Revised Syllabus
(According to CBCS)
w.e.f. from 2015 – 2016

B. TECH.
IN
MECHANICAL ENGINEERING

FACULTY OF ENGINEERING & TECHNOLOGY
GURUKULA KANGRI VISHWAVIDYALAYA
HARIDWAR

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. I Year

(Semester – I)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BAP-C101	DSC1	Engineering Physics	3	1	0	20	10	30	70	4	100
2	BAM-C101	DSC2	Engineering Mathematics–I	3	1	0	20	10	30	70	4	100
3	BEE-C101	DSC3	Basic Electrical Engineering	3	1	0	20	10	30	70	4	100
4	BEC-C101	DSC4	Basic Electronics Engineering	3	1	0	20	10	30	70	4	100
5	BME-C102	DSC5	Basic Manufacturing Process	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
6	BEG-A151	AECC1 Lab	Technical Communication Lab	0	0	2	20	10	30	70	2	100
7	BAP-C151	DSC1 Lab	Engineering Physics Lab	0	0	2	20	10	30	70	2	100
8	BEE-C151	DSC3 Lab	Basic Electrical Engineering Lab	0	0	2	20	10	30	70	2	100
9	BEC-C151	DSC4 Lab	Basic Electronics Engineering Lab	0	0	2	20	10	30	70	2	100
10	BME-C152	DSC5 Lab	Workshop Practice	0	0	2	20	10	30	70	2	100
			TOTAL	15	5	12	200	100	300	700	30	1000

L-Lecture; **T**-Tutorial; **P**-Practical; **CT**-Cumulative Test; **TA**- Teacher Assessment; **ESE**–End Semester Examination; DS**C**-Core Course; **DSC**- Discipline Specific Compulsory; **DSE**-Discipline Specific Elective; **SEC**- Skill Enhancement Course; **AECC-** Ability Enhancement Compulsory Course

Grading & Grade Points: O(Outstanding**)= 10; A^{+}(**Excellent**)= 9; A(**Very Good**)= 8; B^{+}(**Good**)= 7; B(**Above Average**)= 6; C(**Average**)= 5; P(**Pass**)= 4; F(**Fail**)= 0; Ab(**Absent**)= 0**

BME C101
- Semester
- 0, 5 & 6 stands for theory, Practical & Seminar /Project respectively
- Paper Code

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. I Year

(Semester – II)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BEN-A201	AECC2	Environmental Studies	3	1	0	20	10	30	70	4	100
2	BHU-S201	SEC1	Vedic Science & Engineering	3	1	0	20	10	30	70	4	100
3	BME-C201	DSC6	Fundamental of Mechanical Engineering	3	1	0	20	10	30	70	4	100
4	BCS-C201	DSC7	Problem Solving Through 'C'	3	1	0	20	10	30	70	4	100
5	BAM-C201	DSC8	Engineering Mathematics– II	3	1	0	20	10	30	70	4	100
6	BAC-C201	DSC9	Engineering Chemistry	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
7	BAC-C251	DSC9 Lab	Engineering Chemistry Lab	0	0	2	20	10	30	70	2	100
8	BME-C251	DSC6 Lab	Basic Mechanical Engineering Lab	0	0	2	20	10	30	70	2	100
9	BCS-C251	DSC7 Lab	Computer Programming Lab	0	0	2	20	10	30	70	2	100
10	BME-C253	DSC10 Lab	Engineering Graphics	0	0	2	20	10	30	70	2	100
11	BSP-S251	SEC2 Lab	Physical training and yoga	0	0	0	0	100	100			100
			TOTAL	18	6	8	200	200	400	700	32	1100

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BME C101 → Paper Code

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→ Semester

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. II Year

(Semester – III)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BAM-C301	DSC11	Engineering Mathematics – III	3	1	0	20	10	30	70	4	100
2	BME-C302	DSC12	Material Science	3	1	0	20	10	30	70	4	100
3	BME-C303	DSC13	Applied Thermodynamics	3	1	0	20	10	30	70	4	100
4	BME-C304	DSC14	Strength of Material	3	1	0	20	10	30	70	4	100
5	BME-C305	DSC15	Kinematics of Machines	3	1	0	20	10	30	70	4	100
6	BEC-C301	DSC16	Electronic Devices and Circuits	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
7	BME-C351	DSC17 Lab	Machine Drawing	0	0	2	20	10	30	70	2	100
8	BME-C352	DSC12 Lab	Material Science and Testing Lab	0	0	2	20	10	30	70	2	100
9	BME-C353	DSC13 Lab	Applied Thermodynamics Lab	0	0	2	20	10	30	70	2	100
10	BEC-C351	DSC16 Lab	Electronics Devices and Circuits Lab	0	0	2	20	10	30	70	2	100
			TOTAL	18	6	8	200	100	300	700	32	1000

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BME C101 → Paper Code

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→ Semester

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. II Year

(Semester – IV)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BME-C401	DSC18	Fluid Mechanics	3	1	0	20	10	30	70	4	100
2	BME-C402	DSC19	Dynamics of Machines	3	1	0	20	10	30	70	4	100
3	BME-C403	DSC20	Manufacturing Science – I	3	1	0	20	10	30	70	4	100
4	BHU-C401	DSC21	Engineering Economics	3	1	0	20	10	30	70	4	100
5	BAM-C402	DSC22	Numerical Analysis	3	1	0	20	10	30	70	4	100
6	BEE-C404	DSC23	Electrical Machines	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
7	BME-C451	DSC18 Lab	Fluid Mechanics Lab	0	0	2	20	10	30	70	2	100
8	BME-C 452	DSC19 Lab	Theory of Machines Lab	0	0	2	20	10	30	70	2	100
9	BME-C 453	DSC20 Lab	Manufacturing Science – I Lab	0	0	2	20	10	30	70	2	100
10	BEE-C 454	DSC23 Lab	Electrical Machines Lab	0	0	2	20	10	30	70	2	100
			TOTAL	18	6	8	200	100	300	700	32	1000

