Stages of Team Formation, What is an Effective Team? Essential Building Blocks of Effective Teams, Team Player Styles	10

Reference Books:

- Cook, S. *The Effective Manager (e-book).* IT Governance Publishing
- Lesikar, R. V., & Pettit J. B..*Business Communication: Theory and Application.* New Delhi: All India Traveller Book Seller.
- Bhatnagar, Nitin & Mamta Bhatnagar, *Effective Communication and Soft Skills: Strategies for Success.* New Delhi, Pearson (Dorling Kindersley, India Ltd.)
- Mohan, Krishan & NP Singh, *Speaking English Effectively*, New Delhi: Macmillan Publishers India Ltd.
- Pillalamarri, J. K. *Management of Soft Skills* Chennai: Schitech Publications
- Rao, M.S. & Ramana, P.S.V., *Soft Skills for Better Employability*. ICFAI University Press.

MBA304: INDUSTRIAL MANAGEMENT

Credits: 04   **Semester VI**   **L–T–P: 4–0–0**

Module No.	Content	Teaching Hours
I	**Introduction to Management:** Concept, levels of Management, Management functions & skills. **Planning & Organizing:** Concept, Types of planning, Planning Process and premises, Concept of organization structure, Relationship between authority, responsibility and accountability. Directing & Leadership: Concept and principles of direction, Leadership style and traits. Motivation:- Maslow's hierarchy of needs theory, Herzberg's Motivator-hygiene theory, Alderfer's ERG Theory, Vroom's Expectancy theory. Controlling- Types of Controlling, Controlling Process. Staffing:- Concept, significance, Human resource Planning (HRP) Concept, significance and HRP Process. Performance Management: Definition, methods of appraisal: Critical Incidents Method, Comparative Evaluation Method (Ranking & Paired Comparisons), Management By Objectives, Assessment Centers, 360-Degree Feedback..	13
II	Financial Management: Meaning, Objective, Financial Management Functions:- Financial Decision, Investment Decision, Dividends Decision. Profit & Loss statements, Balance sheet preparation, cash flow analysis, Break even Analysis. Time value of Money, Capital budgeting and its techniques: Net present value (NPV), Internal rate of Return (IRR) and Payback method. Material Management: Concept, Scope and objective of Material Management, Inventory Management, Material flow process, Deterministic and Probabilistic model of Inventory control, Material requirements planning, Brief introduction of Just-in-Time(JIT), Enterprise Resource Planning (ERP), Supply chain Management(SCM), Business process re-engineering.(BPR).	14
III	Marketing Management: Marketing: Definition, Scope, Marketing Mix:-Product, Price, Place, Promotion. Segmenting, Targeting and Positioning. Quality Management: Concept of Quality, types of Quality: quality of design, conformance and performance, phases of quality management. An overview of Quality Management assistance tools: Ishikawa diagram, TQM, Kaizen, Five S(5S), six sigma. ISO 9000 : ISO 9001:2008, ISO 9000:2005, ISO 9004:2009, ISO 19011:2011.	13

Text Book:

- Khanna, O.P. (2011) Industrial Engineering & Management. N.Delhi: Dhanpat Rai & Co. Pvt Ltd.
- Khanka, S .S. (2007). Entrepreneurial Development. N.Delhi: S.Chand & Company Ltd..

Reference Books:

- Gopalakrishanan, P. (2005). Material Management. New Delhi: India:Prentice Hall of India.
- Chandra, P. (2006). Projects. New Delhi: India: Tata McGraw-Hill Publishing Company Limited.
- Desai,V.(2007). Dynamics of Entrepreneurship Development and Management. Mumbai: Himalaya Publishing House..

Outcome*:*

After completion of this course student will be able to understand the important managerial dimensions of Industrial Management. To make student's able to apply their thoughts and subject understanding in real practice to support industrial progress.

CSE321: COMPILER DESIGN

Prerequisite: *This course requires basic knowledge of Theory of Automata & Formal Languages.*

Credits: 04　　　　　　　　　**Semester VI**　　　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction to Compiler**: Phases and passes, bootstrapping, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, YACC, Context free grammars, derivation and parse trees, capabilities of CFG. **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.	14
II	**Advance Parser:** Constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables. **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 Reference, Cases: in arithmetic expressions, procedures call, declarations and case statements.	13
III	**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. **Code Generation:** Design Issues, 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.	13

Text Book:

- Aho, Sethi & Ullman (2008), "*Compilers: Principles, Techniques and Tools", 2nd Edition,* Pearson Education.

Reference Books:

- V Raghvan (2010), "*Principles of Compiler Design"*, 2nd Edition, TMH.
- Kenneth Louden (1997), "*Compiler Construction*", 1st Edition, Cengage Learning.
- Charles Fischer and Ricard LeBlanc (2005), "*Crafting a Compiler with C",* Pearson Education.

Outcome*:*

   After completion of this course student will be able to design translator for any language and can also use the concepts in natural language processing.

CSE322: OPTIMIZATION TECHNIQUES

Prerequisite*: Idea about systematic procedures for assisting decision makers in evaluating alternative choices.*

Credits: 04　　　　　　　**Semester VI**　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Linear Programming**: OR Models, Formulation of LPP, Graphical Method, Simplex Method, Big M Method, Two Phase Method, Primal– Dual construction, Dual Simplex, Sensitivity Analysis. **Integer Programming:** Definition & Application of IP, Solution of IP Using Cutting Plane Method, Branch & Bound Methods.	14
II	**Transportation and Assignment:** Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in TP; Assignment Problem, Hungarian Method, Travelling Salesman Problem. **Game Theory, Sequencing & Replacement:** Two Person Zero Sum Game, Pure and Mixed Strategies Methods, Sequencing Problem, Processing of n Jobs through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem. Replacement of Model which Deteriorate with Time, Money Value, Group Replacement Policies.	13
III	**Dynamic Programming:** Introduction to Dynamic Programming, Bellman Principle of Optimality, Applications of DP in Reliability, Capital Budgeting, Inventory Control & Linear Programming. **Queuing Models:** Elements of Queuing Model, Poisson (arrival pattern) & Erlang (service time) Distribution, Single Server and Multi-server Markovian Models with Infinite and Finite Capacities, Machine Repair Model, Networks of Queues. **Project Management:** Phases of Project Management, Guidelines for Network Construction, CPM and PERT.	13

Text Book:

- D.S.Hira, P.K Gupta (2005), "*Operation Research"*, S. Chand Publication.

Reference Books:

- Taha, H.A. (2010), "*Operations Research - An Introduction"*, 9th Edition, Prentice Hall.
- S.D.Sharma (2011), "*Computer Based Optimization Techniques"*, Kedar Nath Publication.
- Kanti Swaroop, Man Mohan (2008), "*Operation Research"*, Sultan Chand & Sons.

Outcome*:*

After completion of this course students are expected to the role of approximations and errors in the implementation and development of numerical methods. In general, students would master the different techniques for solving a given problem.

ITE311: UNIX OPERATING SYSTEM

Prerequisite*: Students should be familiar with the basic concept of an operating system (CSE221). Previous experience in any high-level programming language is essential (CSE101, CSE102).*

Credits: 04   **Semester VI**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Overview of the system:** History, System Structure. **Introduction to the Kernel:** Architecture of the UNIX Operating System, Introduction to System Concept, Kernel Data Structures, System Administration. **Internal representation of files:** Inodes, Structure of Regular File, Directories, Conversion of a Path Name to an Inode, Super Block, Inode Assignment to a New File, Allocation of Disk Blocks, Other File Types. **System Calls for the File System:** Open, Read, Write, File and Record Locking, Adjusting the Position of File I/O-LSEEK, Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode, STAT and FSTAT, Pipes, Dup, Mounting and Unmounting File Systems, Link, Unlink, File System Abstractions, File system Maintenance.	13
II	**The Structure of Processes:** Process States and Transitions, Layout of System Memory, The Context of a Process, Saving the Context of a Process, Manipulation of the Process Address Space, Sleep. **Process Control:** Process Creation, Signals, Process Termination, Awaiting Process Termination, Invoking Other Programs, The User ID of a Process. **Process Scheduling and Time:** Process Scheduling, System Calls for Time, Clock. **Memory Management Policies:** Swapping, Demand Paging, A Hybrid System with Swapping and Demand Paging.	14
III	**The I/O Subsystem:** Driver Interfaces, Disk Drivers, Terminal Drivers, Streams. **Interprocess Communication:** Process Tracing, System V IPC, Network Communications, Sockets. **Multiprocessor Systems:** Problems of Multiprocessor System, Solution with Master and Slave Processor, Solution with Semaphores.	13

Text Book:

- M.J. Bach (2000), "*Design of the Unix Operating System*", 3rd Edition, PHI Publication.

Reference Books:

- Sumitabh Das (2006), "*Unix Concepts and Applications*", 3rd Edition, TMH Publication.
- S. Parata (2008), "*Advanced Unix: A Programmer's Guide*"', BPB Publication.
- W. Stevens, Bill Fenner, Andrew Rudoff (2003), "Unix Network Programming: The Sockets Networking API", Volume 1, 3rd Edition, Pearson Education.

Outcome:

At the end of the course, students will have the fundamental concept of UNIX operating system.