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→ Semester

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Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. III Year

(Semester – V)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BAM-C501	DSC24	Optimization Techniques	3	1	0	20	10	30	70	4	100
2	BME-C501	DSC25	Fluid Machines	3	1	0	20	10	30	70	4	100
3	BME-C502	DSC26	Measurement, Metrology and Control	3	1	0	20	10	30	70	4	100
4	BME-C503	DSC27	Manufacturing Science-II	3	1	0	20	10	30	70	4	100
5	BHU-C502	DSC28	Principles and Practices of Management	3	1	0	20	10	30	70	4	100
6	BEE-C503	DSC29	Automatic Control System	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
7	BME-C551	DSC25 Lab	Fluid Machines Lab	0	0	2	20	10	30	70	2	100
8	BME-C552	DSC26 Lab	Measurement, Metrology and Control Lab	0	0	2	20	10	30	70	2	100
9	BME-C553	DSC27 Lab	Manufacturing Science-II Lab	0	0	2	20	10	30	70	2	100
10	BME-C554	DSC30 Lab	Seminar	0	0	2	20	10	30	70	2	100
			TOTAL	18	6	8	200	100	300	700	32	1000

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BME C101 → Paper Code

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→ Semester

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. III Year

(Semester – VI)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BME-C601	DSC31	Machine Design – I	3	1	0	20	10	30	70	4	100
2	BME-C602	DSC32	Heat and Mass Transfer	3	1	0	20	10	30	70	4	100
3	BME-C603	DSC33	I.C. Engines	3	1	0	20	10	30	70	4	100
4	BME-C604	DSC34	Industrial Engineering	3	1	0	20	10	30	70	4	100
5	BME-C605	DSC35	Quality Control and Reliability Engineering	3	1	0	20	10	30	70	4	100
6	BME-C606	DSC36	Mechanical Vibrations	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
7	BME-C651	DSC31 Lab	Machine Design – I Lab	0	0	2	20	10	30	70	2	100
8	BME-C652	DSC32 Lab	Heat and Mass Transfer Lab	0	0	2	20	10	30	70	2	100
9	BME-C653	DSC33 Lab	I. C. Engines Lab	0	0	2	20	10	30	70	2	100
10	BEG-C651/ BEG-C351/BEG-C551	DSC37 Lab	Technical Communication Lab	0	0	2	20	10	30	70	2	100
			TOTAL	18	6	8	200	100	300	700	32	1000

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→ Semester

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Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. IV Year

(Semester – VII)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BME-C701	DSC38	Machine Design – II	3	1	0	20	10	30	70	4	100
2	BME-C702	DSC39	Refrigeration and Air Conditioning	3	1	0	20	10	30	70	4	100
3	BME-C703	DSC40	Energy Resources and Management	3	1	0	20	10	30	70	4	100
4		DSE1	Elective-I	3	1	0	20	10	30	70	4	100
5		DSE2	Elective-II	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
6	BME-C751	DSC38 Lab	Machine Design – II Lab	0	0	2	20	10	30	70	2	100
7	BME-C752	DSC39 Lab	Refrigeration and Air Conditioning Lab	0	0	2	20	10	30	70	2	100
8	BME-C760	DSC40 Lab	Minor Project	0	0	4		50	50	150	4	200
			TOTAL	15	5	8	140	120	260	640	28	900

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→ Semester

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. IV Year

(Semester – VIII)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	BME-C801	DSC41	Machine Tool Design	3	1	0	20	10	30	70	4	100
2		DSE3	Elective III	3	1	0	20	10	30	70	4	100
3		DSE4	Elective IV	3	1	0	20	10	30	70	4	100
4		DSE5	Elective V	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
5	BME-C 860	DSC42 Lab	Major Project	0	0	8	0	100	100	300	8	400
			TOTAL	12	4	8	80	140	220	580	24	800

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→ Semester

Revised Syllabus (Effective from the session 2015-16)

Gurukula Kangri Vishwavidyalaya, Haridwar

Faculty of Engineering & Technology

Mechanical Engineering

B. Tech. IV Year

LIST OF ELECTIVES

Elective - I & II (Seventh semester)

BME-E 711	Advanced Materials Technology
BME-E 712	Advanced Synthesis of Mechanisms
BME-E 713	Thermal Turbo Machines
BME-E 714	Unconventional Manufacturing Processes
BME-E 715	Automobile Engineering
BME-E 716	Computer Aided Design (CAD)
BME-E 717	Computer Aided Manufacturing (CAM)
BME-E 718	Product Development and Design
BME-E 719	Robotics
BME-E 720	Operations Management: Models & Concepts

Elective - III , IV & V (Eighth semester)

BME-E 821	Total Quality Management (TQM)
BME-E 822	Non Destructive Testing
BME-E 823	Concurrent Engineering
BME-E 824	Automatic Controls
BME-E 825	Optimization Techniques in Engineering
BME-E 826	Advanced Welding Processes
BME-E 827	Maintenance Engineering & Management
BME-E 828	Advanced Dynamics of Machinery
BME-E 829	Mechanical System Design
BME-E 830	Project Management
BME-E 831	Foundry Engineering
BME-E 832	Finite Element Methods
BME-E 833	Nanotechnology and Nanocomputing

NOTE: *Electives will be offered depending upon the availability of teaching staff and minimum thirty students should opt for a particular elective.*

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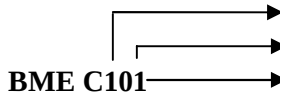