CSE323: SOFT COMPUTING

Prerequisite: *The prerequisite for this course is a basic understanding of problem solving, design and analysis of algorithms and computer programming. A prior course in Artificial Intelligence will be an advantage.*

Credits: 04   **Semester VI**   **L–T–P : 3–1–0**

Module No.	Content	Teaching Hours
I.	**Neural Networks :**Introduction to Soft Computing & Neural Computing, Fundamentals of Artificial Neural Network(ANN), Models of ANN, Architectures of ANN(Feed Forward and Feedback or Recurrent N/W), Learning Methods in ANN, Taxonomy of ANN System, Single Layer Perceptron, Linearly Separable Task and XOR Problem, Introduction to Error Back Propagation Network(EBPN), Back Propagation Learning, Error Back Propagation Learning Algorithm, Associative Memory, Auto Associative Memory, Bidirectional Hetro-Associative Memory, Adaptive Resonance Theory, Applications of Neural Network, ADALINE, MADALINE Network, Rosenblatt's Perception.	13
II.	**Fuzzy Logic:** Introduction to Fuzzy Sets & Crisp Sets, Fuzzy Membership and Fuzzy Operations, Properties of Fuzzy Sets, Crisp Relations and Fuzzy Relations, Fuzzy System, Crisp Logic, Propositional Logic and its Laws, Inference in Propositional Logic (Modus Ponens, Modus Tollens and Chain Rule), Fuzzy Logic, Inference in Fuzzy Logic (GMP and GMT), Fuzzy Rule Based System, Fuzzyfications & Defuzzifications, Applications of Fuzzy Logic.	14
III.	**Genetic Algorithm(GA):**Introduction to GA, Search optimization Method, Evolutionary Algorithm Working Principle, Biological Background of GA, Working Principles of GA, Flow Chart of Genetic Programming, Encoding(Binary, Value, Permutation, Tree), Operators of GA(Random Population, Reproduction or Selection), Crossover and Mutation, Basics of Genetic Algorithm with Example for Maximize $f(x)=x^2$.	13

Text Book:

- S. Rajsekaran & G.A. Vijayalakshmi Pai(2003), *"Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications",* 4th Edition, Prentice Hall of India*.*

Reference Books:

- Timothy J Ross (2009), *"Fuzzy Logic with Engineering Applications",* 3rd Edition, John Wiley and Sons.
- David E. Goldberg (2009), *"Genetic Algorithm in Search Optimization and Machine Learning ",* Adission-Wesley*.*
- Karray (2009), "*Soft Computing and Intelligent Systems Design: Theory, Tools and Applications",* 1st Edition, Pearson Education*.*

Outcome*:*

> *By the end of the course a student is expected to become able to apply Fuzzy Logic, Genetic Algorithms and Artificial Neural Networks as computational tools to solve a variety of real world problems in their area of interest ranging from Optimization problems to Pattern recognition and control tasks.*

CSE391: COMPILER DESIGN LAB

Prerequisite*: Students should be familiar with the basic concept of C/C++ .*

Credits: 01   **Semester VI**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	• Practice of Lex/ YACC of compiler writing. • Write a program to check whether a string belongs to the grammar or not. • Write a program to generate a parse tree. • Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *. • Write a program to find leading terminals. • Write a program to find trailing terminals. • Write a program to compute FIRST of non-terminals. • Write a program to compute FOLLOW of non-terminals. • Write a program to check whether a grammar is left recursive and remove left recursion. • Write a program to remove left factoring. • Write a program to check whether a grammar is operator precedent.	24

Text Book:

- Aho, Sethi & Ullman (2008), "*Compilers: Principles, Techniques and Tools",* 2nd Edition, Pearson Education.

Reference Books:

- V Raghvan (2009), "*Principles of Compiler Design",* TMH.
- Kenneth Louden (1997), "*Compiler Construction*", 1st Edition, Cengage Learning.
- Charles Fischer and Ricard LeBlanc (2007), "*Crafting a Compiler with C",* Pearson Education.

Outcome*:*

In the lab sessions students implement Lexical analyzers and code for each phase to understand compiler software working and its coding in detail.

CSE393: MINI PROJECT –II

Prerequisite*: Sound knowledge of programming concepts.*

Credits: 02   **Semester VI**   **L–T–P : 0–0–4**

Module No.	Content	Lab. Hours
I	Students are required to develop a real time application project comprising of minimum 3000 LOC on any platform in a modular structure. The project must be based on any of the subject studied till previous semesters and should have a interactive GUI. The development of the project must consist of the following : Project Planning – Schedule and Activity Estimation using MS Project 2000 SRS in IEEE 830-1998 format Process Framework for development Software Design Document as per IEEE-1016 Interfaces detail and component level design Test Cases development as per the stated software requirement, which is further to be tested on any CASE tool. In order to obtain creativity, it is required that the software must have minimal use of library/ library functions of respective language/ package.	48

Outcome*:*

After completing the project, the students should gain an insight into the development process of real projects.

ITE381: UNIX/LINUX LAB

Prerequisite*: Students should be familiar with the basic concept of an operating system (*CSE221)*. Previous experience in any high-level programming language is essential (CSE101, CSE102).*

Credits: 01   **Semester VI**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	**Objective:** To teach students various unix/linux utilities and shell scripting. **Commands** • Unix/linux basic commands. • vi editor commands • Process and process control related commands • Filter related commands • IPC related commands **Shell Scripts** • Write a shell script that print out the date information in the following order, time, date of week, day, month, year. • Write a shell script that tells you its name and its PID. • Write a shell script that takes three command line arguments. The first argument is the name of the destination file and other two arguments are the names of files to be placed in the destination file. • Write a shell script that takes the command line argument and report whether it is a directory or a file or something else. • Write a shell script that accept the file name on the command line if the file is readable than count the no. of lines ,words and characters in this file. • Write a shell script to find all login users on your system whose user-id is greater than 200. • Write a shell script to calculate the following series without multiplication. • Write a shell program which displays the number of occurrences of string 2 in string 1. • Write a shell script to find out the length of the input string. • Write a shell script to compare two strings input by the user, **System Calls In C** • File related system calls • IPC related system calls	24

Reference Books:

- Sumitabh Das (2006). "*Unix Concepts and Applications*", 4th Edition, TMH Publication.
- S. Parata (2008), "*Advanced Unix: A Programmer's Guide*", BPB Publication.
- Yashwant Kanetkar (2009), "*Unix Shell Programming*", BPB Publication.

Outcome:

After completing this lab the student will be able to
- *Understand Linux or Unix Operating system.*
- *Understand Logging in the system and Create and modify files and use basic file permissions. Perform basic process and job control.*
- *Understand vi text editor.*
- *Understand Shell Programming and system programming.*

AHE 382: SOFT SKILLS- IV

It is well recognized by the Industry that the soft skills are essential for entry level employees and they include articulation, competence in reading, writing, effective listening and oral communication skills; adaptability to cross cultural environment through creative thinking and problem solving; personal management with assertiveness and initiative; interpersonal skills; the ability to work in teams. Enterprises define the entrants to be 'Industry Ready' when they possess these soft skills.

Course Objectives:

- Understand what constitutes a professional environment.
- Develop positive group strategies & team spirit.
- Set specific measurable goals for themselves in their personal and/or professional life.
- Understand the skills and the intricacies involved in starting an entrepreneurial venture.

Credit-01   Semester VI   L-T-P: 0-0-2

Module No.	Content	Lab Hours
I	Campus to Company The Corporate Fit-Dressing and Grooming, Corporate Dressing – Dress for Success Business Etiquette, Basic Table Manners, Dealing with people Communication Media Etiquette Telephone and Email Etiquette	10
II	Group Discussions, Interviews and Presentations Group Discussions Group Discussions, Structured Group Discussions, Unstructured Group Discussions Interviewing Skills Interview Handling Skills An Effective Resume The Interview Process The Interview Preparation Check List At the Interview – Putting your best foot forward Common Interview Mistakes Presentation Skills Voice, Body Language, Content and Visual Aids, Audience Management, Practice	10
III	Entrepreneurial Skills Development Goal Setting, Understanding Entrepreneurship Studying Entrepreneurial Competencies What are the Entrepreneurial Competencies? Entrepreneurship in Daily Life Venture Project Planning & Entrepreneurship Cycles Planning the Project Case Studies in Entrepreneurship References and Links Entrepreneurship Courses in India Links to Venture capitalists	10

Reference Books:

- Hornby, A.S., An Advanced Learners' Dictionary of Current English, OUP.
- Murphy, Raymond, Intermediate English Grammar, Cambridge University Press.
- Rizvi, Ashraf, M. Effective Technical Communication. New Delhi: Tata McGraw Hill.
- Infosys modules
- PPT slides & videos provided by Infosys.

Material:

Audio-Video Material available in the language Lab.

CSE411: DIGITAL IMAGE PROCESSING

Prerequisite: *Discrete Mathematics (CSE213), Mathematics III (AHM201).*

Credits: 04　　　　　　**Semester VII**　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, An Introduction to the Color Image Model. **Intensity Transformations and Spatial Filtering:** Introduction, Some Basic Intensity Transformation Functions, Histogram Processing, Histogram Equalization, Histogram Specification, Local Enhancement, Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing - Mean Filter, Ordered Statistic Filter, Sharpening – The Laplacian.	13
II	**Filtering in the Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain. **Morphological Image Processing:** Introduction, Logical Operations involving Binary Images, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.	14
III	**Image Segmentation:** Point, Line & Edge detection, Thresholding, Region-based Segmentation, Region Extraction - Pixel Based Approach & Region Based Approach, Edge and Line Detection - Basic Edge Detection, Cannay Edge Detection, Edge Linking - Hough Transform. **Representation & Description:** Representation - Boundary Following, Chain Codes; Boundary Descriptors – Shape Numbers.	13

Text Book:

- R.C.Gonzalez and R.E.Woods (2011), "*Digital Image Processing*", Prentice Hall, 3rd Edition,

Reference Books:

- Bhabatosh Chanda, D. Dutta Majumder (2011), *"Digital Image Processing and Analysis"*, PHI.
- S. Sridhar (2011), *"Digital Image Processing"*, Oxford University Press..

Outcome:

Upon successful completion of this course, students will be able to:
- *Describe, analyze and reason about how digital images are represented, manipulated, encoded and processed.*
- *Apply various intensity transformations and spatial filters for enhancing the image quality.*
- *Evaluate the methodologies for image segmentation and restoration.*
- *Apply image processing algorithms in real-life problems.*

CSE412: ADVANCED COMPUTER ARCHITECTURE

Prerequisite: *Computer Organizations (CSE212).*

Credits: 04   **Semester VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Need for Parallel Computing, Introduction to Parallel Computer Models, Parallel Architectural Classification Schemes, Speedup Performance Laws. **Memory:** Memory Hierarchy Technology, Cache Memory Organization, Memory Replacement Policies, Cache Coherence, Inclusion and Locality. **Shared Memory Organization**: Memory Interleaving, Bandwidth and Fault Tolerance, Memory Allocation Schemes.	13
II	**Pipelining Techniques:** Introduction to Pipelining, Instruction Pipeline, Arithmetic Pipeline, Hazards, Hazards Detections and Resolution, Instruction Prefetching, Branch Handling Techniques. Scheduling of Static & Dynamic Pipelines. **Different Architectures:** Superscalar and Vector Processor, VLIW Architecture, Data flow Computer, Multicore Architecture.	13
III	**Parallel and Scalable Architectures:** Multiprocessor and Multicomputer, System Interconnects, Cache Coherence and Synchronization, Message Passing Mechanism. **Program and Network Properties:** System Interconnect Architectures, Elementary Permutations in Interconnection Network, Mesh, Cube, Butterfly Network, PM2I, Bus Systems.	14

Text Book:

Kai Hwang, Naresh Jotwani (2011), "Advanced Computer Architecture", 2nd Edition, Tata McGraw-Hill.

Reference Books:

- John L. Hennessy (2011), *"Computer architecture: A Quantitative Approach"*, 5th Edition, Elsevier.
- Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta (2003), *"Introduction to Parallel Computing"*, 2nd Edition, Addison Wesley.
- Bhujade (2011), *"Parallel Computing"*, 2nd Edition, New Age International.

Outcome:

After the completion of this course students will be able to:
- *Implement real time problems on different architectures.*
- *Use different techniques to create and use parallelism.*

ITE411: MOBILE COMPUTING

Prerequisite: *Computer Networks (CSE224).*

Credits: 03   **Semester VII**   **L–T–P: 3–0–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Challenges in Mobile Computing, Coping with Uncertainties, Resource Poorness, Bandwidth, etc. Cellular Architecture, Co-channel Interference, Frequency Reuse, Capacity Increase by Cell Splitting. Evolution of Mobile System: CDMA, FDMA, TDMA, GSM. **Mobility Management:** Cellular Architecture, Co-channel Interference, Mobility - Handoff, Types of Handoffs; Location Management, HLR-VLR Scheme, Hierarchical Scheme, Predictive Location Management Schemes. Mobile IP, Cellular IP in Mobile Computing, Case Study of CODA.	13
II	**Wireless LAN, Personal Area Network**: Introduction to IEEE 802.11, Bluetooth and ZigBee, Network Layer Issues. **Publishing & Accessing Data in Air:** Pull and Push Based Data Delivery Models, Data Dissemination by Broadcast, Energy Efficient Indexing Scheme for Push Based Data Delivery. **Mobile OS**: Windows Mobile OS and Android OS **Getting Started with Mobility**:-Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the Mobile app development environment along with an emulator, a case study on Mobile app development	13
III	**Mobile Transaction and Commerce**: Models for Mobile Transaction, Kangaroo and Joey Transactions, Team Transaction, Recovery Model for Mobile Transactions, Electronic Payment and Protocols for Mobile Commerce. **Mobile Internet and WAP**: WWW Programming Model, WAP Programming Model, Gateways. **Mobile agents**: JADE, Aglet. **Native data handling**: On-device file I/O, shared preferences, mobile databases such as SQLite and enterprise data access.	14

Text Book:

- J. Schiller (2008), *"Mobile Communications"*, 2nd Edition, Pearson Education.

Reference Books:

- T. Rappaport, "*Wireless Communication: Principles and Practice*", Pearson Education.
- Paolo Bellavista and Antonio Corradi (2005), "*Handbook of Mobile Middleware*", Auerbach Publication.
- Reza B'Far, "*Mobile Computing Principles*", Cambridge University Press.
- Frank Adelstein, S.K.S. Gupta, Golden G. Richard III and Loren Schwiebert (2004), "Fundamentals *of Mobile and Pervasive Computing*", McGraw-Hill Professional.
- Anubhav Pradhan, "*Composing Mobile Apps,"* Wiley

Outcome:

After completion of the course, the students will be able to:
- *Understand the basic terminology, fundamental concepts, and principles behind design of distributed applications which can run on mobile devices and support user mobility by leveraging wireless communications.*
- *Appreciate the judicious use of bandwidth, relocation of computation and will also be exposed to theoretical concepts behind computing with mobile portable devices.*

CSE431: ADVANCED COMPUTER NETWORKS
(Elective-I)

Prerequisite: *Computer Networks (CSE224).*

Credits: 04　　　　　　**Semester VII**　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Protocols and Standards, Standards Organizations, Internet Standards, Internet Administration; Overview of Reference Models: The OSI Model, TCP/IP Protocol Suite, Addressing, IP Versions. Connectors, Transceivers and Media Converters, Network Interface Cards and PC Cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc. H/W Selection. **MAC Protocols:** MAC Protocols for High-speed LANs, MANs, and Wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.) Fast Access Technologies. (For example, ADSL, Cable Modem, etc.)	12
II	**Routing and Internetworking:** IPv6: Why IPv6, Basic Protocol, Extensions and Options, Support for QoS, Security, etc., Neighbor Discovery, Auto-configuration, Routing, Changes to Other Protocols, Application Programming Interface for IPv6, 6bone, Mobility in Networks, Mobile IP, Security Related Issues. IP Multicasting, Multicast Routing Protocols, Address Assignments, Session Discovery, etc. **Transport and End-to-End Protocols:** TCP Extensions for High-speed Networks, Transaction-oriented Applications, Other New Options in TCP. **Application Layer:** Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple Web Server.	14
III	**Next Generation Networks:** Virtual Private Networks (VPNs), Tunneling and Overlay Networks, Optical Networks, Wireless Sensor Networks, Storage/System Area Networks, P2P Networks, VoIP and Multimedia Networking, Cloud Computing and Data Center Networks, Vehicular Networks, Green Internet,Online Social Networks.	14

Text Books:

- James F. Kurose, Keith W.Ross (2012), "*Computer Networking: A Top-Down Approach Featuring the Internet*", 6th Edition, Pearson Education.
- Nader F. Mir (2006), "*Computer and Communication Networks*", 1st Edition, Prentice Hall.

Reference Books:

- Behrouz Forouzan (2010), "*TCP/IP Protocol Suite*", 4th Edition, Tata McGraw Hill Education.
- N. Olifer, V. Olifer, "*Computer Networks: Principles, Technologies and Protocols for Network design*", 1st Edition, Wiley India.
- Kevin R. Fall, W. Richard Stevens (2011), "*TCP/IP Illustrated, Volume 1: The Protocols*", 2nd Edition, Pearson Education.
- D. E. Comer and M. S. Narayanan, "*Computer Networks and Internets with Internet Applications*", 4th Edition, Pearson Education.
- J. Walrand, P. Varaiya (Oct. 1999), "*High Performance Communication Networks*", 2nd Edition, Morgan Kaufmann.

Outcome:

After completion of the course, the students will be able to:
- *Understand the principles and fundamental concepts of modern computer networks.*
- *Know the details of TCP/IP along with all protocols, working of internet, applications on TCP/IP, managing TCP/IP and to prepare foundation for the future networks.*

ITE431: DATA MINING & WAREHOUSING
(Elective-I)

Prerequisite: *Data Base Management System (ITE221), Mathematics-III (AHM201).*

Credits: 04   **Semester: VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Data Warehousing**: Overview, Difference between Database System and Data Warehouse, Multi-dimensional Data Model: Concept Hierarchy, Three-Tier Architecture, Meta Repository, Data Warehouse & OLAP Technology, Types of OLAP Servers. Data Cubes Computations & Data Generalization. **Data Pre Processing:** Data Cleaning, Data Integration and Data Transformation, Data Reduction.	13
II	**Introduction**: Basics of Data Mining, Issues and Applications of Data Mining Techniques. **Mining frequent Patterns:** Basic Concepts of Association Rules Mining, Apriori Algorithm, FP-Growth. Multilevel Association Rules, Multi-Dimensional Association Rules. **Classification and Predictions**: Classification & Prediction, Issues Regarding Classification and Prediction, Decision Tree, Bayesian Classification, Back Propagation, Neural Network, Nearest Neighbor Classifiers, Support Vector Machines, Prediction.	14
III	**Data Mining Cluster Analysis:** Data Types in Cluster Analysis, Categories of Clustering Methods, Partitioning Methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods-STING, CLIQUE. Model Based Method –Statistical Approach, Outlier Analysis, Mining Multimedia Data, Text Mining, Web Data Mining, Spatial Data Mining, Temporal Data Mining, Data Visualization.	13

Text Book:

Jiawei Han, Micheline Kamber (2011), "*Data Mining Concepts & Techniques*", 3rd Edition, Morgan Kauffmann.

Reference Books:

- M.H.Dunham (2003)**, "***Data Mining: Introductory and Advanced Topics*", 1st Edition, Pearson Education,
- Sam Anahory, Dennis Murray (2009), "*Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems*", 4th Edition, Pearson Education.
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar (2006), "*Introduction to Data Mining*", 2nd Edition, Addison-Wesley.