BPH-C101/ BPH-C201
DSC1-ENGINEERING PHYSICS

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Optics: Interference of light, Coherence, Fresnel's Biprism, Interference in thin films & wedge shaped film, Newton's rings. Diffraction of light, Diffraction at a single slit, Double slits, Plane transmission grating.
Polarization of light,Brewester's Law, Mauls law, Double refraction, Nicol Prism, Production and analysis of polarized light. **8**

UNIT II

Electromagnetics: Gauss' law and its applications.Maxwell's equations, Poynting theorem, Electromagnetic wave equation (elementary idea of each, no derivation). Magnetic induction, Magnetic field intensity, Magnetic permeability and susceptibility (definitions only), Dia, Para,& ferromagnetic materials (Qualitative idea only). Motion of charged particle in uniform electric and magnetic field, Magnetic and electrostatic focusing, Function and block diagram of CRO. **8**

UNIT III

Special Theory of Relativity & Quantum Theory: Inertial & non-inertial frames of reference, Galilean transformation, Lorentz transformation equation of space and time, Michelson-Morlay experiment, Postulates of special theory of relativity, Length contraction, Time dilation, Addition of velocities, Mass energy equivalence& variation of mass with velocities.
Quantum theory of radiations, Planck's law, Photoelectric effect, de-Broglie concept of matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle and its applications, Schrodinger wave equation and its solution for a particle in a box. **10**

UNIT IV

Atomic & Nuclear Physics: Bohr's atomic model and energy level diagram, Sommerfeld relativistic atomic model, Vector atom model, Franck-Hertz experiment, Quantum numbers, general properties of nucleus, Mass defect and packing fraction, Nuclear binding energy, Semi-empirical mass formula. **7**

UNIT V

Solid State Physics: Crystal structure, Miller indices, Separation between lattice planes, Different kinds of crystal bonding, Formation of energy bands in solids (energy level approach), classification of solids, Basic idea of conduction mechanism in semiconductors, Hall effect, X-ray diffraction & Bragg's Law. **7**

References

1. Vasudeva AS, Modern Engineering Physics, S Chand, New Delhi, 1998.
2. Ghatak Ajoy, Optics, TMH, New Delhi, 1999.
3. K.K. Tiwari, Text book of Electricity and Magnetism, S.Chand, New Delhi, 2001
4. Rajam JB.,Atomic Physics, SChand, New Delhi;2000.
5. Beiser Arthur,Concepts of Modern Physics, TMH, New Delhi,1999
6. Mani HS, Modern Physics, New Delhi,1999
7. Kittel Charles(7/e), Introduction to Solid State Physics, John Wiley, Singapore, 1996
8. Murugeshan R (8/e), Modern Physics, S.Chand,New Delhi,2001
9. Kaplan lrving , Nuclear Physics, Narosa ,New Delhi,1998
10. Schiff (3/e), Quantum Mechanics, McGraw, Auckland
11. S.R.Verma, Engg. Physics Vol-I & Vol-II, 2009.

BAM-C101
DSC2-ENGINEERING MATHEMATICS I

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credit: 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Differential Calculus I: Successive differentiation, Leibnitz theorem, Taylor's & Maclaurin's Expansion, Indeterminate forms, Radius of curvature, Asymptotes, Double points and their classification, Tracing of curves.

UNIT II

Differential Calculus II : Partial Differentiation of functions, Normal to surfaces and tangent plane, Change of variables, Jacobian, Taylor's series of two variables, Truncation errors, Extrema of function of two and more variables, Method of Lagrange's multipliers.

UNIT III

Multiple Integrals : Fundamental Theorem of integral calculus, Differentiation under the integral sign, Double and triple integrals, Change of order of integration, change of variables. Application to arc length, area , volume, centroid and moment of inertia. Gamma and Beta functions, Dirichlet's integral.

UNIT IV

Vector Calculus : Differentiation of a vector, Scalar and vector fields, Gradient, Divergence, Curl and their physical meanings, Differential operator and identities, Line, Surface and Volume integrals, Green's theorem in plane. Gauss and Stoke's theorems (without proof). Simple applications.

UNIT V

Matrices : Elementary row/ column operations, Rank of a matrix and its applications, Eigen-values and Eign vectors, Cayley-Hamilton theorem, Diagonalisation of Matrices, Linear dependence and independence, Normal matrices, Complex matrices and unitary matrices.

References

1. Prasad C., A first course in mathematics for Engineers, Prasad Mudranalaya
2. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
4. Srivastava R.S.L., Engineering Mathematics Vol.I

BEE-C101/BEE-C201
DSC3-BASIC ELECTRICAL ENGINEERING

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credit: 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNI I

D.C. Network Theory: Concept of elements**,** Circuit theory concepts- Mesh and node analysis, Star-Delta transformation. Network Theorems- Super-position theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, DC Transients- RL, RC circuits

UNIT II

Steady State Analysis of A.C. Circuits: Sinusoidal and Phasor representation of voltage and current, average and rms value, form and peak factor of sinusoidal and different waveforms, single -phase A.C. circuit- behavior of resistance, inductance and capacitance and their combination in series & parallel and power factor, series parallel resonance-band width and quality factor.

Three Phase A.C. Circuits: Star-Delta connections, line and phase voltage/current relations, three -phase power and its measurement.

UNIT III

Magnetic Circuits: Ampere turns, magnetomotive force, permeability, reluctance, composite magnetic circuits, comparison between magnetic and electric circuits.

Transformer: Principle of operation, types of construction, phasor diagram, equivalent circuit, efficiency and voltage regulation of single-phase transformer, O.C. and S.C. tests.

UNIT IV

D. C. Machines : Principle of electromechanical energy conversion, types of D.C. machines, E.M.F. equation, Magnetization and load characteristics, losses and efficiency, speed control of D.C. motors and applications.