Outcome:

After the completion of this course student shall be able to:

- *Understand and apply the concept of Data Warehouse and Mining in real-life applications.*
- *Have knowledge and understanding of the principle algorithms used in modern machine learning, as outlined in the syllabus.*
- *Have sufficient knowledge of information theory and probability theory to understand some basic theoretical results in Data Mining.*
- *Be able to apply Data mining algorithms to real datasets, evaluate their performance and appreciate the practical issues involved.*
- *Be able to provide a clear and concise description and justification for the employed experimental procedures.*

ITE432: SERVICE ORIENTED ARCHITECTURE
(Elective-I)

Prerequisite: *Operating System (CSE221), Distributed System (CSE421) and Web Technology (ITE321).*

Credits: 04   **Semester VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Introduction to Web 1.0, 2.0, Web Services (WS), Characteristics of Web Services, WS Modeling Web Service Activities, WS Management, WS Composition, Service Descriptions; Introduction to Service Oriented Architecture (SOA), Characteristics Of SOA, Principles of SOA, Comparison of Service and Object Orientation, SOA Interaction Cycle (SIC), Comparing SOA to Client Server and Distributed Internet Architectures, Components of SOA; Patterns Coordination, Atomic Transactions, Business Activities, Orchestration, Choreography, Service Layer Abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer.	14
II	**Service Oriented Analysis:** Business Centric SOA, Deriving Business Services, Service Oriented Design, WSDL Basics, SOAP Basics, Messaging with SOAP, Message Exchange; SOA Composition, Guidelines – Entity Centric Business Service Design, Application Service Design, Task Centric Business Service Design, SOA Platforms - SOA Support in J2EE, Java API for XML Based Web Services (JAX,WS).	13
III	**WS Integration concepts:** Concepts of Enterprise Service Bus (ESB), Web Services Interoperability Technologies (WSIT), SOA Support in .NET, Common Language Runtime, ASP.NET Web Forms, ASP.NET Web Services, Web Services Enhancements (WSE), Concepts of Business Process Execution Language (BPEL).	13

Text Book:

Thomas Erl (2008), "*SOA Principles of Service Design*" The Prentice Hall Service Oriented Computing Series, Prentice Hall India.

Reference Books:

- Newcomer, Lomow (2005), "*Understanding SOA with Web Services*", Pearson Education.
- Sandeep Chatterjee, James Webber (2005), "*Developing Enterprise Web Services: An Architect's Guide*", Pearson Education.
- Munindar P. Singh, Michael N. Huhns (2010), *"Service-Oriented Computing: Semantics, Processes Agents"*, Wiley.
- Dan Woods and Thomas Mattern (2006), "*Enterprise SOA Designing IT for Business Innovation*", 1st Edition, O'Reilly.

Outcome:

At the end of the course, students will be able to:
- *Manage a modern medium scale software development project using SOA principles.*
- *Suggest recommendations for designing services.*
- *Appreciate the impact of SOA on IT infrastructure—in particular, how business processes and transactions are handled differently in a SOA environment as compared to traditional application architecture.*

CSE433: GRAPH THEORY
(Elective-I)

Prerequisite: *Discrete Mathematics (CSE213).*

Credits: 04   **Semester VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Graph, Application of Graphs, Basic Properties of Graph. **Paths & Circuits**: Isomorphism, Subgraphs, Walks, Path & Circuits, Connected & Disconnected Graphs, Euler graphs, Operations on Graph, Hamiltonian Paths and Circuits, Traveling Sales Man Problem. **Trees & Fundamental Circuits**: Trees & Their Properties, Pendant Vertices in Trees, Distance & Centers, Rooted and Binary Trees, Spanning Trees, Fundamental Circuit, Finding All Spanning Trees of a Graph, Spanning Trees in a Weighted Graph.	13
II	**Cut-Sets & Cut-Vertices:** Cut-Sets & Their Properties, All Cut-Sets in a Graph, Fundamental Circuits and Cut Sets, Connectivity and Seperability, 1-Isomorphism, 2-Isomorphism. **Planar & Dual Graphs:** Combinatorial vs Geometric Graphs, Planar Graphs, Kuratowski's Two Graphs, Different Representation of a Planar Graph, Detection of Planarity, Geometric Duals, Thickness & Crossing.	13
III	**Coloring, Covering and Partitioning:** Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching's, Coverings, The Four Color Problem. **Directed Graph:** Types of Digraphs, Digraphs & Binary Relations, Euler Digraph, Trees with Directed Edges. **Enumeration of Graphs:** Types of Enumeration, Counting Labeled Trees, Counting Unlabeled Trees, Polya's Counting Theorem, Graph Enumeration with Polya's Theorem.	14

Text Book:

Narsingh Deo (2009), "*Graph Theory: With Application to Engineering and Computer Science*", New Edition, PHI.

Reference Books:

- V. Balakrishnan (2004), "*Schaum's Outline of Graph Theory*", TMH.
- Robin J. Wilson (2012), "*Introduction to Graph Theory*", 5th Edition, Pearson Education.

Outcome:

After completion of the course, students shall be capable of solving real-world problems using Graph Theory in fields like Computer Networks, Optimization technique, etc.

CSE440: INFORMATION RETRIEVAL SYSTEMS
(Elective-I)

Prerequisite: *Fundamentals of Computer & Programming (CSE101), Problem Solving using computer (CSE102), Algorithms (CSE311) & Web Technology (ITE321).*

Credits: 04   **Semester VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction to IR:** IR Concepts, Boolean Retrievals- An Example Information Retrieval Problem, A First Take at Building an Inverted Index, Processing Boolean Queries. **The Term Vocabulary and Postings Lists:** Document Delineation and Character Sequence Decoding, Determining the Vocabulary of Terms. **Dictionaries and Tolerant Retrieval:** Search Structures for Dictionaries, Wildcard Queries, Spelling Correction, Phonetic Correction.	14
II	**Index Construction:** Hardware Basics Blocked Sort-Based Indexing. **Scoring, Term Weighting and the Vector Space Model:** Parametric and Zone Indexes, Term Frequency and Weighting, The Vector Space Model for Scoring. **Evaluation in Information Retrieval:** Information Retrieval System Evaluation, Standard Test Collections, Evaluation of Unranked Retrieval Sets, Evaluation of Ranked Retrieval Results. **XML Retrieval**: Basic XML Concepts, Challenges in XML Retrieval, A Vector Space Model for XML Retrieval, Evaluation of XML Retrieval, Text-Centric vs. Data-Centric XML Retrieval.	13
III	**Web Search Basics:** Web Characteristics, Advertising as the Economic Model, The Search User Experience, Index Size and Estimation, Near-Duplicates and Shingling. **Web Crawling and Indexes:** Overview, Crawling, Distributing Indexes, Connectivity Servers. **Link Analysis:** The Web as a Graph, Page Rank, Hubs and Authorities.	13

Text Book:

Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze (2009), *"Introduction to Information Retrieval"*, Cambridge University Press.

Reference Books:

- Ricardo Baeza-Yate, Berthier Ribeiro-Neto (2011), "*Modern Information Retrieval*", 2nd Edition, Addison Wesley.
- Soumen Chakrabarti (2002), "*Mining the Web: discovering knowledge from hypertext data*", 2nd Edition, Morgan Kaufmann.
- David A. Grossman, Ophir Frieder (2004), "*Information Retrieval: Algorithms, and Heuristics*", 2nd Edition, Springer.

Outcome:

Upon successful completion of this course, students should be able to:

- *The ability to apply Information retrieval System concepts, models, algorithms and techniques for efficient information retrieval from digital library, search engine etc.*
- *Working of information retrieval system and its capabilities for searching information using various searching techniques and formalizing queries for search engine.*

CSE461: HUMAN COMPUTER INTERACTION
(Open Elective)

Prerequisite: *Fundamentals of Computer & Programming (CSE101), Problem Solving using Computers (CSE102)*

Credits: 04   **Semester VII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Importance of User Interface, Definition, Importance of Good Design, Benefits of Good Design, Human-Centered Development and Evaluation, Human Performance Models, A Brief History of Screen Design. **The Graphical User Interface:** Popularity of Graphics, The Concept of Direct Manipulation, Graphical System, Characteristics, Web User – Interface Popularity, Characteristics and Principles of User Interface. **Design Process:** Human Interaction with Computers, Importance of Human Characteristics, Human Consideration, Human Interaction Speeds and Understanding Business Junctions.	14
II	**Screen Designing:** Design Goals, Screen Planning and Purpose, Organizing Screen Elements, Ordering of Screen Data and Content, Screen Navigation and Flow, Visually Pleasing Composition, Amount of Information, Focus and Emphasis, Presenting Information Simply and Meaningfully, Information Retrieval on Web, Statistical Graphics, Technological Consideration in Interface Design. **Windows:** New and Navigation Schemes Selection of Window, Selection of Devices Based and Screen Based Controls.	13
III	**Components:** Text and Messages, Icons and Increases; Multimedia, Colors, Uses Problems, Choosing Colors. **Software Tools**: Specification Methods, Interface Building Tools. **Interaction Devices:** Keyboard and Function Keys, Pointing Devices Speech Recognition, Digitization and Generation, Image and Video Display Drivers.	13

Text Books:

- Wilbert O Galitz (2007), *"The essential guide to user interface design"*, 3rd Edition, Wiley India Pvt. Ltd.
- Ben Shneidermann (2009), *"Designing the user interface"*, 5th Edition, Pearson Education Asia.

Reference Books:

- Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg (2003), *"Human Computer Interaction"*, 4th Edition, Pearson/Prentice-Hall.
- Rogers, Sharps, Preece (2002), "*Interaction Design Prec*", 3rd Edition, John Wiley.