Measuring Instruments: Principle of working and constructional features of Permanent Magnet Moving Coil and Moving Iron ammeters and voltmeters, Electrodynamic Wattmeter, Induction type single-phase Energy meter

UNIT V

Three-phase Induction Motor: Principle of operation, types and methods of starting, slip-torque characteristics and applications.

Single-phase Induction Motor: Principle of operation, methods of starting.

Three-phase Synchronous Machines: Principle of operation and application of synchronous motor.

Text Books

1. V. Del Toro, Principles of Electrical Engineering, Prentice Hall International.
2. H. Cotton, Advanced Electrical Technology, Wheeler Publishing.
3. E. Huges, Electrical Technology.

References

1. B. L., Theraja, Electrical Technology, Vol-1, S. Chand Publisher, New Delhi.
2. W.H. Hayt & J.E. Kennedy, Engineering circuit Analysis, Mc Graw Hill.
3. I.J. Nagrath, Basic Electrical Engineering, Tata Mc Graw Hill.
4. A.E. Fitgerald, D.E., Higginbotham and A Grabel, Basic Electrical Engineering, Mc Graw Hill.
5. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpat Rai Publish.

BEC-C 101/ BEC-C 201
DSC4 -BASIC ELECTRONICS ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Semiconductors, energy band description of semiconductors, effect of temperature on semiconductors, intrinsic and extrinsic semiconductors, donor and acceptor impurities, electron and hole concentration, conductivity of a semiconductor, mobility, Hall effect, Fermi level, mass action law, charge densities in a semiconductor, diffusion and continuity equation. 8

UNIT II

P-N junction and its properties, V-I characteristics of P-N junction, semiconductor-diode, depletion layer, equivalent circuits of junction diode, diode equation, diode resistance and capacitance, application of junction diode as clippers, clampers and rectifiers (Half-wave, Full-wave and bridge), efficiency of rectifiers, ripple factor, filter circuits, Zener and avalanche breakdown mechanism, Zener diode and its characteristics, equivalent circuit of Zener diode, Zener diode as a voltage regulator.

8

UNIT III

Bipolar junction transistor (BJT) and its action, Transistor configurations (CB, CE and CC) and their characteristics, cut-off, active and saturation regions, Transistor as a switch, operating point, dc load line, Transistor biasing and its necessity, thermal runaway, types of biasing and their analysis, stability factors, Transistor as a regulator. 8

UNIT IV

Concept of Transistor amplifier, graphical analysis of CE amplifier, dc and ac equivalent circuits, Emitter follower and its ac model. Basic idea of operational amplifier and OP-AMP parameters, inverting, non-inverting and unity gain configurations. Application of OP-AMP as adder, subtractor, differentiator and integrator 8

UNIT V

Number system, conversion of bases (decimal ,binary, octal and hexadecimal), addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gate, canonical forms, Minimization using K-map, don't care conditions. 8

Text Book

1. Integrated Electronics: Jacob Millman & C.C. Halkias

References

1. Malvino and leach “Digital principle and applications.
2. Streetman Ben.G, “Solid state electronic devices” (3/e), PHI
3. Millman and grabel, “Microelectronics” PHI
4. Robert Bolyestad “Electronic devices and circuit”, PHI

BME-C102/BME-C202
DSC5-BASIC MANUFACTURING PROCESS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credit :4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction : Classification of Manufacturing Process, Composition , Properties and uses of wrought iron, cast iron, Malleable iron ,Carbon and alloy steels, Copper, Aluminum, lead, brass, bronze, duralumin, bearing metals, high temperature metals , Properties of metals: Strength , Elasticity, Stiffness , Plasticity, Malleability , Ductility, Brittleness, Toughness, Hardness, Impact Strength, Fatigue.

UNIT II

Metal Casting: Scope of moulding, moulding sands, Principles of metal casting, pattern materials, types and allowances: classification of moulds, roles of gate, runner and riser, core, core box, and core print. Introduction of diecasting, permanent mould casting, investment casting, casting defects.

UNIT III

Metal Joining: Welding Principles, Classification of welding techniques, oxy-acetylene gas welding, Electric Arc welding, Electric resistance welding, Spot, Seam, Butt welding, Flux: composition, properties and function, Brazing and soldering, types of joints

UNIT IV

Machine Shop and Metal Cutting : Brief description of Lathe, drilling, shaping, planning, milling machines, Cutting tools used and their materials and geometry. Introduction & Profile Programming to CNC machines.

UNIT V

Carpentry: Characteristics of Soft Wood & Hard Wood, object & Methods Seasoning. Cutting, Drilling, Boring, Striking, Miscellaneous & Shaving tools. Types of Saw, Chisels & Planes.

Fitting: Operation of the Fitting Shop. Type of Vices & Clamps. Marking , Cutting, Drilling & Boring tools. Classification of Files, Hacksaw, Scrapers, Hammer, Taps, Dies, Drill, Surface Plate.

References

1 Hazra and Chowdhary (11/e), Workshop Technology (Vol 1 and 2), Media, Mumbai, 2000
2 B.S.Raghuvanshi (9/e),Workshop Technology (Vol 1 and 2), Dhanapat Rai, Delhi, 2001
3 Lindeberg Ray A, (4/e), Process & Materials of Manufacturing, PHI, New Delhi, 1995
4 Degarmo, Materials and Processes in Manufacturing, PHI, New Delhi, 2000

BEG-A151/BEG-A152
AECC1- TECHNICAL COMMUNICATION

MM: 100 **Sessional: 30**

Time: 2 hrs **ESE: 70**

L T P **Credits 2**

0 0 2

OBJECTIVES:

--To sensitize the learners to non-verbal communication.

--To expose the learners to English sound system and acquire phonetic skill and speech Rhythm.

--To help the learners use grammar correctly.

--To train the learners to speak and write English clearly, intelligibly and effectively;

Objectives:

1. To expose the learners to English sound system and acquire phonetic skill and speech rhythm.
2. To help the learners use grammar correctly.
3. To train the learners to speak English, clearly, intelligibility and effectively.
4. To equip the learners to compete for a career, and enable them to function effectively in careers which demand good communication skills.

Contents:

i) Non - verbal communication

- Use of hands
- Posture of shoulders
- Eye contact
- Weight of the body
- Movement of the body

ii) Applied Phonetics

- Sound of English-consonants and Vowels
- Phonemic Transcription
- Stress, Rhythm and Intonation

Remedial Grammar

- Some useful expression (introduction, greetings etc.) that are used frequently.
- Common mistakes in the use of nouns, pronouns, adjectives, adverb, prepositions and conjunctions.
- Use of who and whome, much and many, still and yet, so as and so that, make and do.
- Tense and their use.
- Confusion of participles.
- Tag Questions

Reading and Speaking skills, Listening and Writing skills

- Presentation and addresses
- Group discussion
- Interviews
- Role playing

Reading and Writing skills, Listening and Writing skills

- Letter writing-formal and informal
- Real life social situations
- Curriculum vitae
- Agenda, notice and minutes

List of recommended Books (Latest editions unless specified)

1). T. Balsubramaniam. “Phonetics for Indian students”, Macmillan India Ltd.
2). Jones, Daniel. “English Pronouncing Dictionary”, Cambridge Univ. Press.
3). Oxford Advanced Learners Dictionary.
4). Taylor, Grant. “Conversation Practice”, TMH, New Delhi.
5). F.T.A. Wood. “Remedial English Grammar”, Macmillan India Ltd.
6). Berry, Thomas Elliot. “The most common errors in English usage”, TMH, New Delhi.
7). N. Krishnaswamy. “Modern English”, Macmillan India Ltd.
8). Desmond. “People Watching”.

BPH-C 151/ BPH-C 251
DSC1-ENGINEERING PHYSICS LAB

MM : 100 **Sessional: 30**

Time : 2 hrs **ESE: 70**

L T P **Credit : 2**

0 0 2

LIST OF EXPERIMENTS

1. To determine the value of Stefan's constant by electrical method.
2. To determine the focal points, principal points and focal length of a combination of lenses by Newton's method and its verification.
3. To determine the focal length of a combination of two lenses by Nodal Slide method and to Locate the position of cardinal points.
4. To determine the dispersive power of the material of the given prism.
5. To determine the wavelength of spectral lines by plane transmission grating.
6. To determine the wavelength of monochromatic light with the help of Newton's ring method.
7. To determine the wavelength of monochromatic light with the help of Fresnel's Biprism.
8. To study the variation of magnetic field along the axis of the current carrying coil and then to estimate the radius of the coil.
9. To determine the e/m of electron by magnetron method.
10. To study the characteristics of a photocell.
11. To determine the value of Plank's constant by photoelectric effect.
12. To study the Energy band gap of a semi conducting sample by Four Probe method.
13. To study the Hall effect using Hall effect set up.
14. To determine the susceptibility by Quink's method.
15. To determine the specific resistance of the material of the given wire using C.F. bridge.
16. To study the nature of polarization of Laser light& to verify malus Law.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BEE-C 151/BEE-C 251
DSC3-BASIC ELECTRICAL ENGINEERING LAB

MM: 100 **Sessional: 30**
Time: 2 hrs **ESE: 70**
L T P **Credit: 2**
0 0 2

LIST OF EXPERIMENTS

1. Verification of Kirchoff's laws.
2. Verification of Thevenin's theorems.
3. Verification of Norton's theorem
4. Verification of Superposition theorem.
5. Verification of maximum power transfer theorem.
6. Measurement of power in three-phase circuit by two wattmeter method.
7. Determination of efficiency of a single-phase transformer by load test.
8. To perform open circuit test on single-phase transformer & find equivalent circuit parameters.
9. To perform short circuit test on single-phase transformer & find equivalent circuit parameters.
10. D.C. generator characteristics
    (a) Shunt generator
    (b) Series generator
    (c) Compound generator
11. Speed control of D.C. shunt generator.
12. To study running and reversing of a three-phase Induction Motor.
13. To study & calibration of a single-phase Energy Meter.
14. Calibration of voltmeter and ammeter.
15. To study of resonance in RLC circuit.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BEC-C 151/ BEC-C 251
DSC4-BASIC ELECTRONICS ENGINEERING LAB

MM: 100 **Sessional: 30**
Time: 2 hrs **ESE: 70**
L T P **Credit: 2**
0 0 2

LIST OF EXPERIMENTS

1. To draw the V-I characteristics of PN junction diode.
2. To draw the V-I characteristics of Zener diode.
3. To study junction diode as half wave and full wave rectifier.
4. To study junction diode as clipper and clamper.
5. To study the Zener diode as voltage regulator.
6. To draw the input and output characteristics of a transistor in CE configuration.
7. To draw the input and output characteristics of a transistor in CB configuration.
8. To find the small signal h-parameters of a transistor.
9. To study various logic gates.
10. To study Op-Amp as inverting and non- inverting amplifier.
11. To study Op-Amp as adder and subtractor.
12. To study Op-Amp as differentiator and integrator.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BME-C152/BME-C252
DSC5-WORKSHOP PRACTICE

MM : 100 **Sessional: 30**
Time : 2 hrs **ESE: 70**
L T P **Credit : 2**
0 0 2

LIST OF EXPERIMENTS

Carpentry Shop

1. To prepare a half T joint of given dimensions.
2. To prepare a wooden pattern of given dimensions.

Moulding Shop

3. To prepare a mould of half bearing.
4. To prepare a mould using core.

Metal Joining.