Outcome:

Upon successful completion of this course, students should be able to:
- *Design, implement and evaluate effective and usable graphical computer interfaces.*
- *Describe and apply core theories, models and methodologies from the field of HCI.*

CSE462: IT IN BUSINESS
(Open Elective)

Prerequisite*: Fundamentals of Computer & Programming (CSE101), Problem Solving using Computers (CSE102).*

Credits: 04　　　　　**Semester VII**　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** An Overview of Database Management System, Database System vs File System, Data Models Schema and Instances, Data Independence and Data Base Language and Interfaces, Database Users, Data Definitions Language, DML, Overall Database Structure; Database Design Using E-R Diagram. **Data Base Normalization:** Normalization Forms (1NF, 2NF & 3NF), Concept of Transaction Processing, Introduction to Concurrency Control Techniques.	13
II	**Introduction to Client Server architecture:** Components of Client/Server Application, Introduction to Web, Governing the Internet, Internet Computing & Its Applications. **Introduction to Web Development:** Web Server and Application Server, Web in Business and Work, Web Portal, Search Engines and Types, Web Protocols, Tools, Client/Server Side Languages for Web Development, Multimedia Tools and Environment, Web Project Development Life Cycle, Web Development Techniques, Target Users, Web Team, Concept of Team Dynamics and Management, Planning & Process Development, Cyber Laws.	13
III	**System and Information Concepts:** General Model, Types of Systems, Subsystems, Feedback Control, Systems Approach to Organization, Information Concepts, Types of Information, Quality of Information, Value of Information. **Management Information System and Decision Making Process:** Definitions, Role of MIS, MIS in Academics, and Structure of MIS Based on Management Activity and Functions, System and Information Concepts to MIS, Decision Making Definition and Concept, Phases of Decision Making Process, Modeling Process, Static and Dynamic Models. Decision Support System and Executive Information Systems, DSS Definition, Characteristics & Capabilities of DSS, DSS Application; Enterprise & Executive Information System Concept and Definition, Information needs of Executives, Characteristics and Benefits of EIS, Comparing and Integrating EIS and DSS.	14

Text Books:

- Elmasri and Navathe (2010), *"Fundamentals of Database Systems"*, 6th Edition, Addison Wesley.
- Chris Bates (2006), *"Web Programming – Building Internet Application"*, 3rd Edition, Wiley-Dreamtech India Pvt. Ltd.
- Robert Murdick, Joel e. Ross, "*Information Systems for Modern Management"*, 3rd Edition, PHI.

Reference Books:

- Bipin C. Desai (2008), "*An Introduction to Database Systems"*, Galgotia Publications.
- Jessica Burdman (2002), *"Collaborative Web Development"*, Addison Wesley.
- Efraim Turban (2010), *"Decision Support & Intelligent System"*, 9th Edition, Pearson.

Outcome:

After completion of the course students will be able to understand:
- *Concept of data base.*
- *Use of web in IT.*

CSE463: SOFT COMPUTING
(Open Elective)

Prerequisite: The prerequisite for this course is a basic understanding of problem solving, design and analysis of algorithms and computer. A programming prior course in Artificial Intelligence will be an advantage.

Credits: 04   **Semester VII**   **L–T–P : 3–1–0**

Module No.	Content	Teaching Hours
I.	**Artificial Intelligence:** Introduction to AI, Applications of AI, Heuristic Search: Problem Solving, Techniques for heuristic search, heuristic classification, **Genetic Algorithm(GA):** Introduction to GA, Representation, initialization and selection, operators, mutation. Introduction to Evolutionary programming.	13
II.	**Fuzzy Logic:** Introduction to Soft Computing, Fuzzy Sets & Crisp Sets, Fuzzy Membership and Fuzzy Operations, Properties of Fuzzy Sets, Crisp Relations and Fuzzy Relations, Fuzzy System, Crisp Logic, Fuzzy Logic, Inference in Fuzzy Logic , Fuzzy Rule Based System, Fuzzyfications & Defuzzifications, Applications of Fuzzy Logic.	13
III.	**Neural Networks :**Fundamentals of Artificial Neural Network(ANN), Models of ANN, Architectures of ANN (Feed Forward and Feedback N/W), Learning Methods in ANN, Mc Culloch Pitts Neuron, Single Layer Perceptron, Perceptron Learning Rule, Error Back Propagation Network(EBPN), Associative Memory, Applications of Neural Network.	14

Text Book:

- S. Rajsekaran & G.A. Vijayalakshmi Pai(2003), *"Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications",* 4th Edition, Prentice Hall of India*.*

Reference Books:

- Timothy J Ross (2009), *"Fuzzy Logic with Engineering Applications",* 3rd Edition, John Wiley and Sons.
- David E. Goldberg (2009), *"Genetic Algorithm in Search Optimization and Machine Learning ",* Adission-Wesley*.*
- Simon Haykin (2008), "*Neural Networks and Learning Machines*", Prentice Hall; 3rd edition
- Karray (2009), "*Soft Computing and Intelligent Systems Design: Theory, Tools and Applications",* 1st Edition, Pearson Education*.*

Outcome:

By the end of the course a student is expected to become able to apply Fuzzy Logic, Genetic Algorithms and Artificial Neural Networks as computational tools to solve a variety of real world problems in their area of interest ranging from Optimization problems to Pattern recognition and control tasks.

CSE464: CYBER SECURITY
(Open Elective)

Credits: 04 **SemesterVII** **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction –** History of Information Systems and its importance, Basics, Changing nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages, Security Implications for Organizations, Basic Principles of Information Security, Confidentiality, Integrity, Availability, Information Classification and their Roles. **Access Control –** Biometrics, Factors in Biometrics Systems, Benefits, Criteria for Selection of Biometrics, Design Issues in Biometric Systems Interoperability Issues, Economic and Social Aspects, Legal Challenges.	7
II	**Cryptographic System –** Introduction to Cryptographic Systems, Transposition & Substitution Ciphers, System of Keys, Public Key Cryptography, Digital Signature, Application of cryptographic systems, threats to cryptographic systems and their solutions. **Network Security –** Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks. **Intrusion Detection –** Introduction, Need for Intrusion Monitoring and Detection, Intrusion Detection Systems. **Firewalls –** Introduction, Types of Firewall. **Security of Operating System –** Role and types of Operating Systems, Host Security and OS Hardening, Patched Operating System. **E-Commerce Security –** Security Threats to E-Commerce, Business Transactions on Web, and Concepts in Electronics Payment Systems.	7
III	**Security of E-mail –** Mechanism, Security Threats and Countermeasures. **Social Networking Security –** Social Networking Threats and Countermeasures. **Cyber Crime –** Introduction, Cyber Crime Types. **Cyber Contracts & Indian Legal Position –** Introduction, Legal Issues in Cyber Contracts. **ISO Standards and Indian Acts –** ISO 27001, IT ACT, Indian Evidence Act. **IPR Law –** Patent Law, Copyright Law, Trademark Law, Domain Name Disputes, Software Piracy.	6

Text Book:

- Nina Godbole, " Information Systems Security" Wiley India Pvt. Ltd., 2010.

Reference Books:

- Mark Merkov & James Breithaupt, "Information Security: Principles & Practices", Pearson Education, 2006.
- Corey Schou & Daniel Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill, 2006.
- Vivek Sood, "Cyber Laws Simplified", McGraw Hill, 2012.
- Steven M. Furnell, "Computer Insecurity: Risking the System" Springer, 2005.

Outcomes:

- *After studying the subject, the students are expected to understand*
- *Computer Crimes together with its social and legal implications.*
- *Techniques of Computer and Network Forensics.*

CSE481: DIGITAL IMAGE PROCESSING LAB

Prerequisite: *Discrete Mathematics (CSE213), Mathematics III (AHM201).*

Credits: 01   **Semester VII**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	• Perform basic MATLAB operations. • Check the basic relationships of Pixel i.e. connectivity based on following two methods: a) 4-Adjacency b) 8-Adjacency • Mirror Image Generation. • Flipped Image Generation. • Implement Low Pass Filters – Gaussian, Butterworth, Ideal. • Implement High Pass Filters – Gaussian, Butterworth, Ideal. • Perform Image Enhancement in Spatial Domain through Gray Level Transformation Function. • Histogram Equalization. • Histogram Specification. • Use of Second Derivate for Image Enhancement: The Laplacian. • Use of First Derivate for Image Enhancement. • Implement the Morphological Operations: • Write a program for color image processing. • Write a program for image segmentation. • Write a program for Edge detection.	12*2=24

Outcome:

Student will be able to comprehend the major ideas, methods and techniques of image processing.