5. To prepare a butt joint of MS strips using Arc welding.
6. To prepare a T joint of MS strips using Oxy Acetylene gas welding.

Fitting Shop

7. To prepare a rectangular piece with slant edge of given size from M.S. flat.

Machine Shop

8. To prepare a job on Lathe machine of given shape and size.
9. To prepare a job on Shaper machine of given shape and size.
10. To prepare a job on Milling machine of given shape and size.
11. To prepare a job on CNC train master of given shape and size.
12. To prepare a job on drilling machine of given shape and size.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

Effective from 2015-16

BEN-A101/ BEN-A201
AECC2-ENVIRONMENTAL STUDIES

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Multidisciplinary Nature of Environmental Studies & Ecosystems: (a) definition, scope and importance of ecology and environment (b) ecological components: (i) abiotic components: soil, water, light and temperature (ii) biotic components & their relationships- symbiosis, commensalisms, parasitism, predation and antibiosis (c) concept of an ecosystem (d) structure and function of an ecosystem (e) producers, consumers and decomposers (f) energy flow in the ecosystem (g) ecological succession (h) food chains, food webs and ecological pyramids (i) introduction, types, characteristic features, structure and function of the following ecosystems: (i) forest ecosystem (ii) grassland ecosystem (iii) desert ecosystem (iv) aquatic ecosystems (pond, river, ocean) (j) Need for public awareness

UNIT II

Natural Resources: (a) forest resources: use and over-exploitation, deforestation, timber extraction, mining; dams and their effects on forest and tribal people (b) water resources: use and over-utilization of surface and ground water, benefits and problems of dams (c) mineral resources: use and exploitation, environmental effects of extracting and using mineral resources (d) energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources (e) land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification (f) biodiversity & its conservation: definition- genetic, species and ecosystem diversity, values of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values (g) India as a mega-diversity nation, hot-spots of biodiversity, threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts; endangered and endemic species of India, conservation of biodiversity: *in-situ* & *ex-situ* methods (h) bio-geographical classification of India (i) role of an individual in conservation of natural resources (j) equitable use of resources for sustainable lifestyles

UNIT III

Environmental Pollution: (a) Definition, causes, effects and control measures of: air pollution, water pollution, soil pollution, noise pollution, thermal pollution and nuclear hazards (b) solid waste management- causes, effects and control measures of urban and industrial wastes (c) role of an

individual in prevention of pollution (d) disaster management: floods, earthquake, drought & landslides

UNIT IV

Social Issues and the Environment: (a) from unsustainable to sustainable development (b) urban problems related to energy (c) rain water harvesting (d) resettlement & rehabilitation of people-problems and concerns (e) environmental ethics- issues and possible solutions (f) wasteland reclamation (g) population growth and family welfare programme (h) environment and human health, human rights, value education (i) HIV/AIDS (j) role of information technology (IT) in environment and human health (k) global environmental issues: global warming, acid rain, ozone layer depletion

UNIT V

Environmental policies and laws: (a) salient features of following acts i. Environment Protection Act 1986 ii. Air (Prevention and Control of Pollution) Act 1981 iii. Water (Prevention and Control of Pollution) Act 1974 iv. Wildlife Protection Act 1972 v. Forest Conservation Act 1980 (b) issues involved in enforcement of environmental legislation (c) public awareness

References

1. Agarwal, K.C. *Environmental Biology*, Nidhi Publ. Ltd., Bikaner.
2. Bharucha E. *The Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad.
3. Clark R.S. *Marine Pollution*, Clanderson Press Oxford.
4. Cunningham, W.P., Cooper, T.H., Gorhani, E. & Hepworth, M.T. *Environmental Encyclopedia*, Jaico Publ. House, Mumabai.
5. De A.K. *Environmental Chemistry*, Wiley Eastern Ltd.
6. Gleick, H.P. *Water in Crisis*, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press.
7. Hawkins R.E. *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay.
8. Heywood, V.H & Waston, R.T. *Global Biodiversity Assessment*, Cambridge Univ. Press.
9. Odum, E.P. *Fundamentals of Ecology*, W.B. Saunders Co. USA.
10. Rao M N. & Datta, A.K. *Waste water treatment*, Oxford & IBH Publ. Co. Pvt. Ltd.
11. Sharma B.K. *Environmental Chemistry*, Geol Publ. House, Meerut.
12. Trivedi R.K. *Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards*, Vol. I and II, Enviro Media.
13. Trivedi R. K. and Goel, P. K. *Introduction to air pollution*, Techno-Science Publication.
14. Wanger K.D. *Environmental Management*, W.B. Saunders Co. Philadelphia, USA.

BHU-S101/ BHU-S201
SEC 1 VEDIC SCIENCE & ENGINEERING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits: 2**
2 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllbus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Science in Vedic literature and Indian Philosophy-I : Kanad's atomic theory, concept of parmanu, Formation of molecules, Parimandal, Comparison with Dalton's atomic theory and models of Thompson, Rutherford and Bhor. Concept of SAMATA and VISHAMTA vs Maxwell-Boltzmann's distribution of velocities and energies.

UNIT II

Science in Vedic literature and Indian Philosophy-II : First and Second Law of thermodynamics in daily life. Law of helplessness of mankind in thermodynamics and Indian philosophy. Entopy in life and concept of pralaya. Dhananjay Vs concept of Radioactivity-life after death. Atomic spectrum Vs concept of Kundalini.

UNIT III

Vedic Mathematics : Measurements in Vedic Times, ancient scale of length, mass, time and temperature, Number system, Geometry according to sulba Sutra. Overview of Vedic Mathematical Rules (ekadhiken pooren, Nikhil navtascharaman dashatah, oordhavatriyagyabhyam)

UNIT IV

Electrical, Electronics & Aeronautical Engineering in Vedas : Concept of electrical Engineering, type of electricity – Tadit, Saudamini, Vidyut, Shatakoti, Haradini, Ashani. Electronics Engineering in Vedic literature. Aeronautical Engineering in Vedic literature, Types of Vimanas and their construction and working, Shakun viman, Rukma viman, Tripura viman, concept of calculator and ancient ways of computation.

UNIT V

Mechanical, Chemical, Civil & Architectural engineering in Vedic Literature : Mechanical & Chemical Engineeering in ancient India,Art of Alchemy,Types of Iron and steel.Civil and Architectural engineering in Vedic literature.Concept of cryptography & Art of secret writing.

Suggested Readings :

1. Science in Vedas by Acharya Vaidyanath Sashtri.
2. Science in the Vedas by Hansraj, Shakti Publications, Ludhiana.
3. Vedic Mathematics by Swamisri Bharati Krishana Teerathaji, Motilal Banarasi Das, Delhi.
4. Brahad Viman shastra by Maharishi Bhardwaj.
5. Vymanika shastra, English translation by G. R. Josyer.
6. Alchemy and Metallic Medicines in Ayurveda by : Vaidya Bhagwan Das.
7. History of Hindu Chemistry by : P. C. Raya
8. Indian Alchemy by : Dr. S. Mahdihassan.
9. Ancient Scientist of Indian by Satya Prakash.
10. Vaishaishik Darshan by Maharishi Kanad.
11. Vedas : The sources of ultimate science by S. R. Verma, Nag Publisher, New Delhi**DSC8-**

BME-C 101/BME-C 201
DSC6-FUNDAMENTAL OF MECHANICAL ENGINEERING

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credit: 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Thermodynamics I: Introduction to SI units, Definition of thermodynamic system, Surrounding and Universe, Quasi static process, Energy interaction Zeroth law, Concept of temperature First law of thermodynamics, Application to closed and open system, Concept of Enthalpy, steady flow energy equation, Throttling process.

UNIT II

Thermodynamics II: Second law, reversible and irreversible process, Thermal reservoir, heat engines and thermal efficiency, COP of heat pump and refrigerator, Carnot cycle, Clausius inequality, Concept of entropy, Entropy change for ideal gases.

UNIT III

Thermodynamics III: Generation of steam at constant pressure, Properties of steam, Use of property diagram, Process of vapor in closed and open system, Rankine cycle. Stroke clearance ratio, Compression ratio, Definition and calculation of mean effective pressure (no proof) for air standard cycles (Otto and diesel cycles)

UNIT IV

Mechanics: Trusses: Plane structure, (Method of Joints and Sections only) Beams: Bending moment and shear force diagram for statically determinate beams.

UNIT V

Strength of Materials: Simple stresses and strain, strain energy, stress- strain diagram, elastic constants. Compound stress and strain: state of stress at a point, Simple tension, pure shear,general two dimensional stress system, principal planes, principal stresses and strains, Mohr's stress circle, Poisson's ratio, maximum shear stress

References

1 Kumar DS (2/e), Thermal Science and Engineering, S.K.Kataria, New Delhi,2001
2 P.K.Nag (2/e), Engineering Thermodynamics, TMH, New Delhi,2001
3 R.Yadav(7/e), Thermal Engineering, Central Publishing House, Allahabad, 2000
4 Shames Irving H.(4/e), Engineering Mechanics, PHI, New Delhi, 1994
5 Hibler (1/e), Statics and Dynamics, Pearson Education, Singapore, 2000

BCS-C 101/BCS-C 201
DSC7 -PROGRAMMING SOLVING THROUGH 'C'

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credit: 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Computers: Block diagram of computers, functions of its important components, Memory and I/O devices. Concept of assembler, interpreter, compiler & generation of languages

Number System: Decimal, Binary, Octal, and Hexadecimal numbers and their arithmetic (addition, subtraction, multiplication, and division): 1's and 2's complements

UNIT II

Basic Operating System Concepts: MS-DOS, WINDOWS, UNIX, Functional knowledge of these operating systems. Introduction to basic commands of DOS & UNIX, Managing Files and Directories in various operating systems, Introduction to Internet, Basic terms related with Internet, TCP/IP.

UNIT III

Programming in C: History, Introduction to C Programming Languages, Structure of C Programs, Compilation and Execution of C Programs, Debugging techniques, Data Type and sizes, Declarations of variables, Modifiers, Identifiers and keywords, Symbolic Constants, Storage classes(automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

Operators: Unary operators, Arithmetic & Logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

Control Statements: If-else, switch, break, continue, the coma operator, goto statement. **Loops:** while, do-while, for loop.

UNIT IV

Arrays: One-dimensional arrays: declaration, initialization and application. Two-dimensional array: declaration, initialization and application, Multidimensional arrays.

Handling of Character Strings: Declaring and initializing string variables, Reading strings, Writing strings, Arithmetic operation on strings, comparison of two strings and string handling functions.

Pointers: Accessing the address of the variable, Declaring and initializing pointers, accessing a variable through its pointer expression, pointer increment and scale factor, pointers and array, pointers and character strings.