CSE482: ADVANCED COMPUTER ARCHITECTURE LAB

Prerequisite: *Computer Organization Lab (CSE282), Microprocessor Lab (CSE292).*

Credits: 01   **Semester VII**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	• Write a program to execute three POSIX Threads (PThreads) simultaneously for updating a text file. • Implement the PRAM Algorithm for Parallel Reduction, Prefix Sums, Preorder Tree Traversal. • Implement Parallel Matrix Multiplication using: (a) Row-Column Oriented Algorithm (b) Block-Oriented Algorithm • Case study of RISC Pipelining. • Case study of Pentium 4. • Case study of Job Sequencing & Collision Prevention. • Case study of Load Balancing – Static & Dynamic. • Case study of Parallel Search Algorithm. • Introduction to OpenMp and MPI Programming	12*2=24

Outcome:

- *Student will be able to apply the concept of Parallel Algorithms and other concepts on different Architectures.*

CSE421: DISTRIBUTED SYSTEMS

Prerequisite: *Operating Systems (CSE221), Computer Network (CSE 224)s, Databse Management System (ITE 221).*

Credits: 04   **Semester VIII**   **L–T–P : 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Overview to Distributed Systems, Characteristics, Examples of Distributed Systems, Issues and Challenges, System Models. **Theoretical Foundation:** Limitation of DS, Introduction to Time and Global States, Clocks, Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Introduction to Distributed Operating System – Layered Architecture. **Distributed Deadlock Detection:** Distributed Mutual Exclusion – Introduction, Classification, Algorithms and their performances, Deadlock Prevention, Avoidance, Detection and Resolution, Deadlock Detection (Centralized & Distributed) Algorithms and their performances.	13
II	**Agreement Protocols:** Introduction, Classification, Solution to Byzantine Agreement Problem and Applications. **Distributed Objects:** Introduction to Interprocess Communications, Client Server Communication, Group Communication, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Studies – Java RMI and CORBA. **Distributed File System:** Introduction to DFS, File Service Architecture, Sun Network File System, Andrew File System, Name Services, DNS, Directory and Directory Services.	13
III	**Fault Tolerance:** Issues in Fault Tolerance, Commit Protocols, Voting Protocols, Dynamic Voting Protocols. **Failure Recovery in Distributed Systems:** Concepts in Backward and Forward Recovery, Recovery in Concurrent Systems, Recovery in Distributed Database Systems. **Load Balancing:** Introduction, Issues, Components and load distributing algorithms – Sender – Initiated, Receiver – initiated, Symmetrically – initiated and Adaptive algorithm. **Overview of Security Techniques:** Introduction to Cryptographic Algorithms, Digital Signatures, Replication, System Model and Group Communications, Active and Passive Transactions with Replicated Data.	14

Text Book:
- Mukesh Singhal, Ohio State University, Columbus (1994), *"Advanced Concepts in Operating Systems"*, McGraw-Hill Series in Computer Science.

Reference Books:
- A.S.Tanenbaum and M.Van Steen (2004), *"Distributed Systems"*, Pearson Education.
- George Coulouris, Jean Dollimore and Tim Kindberg (2011), *"Distributed Systems Concepts and Design"*, 5th Edition, Pearson Education Asia.

Outcome:

On completion of the course the student will be able to:
- *Apply the concept of resource sharing and distributed computation in appropriate application to achieve the better outcome.*

CSE422: CRYPTOGRAPHY & NETWORK SECURITY

Prerequisite: *Mathematics II (AHM102), Mathematics III (AHM201) & Computer Networks (CSE224).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction**: Introduction to Security Attacks, Services and Mechanism, Classical Encryption Techniques-Substitution Ciphers and Transposition Ciphers, Steganography, Stream and Block Ciphers, Cryptanalysis. **Symmetric Key Cryptosystems:** Block Cipher Principles, Shannon's Theory of Confusion and Diffusion, Data Encryption Standard(DES), Strength of DES, Triple DES, Advance Encryption Standard (AES), Linear and Differential Cryptanalysis, Block Ciphers Modes of Operation. **Introduction to Number Theory:** Modular Arithmetic, Prime and Relative Prime Numbers, Primitive Roots, Fermat's and Euler's Theorem, Extended Euclidean Algorithm, Chinese Remainder Theorem.	14
II	**Algebraic Structures:** Introduction to Group, Ring & Field of the Form GF(P). **Asymmetric Key Cryptosystems:** RSA Cryptosystem, Attacks on RSA, Security of RSA, Discrete Logarithm Problem, Elgamal Encryption Algorithm. **Hash Functions and Macs:** Authentication Functions, Message Authentication Code, Hash Functions, Birthday Attacks, Security of Hash Functions, Secure Hash Algorithm (SHA-512). **Digital Signature:** Digital Signatures, RSA Digital Signature Scheme, Elgamal Digital Signature Techniques, Digital Signature Standards (DSS).	13
III	**Key Management:** Symmetric Key Distribution, Diffie Hellman Key Exchange Algorithm. **Public Key Distribution:** X.509 Certificates, Public Key Infrastructure. **Authentication Applications and E-Mail Security:** Kerberos, Pretty Good Privacy (PGP), S/MIME. **IP Security and Web Security:** IP Sec Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Introduction to Secure Socket Layer, Transport Layer Security, Secure Electronic Transaction (SET). **System Security:** Introductory Idea of Intrusion, Intrusion Detection, Malicious Programs, Firewalls.	13

Text Book:

W. Stallings (2010), *"Cryptography and Network Security: Principles and Practices"*, 5th Edition, Pearson Education.

Reference Books:

- B. A. Forouzan (2003), *"Cryptography & Network Security"*, 3rd Edition, Tata McGraw Hill.
- Wenbo Mao (2003), *"Modern Cryptography: Theory and Practice"*, Prentice Hall.
- Douglas Stinson, *"Cryptography Theory and Practice"*, 2nd Edition, Chapman & Hall/CRC.

Outcome:

- *After studying the subject, the students will be able to understand various practical aspects of Network Security.*

CSE434: DATA COMPRESSION
(Elective-II)

Prerequisite*: Discrete Mathematics (CSE213), Digital Image Processing (CSE411).*

Credits: 04   **Semester VIII**   **L–T–P : 3–1–0**

Module No.	Content	Teaching Hours
I	**Compression Techniques:** Lossless 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. **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 Huffman Coding:** Lossless Image Compression, Text Compression, Audio Compression.	13
II	**Coding**: 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 Markov Compression.	14
III	**Mathematical Preliminaries**: Lossy Coding, Distortion Criteria, Models. **Scalar Quantization:** The Quantization Problem, Uniform Quantizer, Adaptive Quantization, Non Uniform Quantization, Vector Quantization, Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo- Gray Algorithm, Tree Structured Vector Quantizers, Structured Vector Quantizers.	13

Text Book:

Khalid Sayood (2012), "*Introduction to Data Compression*", 4th Edition, Morgan Kaufmann Publisher.

Reference Books:

- Mark Nelson & Jean-Loup Gailly, "*The Data Compression Book*", 2nd Edition, BPB Publishing.
- D. Salomon (2007), "*Data Compression: The Complete Reference*", 4th Edition, Springer.

Outcome:

After the completion of this course student shall be able to:
- *Understand and describe various models of data.*
- *Understand the basic data compression algorithms and show how they work on a particular input.*
- *Implement these algorithms.*
- *Compare their efficiency in terms of speed and compression ratio.*

ITE434: ADVANCED CONCEPTS IN DATABASE SYSTEMS
(Elective-II)

Prerequisite: *Databases Management System (ITE221) and Data Structures & Algorithms (CSE211).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Query Processing:** Concept of Indexing, Index Structure for Files, Concept of Query Processing, Algorithms for Executing Query Operations. Heuristics for Query Optimizations, Estimations of Query Processing Cost, Database Workloads, DBMS Benchmarks, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations.	13
II	**Modeling and Programming for Semistructured Data:** Structured vs Semistructured Data Model, XML Hierarchical Data Model, XML Documents, DTD and XML Schema, XML Querying, XPath, XQuery.	13
III	**Enhanced Data Model for Advanced Applications:** Introduction to Temporal Database Concepts, Spatial and Multimedia Databases, Active Database System, Deductive Databases, Main Memory Database, Evolutionary Database. **Introduction to Expert Database and Fuzzy Database System:** Expert Databases - Use of Rules of Deduction in Databases, Recursive Rules. Fuzzy Databases - Fuzzy Set & Fuzzy Logic, Use of Fuzzy Techniques to Define Inexact and Incomplete Databases.	14

Text Book:

Elmasri, Navathe (2011), *"Fundamentals of Database Systems",* 5th Edition, Pearson.

Reference Books:

- Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom (2008), *"Database Systems: The Complete Book"*, 2nd Edition, Pearson.
- Korth, Silbertz, Sudarshan (2010), *"Database Concepts"*, 6th Edition, McGraw Hill.
- Ramakrishnan, Gehrke (2003), *"Database Management System"*, 3rd Edition, McGraw Hill.

Outcome:

At the end of the course, student will able to understand how:
- *Queries are implemented as series of primitive operations.*
- *Semistructured data model are implemented, and how applications can be designed for these Databases.*
- *To implement more advance data models.*

ITE435: SOFTWARE QUALITY ENGINEERING
(Elective-II)

Prerequisite*: Software Engineering (ITE312).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Software Quality:** Software Quality Attributes and Specification, Total Quality Management, ISO 9126 Quality Standards; Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review. **Software Quality Metrics:** Product Quality Metrics - Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, 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.	13
II	**Software Quality Assurance:** Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities/Issues, Zero Defect Software. **Software Testing:** Functional Testing - Boundary Value Testing, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Techniques; Structural Testing - Path Testing, Data Flow Testing.	13
III	**Test Selection & Minimization for Regression Testing:** Regression Testing, Regression Test Process, Initial Smoke or Sanity Test, Selection of Regression Tests, Classifying Test Cases, Methodology for Selecting Test Cases, Resetting the Test Cases for Regression Testing; Introduction to Ad-Hoc Testing. **Testing Web Applications:** Web testing, Functional Testing, User Interface Testing, Usability Testing, Configuration and Compatibility Testing, Security Testing, Performance Testing, Database Testing, Post-Deployment Testing, Web Metrics; Introduction to Automated Test Data Generation.	14

Text Books:

- Stephen H. Kan (2000), *"Metrics and Models in Software Quality Engineering"*, 2nd Edition, Pearson Education.
- Yogesh Singh (2011), *"Software Testing"*, Cambridge University Press.

Reference Books:

- Jeff Tian (2005), *"Software Quality Engineering (SQE)"*, Wiley-Interscience.
- S. Desikan and G. Ramesh (2008), *"Software Testing: Principles and Practices"*, Pearson Education.
- Aditya P. Mathur (2011), *"Fundamentals of Software Testing"*, Pearson Education.
- Naresh Chauhan (2010), *"Software Testing: Principles and Practices"*, 1st Edition, Oxford University Press.
- Naik and Tripathy (2008), "*Software Testing and Quality Assurance*", Wiley India.

Outcome:

After the completion of this syllabus the student will be able to:
- *Define the skills and knowledge necessary to perform software quality engineering tasks,*
- *Understand the software life cycle,*
- *Determine how to evaluate software quality activities and processes and determine whether they meet their intended purpose.*

CSE442: EMBEDDED SYSTEMS
(Elective-II)

Prerequisite: *Computer Organizations (CSE212), Design & Analysis of Algorithms (CSE311).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction**: Introduction to Embedded Systems, Hardware Needs, Challenges and Design Process of Embedded System, Processor Architectures, Memory Organization, Embedded Devices and Its Network. **Architecture of Embedded System**: CPUs, Bus Based Computer Systems, Programming Design and Analysis, Model of Program, Basic Compilation Techniques, Program Optimization and Performance.	13
II	**Software Architectures**: Processes and Operating Systems, Multiple Task and Multiple Processes, Preemptive RTOS, Priority Based Scheduling, Interprocess Communication Mechanism, Multiprocessors. **OS for Embedded Systems**: Real Time Operating System, ISR in RTOS, Basic Design Using an RTOS, RTOS Task Scheduling Models, RTOS Programming.	13
III	**Program Modeling Concepts:** Program Model, DFG Models, Modeling of Multiprocessor Systems, UML Modeling, Embedded Software Development Process and Tools. **Networks & System Design Techniques:** Networks for Embedded and its Design, Internet Enabled System, Introduction to Sensor Network, Design Methodologies, Requirement Analysis, System Analysis and Quality Assurance.	14

Text Book:

Wolf, Wayne (2008), *"Computers as Components - Principles of Embedded Computing System Design"*, Elsevier.

Reference Books:

- Raj Kamal (2011), *"Embedded Systems–Architecture, Programming & Design"*, Tata McGraw Hill.
- David A. Simon (1999), *"An Embedded Software Primer"*, Pearson Education.
- Daniel W. Lewis (2012), *"Fundamentals of Embedded Software Where C and Assembly Meet"*, 2nd Edition, Pearson College Division.
- James K. Peckol (2012), "*Embedded Systems: A Contemporary Design Tool*", Wiley India

Outcome:

After completion of this course students will be able to:
- *Visualize and analyze the design and behavior of the hardware components.*
- *Apply knowledge of embedded systems along with some specialization in any area of computer engineering.*

CSE435: PROBABILITY AND STATISTICS
(Elective-II)

Prerequisite: *Discrete Mathematics (CSE213).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Probability:** Probability Models, Sample Space, Events, Algebra of Events, Probability Axioms, Combinatorial Problems, Conditional Probability, Multiplication Rule, Total Probability, Bayes' Theorem and Independence of Events. **Random Variables:** Discrete, Continuous and Mixed Random Variables, Probability Mass, Distribution and Cumulative Distribution Functions, Mathematical Expectation, Moments, Probability and Moment Generating Function, Median and Quantiles, Markov Inequality, Chebyshev's Inequality, Function of a Random Variable.	13
II	**Probability / Discrete Distributions:** Binomial, Poisson, Negative Binominal Distributions and Their Properties (Definition, Mean, Variance, Moment Generating Function, Additive Properties, Fitting of the Distribution.), Continuous Distributions - Uniform, Normal, Exponential Distributions and their Properties. **Joint Distributions:** Joint, Marginal and Conditional Distributions. **Sampling Distributions:** The Central Limit Theorem, Distributions of the Sample Mean and the Sample Variance for a Normal Population, Chi-Square, T and F Distributions.	14
III	**Multivariate Analysis:** Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient of Association. **Testing of Hypotheses:** Null and Alternative Hypotheses, The Critical and Acceptance Regions, Two Types of Errors, Power of the Test, Tests for One Sample and Two Sample Problems for Normal Populations, Tests for Proportions, Chi-Square Goodness of Fit Test and Its Applications.	13

Text Book:

E.J. Dudewicz & S.N. Mishra, *"Modern Mathematical Statistics"*, 3rd Edition, Wiley India.

Reference Books:

- A.M. Mood, F.A. Graybill and D.C.Boes, *"Introduction to the Theory of Statistics"*, 3rd Edition, NYMH.
- V.K. Rohatgi & A.K. Md. E. Saleh, *"An Introduction to Probability and Statistics"*, 2nd Edition, Wiley India.
- W. W. Hines, D. C. Montgomery, D. M. Goldman. C.M. Borror(2012), "*Probability and Statistics in Engineering*", Fourth Edition, Wiley India
- Athanasios Papoulis and S. Unnikrishna Pillai, *"Probability, Random Variables and Stochastic Processes"*, 4th Edition, TMH.

Outcome:

Students will be aware of the use of probability theory and its applications in real world problems specifically in the area of computer science.

CSE436: DISTRIBUTED AND PARALLEL DATABASE
(Elective-III)

Prerequisite: *Databases Management System (ITE221).*

Credits: 04　　　　　　　　**Semester VIII**　　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** Introduction to Databases, Overview of Relational DBMS, Relational Database concepts, Normalization. **Distributed Database:** Introduction, Comparison of Distributed and Centralized Database Systems, Distributed Database Architecture, Distributed Data Base Design, Types of Data Fragmentations, Fragmentation and Allocation of Fragments, Distributed Catalog Management.	13
II	**Transactions Management in Distributed Database:** Properties and Goals of Transaction Management, Distributed Transactions, Two Phase Commit Protocol, Recovery Mechanism in case of Transaction Failures, Log Based Recovery, Communication and Site Failures. **Concurrency Control in Distributed Database:** Serializability, Locking and Timestamp Based Concurrency Control Approach in Distributed Databases. Optimistic Concurrency Control Approach, Introduction to Distributed Deadlocks, Local and Global Wait-For-Graphs, Deadlock Detection and Prevention of Deadlocks.	14
III	**Parallel Database:** Database Server Approach, Parallel Architectures, Parallel DBMS Techniques - Data Placement, Query Parallelism, Parallel Database Processing, Parallel Query Optimization; Parallel Execution Problems- Initialization, Interferences and Convoy Effect, Load Balancing, Parallel Execution for Hierarchical Architecture – Basic Concept, Load Balancing Strategy, Performance Evaluation.	13

Text Book:

M. Tamer Oezsu, Patrick Valduriez (2011). *"Principles of Distributed Database Systems"*, 2nd Edition, Prentice Hall.

Reference Books:

- Elmasri, Navathe (2011), "*Fundamentals of Database Systems"*, 5th Edition, Pearson.
- Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom (2008), *"Database Systems: The Complete Book", 2nh Edition,* Pearson.
- Philip A. Bernstein, Vassos Hadzilacos, Nathan Goodman (1987), "*Concurrency Control and Recovery in Database Systems*", Addison-Wesley.
- Jim Gray, Andreas Reuter (1993), "*Transaction Processing: Concepts and Techniques*", Morgan Kaufmann.

Outcome:

At the end of the course, student will able to understand how:
- *Distributed Databases are implemented, and how applications can be designed for those Distributed Databases.*
- *Series of primitive operations are executed as atomic units of work called transactions, and how these transactions may be executed concurrently.*
- *To implement Parallel databases.*

CSE437: SOFTWARE ONTOLOGY & WEB SEMANTICS
(Elective-III)

Prerequisite: *Web Technology (ITE321).*

Credits: 04   **Semester VIII**   **L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Ontology in Computer Science**: Definition, Ontology Engineering, Constructing Ontology's Manually and Reusing Existing Ontologies, Classifying Ontologies, Web Ontologies, Web Ontology Description Languages, Ontological Categories, Methods for Ontology Development - Introduction, Uschold and King Ontology Development Method, Toronto Virtual Enterprise Method, KACTUS Project Ontology Development Method, Lexicon-Based Ontology Development Method, Simplified Methods; Ontology Learning Algorithms and their Evaluation.	14
II	**Semantic Web**: Introduction, Need, How the Semantic Web Works, Web Documents in XML, Foundation Layers, Architecture; Software Agents - Introduction, Agent Forms, Agent Architecture, Agents in the Semantic web Context; Semantic Desktop - Introduction, Semantic Desktop Metadata, Semantic Desktop Ontologies, Semantic Desktop Architecture, Semantic Desktop Related Applications; Ontology Application in Art - Introduction, Ontologies for the Description of Works of Art, Metadata Schemas for the Description of Works of Art, Semantic Annotation of Art Images, Describing web resources in RDF.	13
III	**Web Services**: Introduction to Semantic Web Services, Security Issues, Languages - Introduction, Usage Scenarios for Rule Languages, Datalog, RuleML, SWRL, TRIPLE; Web Service Essentials, OWL-S Service Ontology; OWL - Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning, and Annotation Properties, Classes and Properties, Data types, A Summary of the OWL Vocabulary; Logic & Inference - Monotonic and Non Monotonic Rules, Syntax and Semantics.	13

Text Book:

Grigoris Antoniou, Frank Van (2004), *"Semantic Web Primer"*, 2nd Edition, MIT Press.

Reference Books:

- H. Stuckenschmidt, F. van Harmelen (2004), "Information Sharing on the Semantic Web", Springer.
- Karin K. Breitman, Marco Antonio Casanova and Walter Truszowski (2004), "Semantic Web Concepts: Technologies and Applications", Springer.
- Rudi Studer, Stephan Grimm, Andrees Abeker, "Semantic Web Services: Concepts, Technologies and Applications", 7th Edition, Springer.
- John Davis, Dieter Fensal, Frank Van Harmelen, "Towards the Semantic Web: Ontology Driven Knowledge Management", 2nd Edition, J. Wiley.

Outcome:

After the completion of this course the students will be able to
- Apply the best practices from agile development methodologies, including systematic tests, short feedback loops, and close involvement of domain experts.
- Implement how these techniques can be put into practice using the modern Semantic Web development.

CSE438: NATURAL LANGUAGE PROCESSING
(Elective-III)

Prerequisite: *Discrete Mathematics (CSE213), Theory of Automata & Formal Languages (CSE313).*

Credits: 04　　　　　　**Semester VIII**　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction:** NLP tasks in Syntax, Semantics, and Pragmatics; Applications such as Information Extraction, Question Answering, and Machine Translation; The Problem of Ambiguity, The Role of Machine Learning, Brief History of the Field. **N-Gram Language Models:** The Role of Language Models, Simple N-Gram Models, Estimating Parameters and Smoothing, Evaluating Language Models.	14
II	**Part of Speech Tagging and Sequence Labeling:** Lexical syntax, Hidden Markov Models, Maximum Entropy Models. Conditional Random Fields. **Syntactic Parsing:** Grammar Formalisms and Tree Banks, Efficient Parsing for Context-Free Grammars (CFGs). Statistical Parsing and Probabilistic CFGs (PCFGs), Lexicalized PCFGs. **Semantic Analysis**: Lexical Semantics and Word-Sense Disambiguation, Compositional Semantics, Semantic Role Labeling and Semantic Parsing.	13
III	**Information Extraction (IE):** Named Entity Recognition and Relation Extraction, IE using Sequence Labeling. **Machine Translation (MT):** Basic Issues in MT, Statistical Translation, Word Alignment, Phrase-Based Translation, and Synchronous Grammars.	13

Text Book:

Daniel Jurafsky & James H.Martin (2002), *"Speech and Language Processing"*, 2nd Edition, Pearson Education (Singapore) Pvt. Ltd.

Reference Book:

- James Allen (2003), *"Natural Language Understanding"*, 2nd Edition, Pearson Education.

Outcome:

On completion of the course the student must:

- *Become familiar with some of the NLP literature and read and suggest improvements to published work.*
- *Be able to see where opportunities for research await and prepare to conduct research in NLP or related fields.*

CSE439: COMPUTATIONAL GEOMETRY
(Elective-III)

Prerequisite: *Design and Analysis of Algorithm (CSE311), Computer Graphics (CSE223).*

Credits: 04　　　　　　　**Semester VIII**　　　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Basic Geometric Concepts**: Points, Lines, Polygons; Subdivisions; Arrangements; Polytopes; Cell Complexes, Convex Hulls - Construction in 2D and 3D, Lower Bounds; Triangulations - Polygon Triangulations, Representations, Point-Set Triangulations, Planar Graphs. **Voronoi Diagrams**: Construction and Applications, Variants; Delayney Triangulations - Divide-And-Conquer, Flip & Incremental Algorithms, Duality, Min-Max Angle Properties.	12
II	**Geometric Searching**: Fractional Cascading, Segment Tree, Interval Tree, Range Tree, Priority Search Tree, Point Location Slab Method, Trapezoid Method, Chain Method, Bridged Chain Method, Plane-Sweep Algorithms, Intersection of Segments, Intersection of Rectangles, Trapezoidation. **Visibility**: Algorithms for Weak and Strong Visibility, Visibility with Reflections, Art-Gallery Problems. **Convex Hulls**: 2-Dimensional Convex Hull, Dynamic Convex Hull, 3-Dimensional Convex Hull, Proximity Closest Pair, Furthest Pair, Voronoi Diagrams, Triangulations.	14
III	**Arrangements of Lines**: Arrangements of Hyper Planes, Zone Theorems, Many-Faces Complexity and Algorithms, Combinatorial Geometry, Ham-Sandwich Cuts. **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. **Graph Drawing:** Planar Drawings, Straight-Line Drawings, Orthogonal Drawings, Polyline Drawings, Upward Drawings, Hierarchical Drawings, Visibility Representations.	14

Text Book:

Franco P. Preparata and Michael Ian Shamos (2000), *"Computational Geometry: An Introduction"*, 2nd Edition, Springer Verlag.

Reference Books:

- Mark de Berg, Marc van Kreveld, Mark Overmars, Otfried Schwarzkopf (2008), *"Computational Geometry, Algorithms and Applications"*, 3rd Edition, Springer-Verlag.
- Ketan Mulmuley (1994), *"Computational Geometry: An Introduction Through Randomized Algorithms"*, 2nd Edition, Prentice-Hall.
- Joseph O'Rourke (1998), *"Computational Geometry in C"*, 2nd Edition, Cambridge University Press.

Outcome:

After completion of this course students will be able to:
- *Construct algorithms for simple geometrical problems.*
- *Implement computational geometry algorithms.*

CSE441: BUSINESS INTELLIGENCE
(Elective-I)

Prerequisite: *Database Management System (ITE221).*

Credits: 04　　　　　**Semester VII**　　　　　**L–T–P: 3–1–0**

Module No.	Content	Teaching Hours
I	**Introduction to Business Intelligence:** Introduction to Digital Data and Its Types – Structured, Semi-Structured and Unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework, Data Warehousing Concepts and Its Role in BI; BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI Best Practices.	13
II	**Basics of Data Integration (Extraction Transformation Loading):** Concepts of Data Integration, Needs and Advantages of using Data Integration, Introduction to Common Data Integration Approaches; Meta Data - Types and Sources, Introduction to Data Quality, Data Profiling Concepts and Applications, Introduction to ETL using Kettle.	13
III	**Introduction to Multi-Dimensional Data Modeling:** Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, Introduction to Business Metrics and KPIS, Creating Cubes using Microsoft Excel. **Basics of Enterprise Reporting:** A Typical Enterprise, Malcolm Bridge - Quality Performance Framework, Balanced Scorecard, Enterprise Dashboard, Balanced Scorecard vs. Enterprise Dashboard, Enterprise Reporting using MS Access / MS Excel, Best Practices in the Design of Enterprise Dashboards.	14

Text Book:

RN Prasad and Seema Acharya (2011), *"Fundamentals of Business Analytics"*, Wiley India.

Reference Books:

- David Loshin (2012), "Business Intelligence", 2nd Edition, Elsevier Science & Technology.
- Mike Biere (2010), "Business Intelligence for the Enterprise", Pearson.
- IBM (2004), "An Introduction to Building Data Warehouse", Prentice Hall of India.
- Larissa Terpeluk Moss & Shaku Atre (2003), "Business Intelligence Roadmap", Pearson.

Outcome:

At the end of this course, student will be able to
- *Differentiate between Transaction Processing and Analytical applications and describe the need for business intelligence.*
- *Demonstrate understanding of technology and processes associated with business intelligence framework.*
- *Demonstrate understanding of Data warehouse implementation methodology and project life cycle.*
- *Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.*

CSE 447: AGILE SOFTWARE DEVELOPMENT
(Elective-III)

Prerequisite
Awareness of basics of software engineering concepts and exposure to any object oriented programming

Credits: 04   **Semester VIII**   **L–T–P : 4–0–0**

Module No.	Content	Teaching Hours
I	**Fundamentals of Agile:** The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools **Agile Scrum Framework:** Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management	14
II	**Agile Software Design and Development:** Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control. Current researches in Agile software development	12
III	**Agile Testing:** The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester **Industry Trends:** Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies	14

References:

- Ken Schawber & Mike Beedle, Agile Software Development with Scrum, Pearson, 2008
- Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, Prentice Hall,2002
- Lisa Crispin & Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison Wesley, 2008
- Alistair Cockburn, Agile Softwaare Development: The Cooperative Game, Addison Wesley, 2006
- Mike Cohn , User Stories Applied: For Agile Software, Addison Wesley 2004

Outcome:

At the end of this course, student shall be able to:

- Understand the background and driving forces for taking an Agile approach to software development. Understand the business value of adopting Agile approaches
- Understand the Agile development practices
- Drive development with unit tests using Test Driven Development
- Apply design principles and refactoring to achieve Agility
- Deploy automated build tools, version control and continuous integration
- Perform testing activities within an Agile project

CSE491: DISTRIBUTED SYSTEM LAB

Prerequisite: *Operating Systems (CSE221).*

Credits: 01   **Semester VIII**   **L–T–P : 0–0–2**

Module No.	Content	Lab Hours
I	• Write a program to implement RMI. • Write a program to implement CORBA. • Write a program to implement Lamport logical clock. • Write a program to implement Vector logical clock. • Write a program to show the problem of mutual exclusion. • Write a program to show that agreement cannot be reached if there is one faulty processor out of three processors. • Write a program to check whether deadlock exists in distributed systems. • Write a program to implement Cryptographic algorithms such as Caesar Cipher, transposition technique: Rail fence, Matrix transposition. • Write a program to implement RSA. • Write a program to implement digital signature.	12*2=24

CSE492: CRYPTOGRAPHY & NETWORK SECURITY LAB

Prerequisite: *Mathematics II (AHM102), Mathematics III (AHM201) & Computer Networks (CSE224).*

Credits: 01   **Semester VIII**   **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	- Write a program in 'C' to implement Additive and Vignere Cipher. - Write a program in 'C' to implement Autokey Cipher. - Write a program in 'C' to find out the Multiplicative inverse of a given number. - Write a program in 'C' to implement RSA Cryptosystem. - Write a program in 'C' to implement Elgamal Cryptosystem. - Write a program in 'C' to implement Rabin Miller Primality Test. - Write a program in 'C' to find out the Primitive roots. - Write a program in 'C' to implement Euclidean Algorithm. - Write a program in 'C' to implement Extended Euclidean Algorithm. - Write a program in 'C' to implement Diffie-Hellman key exchange Algorithm. - Write a program in 'C' to implement Random Number Generator. - Write a program in 'C' to implement Digital Signature Standard Algorithm.	12*2=24