UNIT V

Functions: Need for user defined function, Return value and its type, function calls, No argument and No return values function, Argument and No return values functions, argument and return value functions. Handling of non integer function, Scope and life time of variable in functions

Recursion: Recursive Definition and processes, recursion in C, example of recursion, Tower oh Hanoi Problem, simulating recursion, Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

References

1. Rajaraman V.(3/e), Fundamental of Computers, PHI, New Delhi, 1999
2. Sanders,D.H., Computers Today, Mcgraw Hill, 1998
3. Kris Jamsa, DOS the complete reference, Tata McGraw Hill
4. J.Peek Tim O'reilly & M.Locekides, UNIX POWER TOOLS, BPB Publication
5. Yashwant Kanetkar, Let Us C, BPB
6. Yashwant Kanetkar, C In Depth, BPB

BMA-C 201
DSC8-ENGINEERING MATHEMATICS II

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credit: 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Differential Equation : Ordinary differential equations of first order, orthogonal trajectories, linear differential equations with constant coefficients, Euler- Cauchy equations, Equations of the form $y'' = f(y)$. Solution of second order differential equations by change of dependent and independent variables, Method of variation of parameters for second order differential equations. Simple applications.

UNIT II

Partial Differential Equations and its Applications : Introduction of partial differential equations, Linear partial differential equations of II order with constant coefficients and their classifications - parabolic, elliptic and hyperbolic with illustrative examples, Method of separation of variables. Wave and Heat equation up to two-dimensions

UNIT III

Solution in Series : solution in series of second order linear differential equations, Bessel's and Legendre's equations and their solutions, Properties of Bessel function and Legendre's polynomials, Recurrence relations, Generating functions, Jacobi series, Integral representation of Bessel's functions.

UNIT IV

Fourier Series : Fourier series, Dirichlet's condition and convergence. Half range series, Harmonic analysis.

UNIT V

Statistics : Moments, Moment generating functions. Binomial, Poisson and Normal distributions. Correlation and Regression. Method of least squares and curve fitting - straight line and parabola.

References

1. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
2. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
3. Prasad C.,Advanced Mathematics for Engineers, Prasad Mudranalaya
4. Kapur J. N. & Saxena H.C., Mathematical Statistics

BAC-C 101/ BAC-C 201
DSC9 -ENGINEERING CHEMISTRY

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credit: 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Periodicity & Chemical Bonding: Atomic radii, Ionization potential, Electro negativity, Electro positivity, Electron affinity and their periodicity. Hybridization involving s, p and d orbital, partial ionic character, dipole moment and its applications, hydrogen bond and Vander Waal's forces, elementary treatment of M.O. theory and its application to homo nuclear diatomic molecules of I and II period elements.

Phase Rule: Gibbs phase rule (without derivation). Applications of Phase rule to one component system (H_2O and S) and two component system (KI- H_2O system). **7**

UNIT I

Chemical kinetics: Arrhenius equation, determination of activation energy, theories of reaction rates (collision and absolute reaction rate theory).

Photochemistry: Laws of Photochemistry, Quantum yield, Fluorescence, Phosphorescence, Chemiluminescence, Jabolinski diagram. **8**

UNIT III

Water Analysis: Hard & soft water, Specification of water, Analysis of water-alkalinity, hardness (EDTA Method only) of water for domestic use, Water softening-soda-lime process, anion exchangers, Boiler-feed water, Boiler problems-scale and sludge, priming & forming, Caustic embittlement & corrosion, their cause and prevention (Removal of dissolved gases, carbonate treatment, Phosphate conditioning, Colloidal conditioning), numerical problems based on hardness. Solid impurities (filterable, non-filterable), pH, D.O, B.O.D., C.O.D

Polymers: Polymers, thermoplastics, thermosetting plastic, linear, branched & cross linked polymers etc., industrial application of polymers, addition, condensation polymerizations. (I)Plastics: Structure, properties and uses of thermoplastic (Polyvinyl chloride, Teflon, Nylons and Polymethyl methacrylate) and thermosetting (Bakelite) materials.

(II)Rubber: natural Rubber and it's preparations, vulcanization, mechanism of vulcanization, synthetic rubber (General). **8**

UNIT IV

Fuels: Definition and classification, Calorific value; Gross & Net calorific value and their determination by Bomb calorimeter.

(I)Solid fuels: Coke-it's manufacture by Otto Hoffman oven and uses.

(II) Liquid fuels: Conversion of coal into liquid fuels (Bergius process & Fischer Tropsch process and mechanism), Petroleum- its chemical composition and fractional distillation. Cracking of Heavy oil residues (Thermal cracking and catalytic cracking), Knocking & Anti knocking agents, octane and cetane numbers and their significance

(III)Gaseous fuels: Natural Gas, Producer gas, Water gas, Carburetted water gas, Coal gas and Oil gas.

(IV)Nuclear fuels: Nuclear fission and nuclear fusion. Nuclear reactor

Corrosion: Definition and types of corrosion, Electrochemical Theory of corrosion, laws of oxide film, different theories of corrosion, Atmospheric corrosion, stress corrosion water line, pitting and soil corrosion. Protective measures against corrosion **9**

UNIT V

Lubricants: Principle of Lubrication, types of Lubrication, Lubricating oil, fraction from crude oil, de-waxing of oil fraction, acid and solvent, refining of lubricating oils, properties of refined oils (viscosity, viscosity index, acid value, saponification value & iodine value, pour point and cloud point, flash point and fire point, aniline point, and their determination, Lubricant greases (Semi solid) and their Penetration and drop point tests, solid lubricants.

Name Reactions: Reimer Tieman reaction, Aldol Condensation, Diel's Alder Reaction, Wurt'z Reaction and Claisen Reaction. **8**

References

1. Principales of Physical chemistry : B.R. Puri, L.R. Sharma, M. Pathania
2. Advanced inorganic chemistry : Cotton
3. A text book of organic chemistry : S.K. Jain
4. Principals of Physical Chemistry : Samuel Glastone
5. A text book of Engineering chemistry : S.S. Dara
6. A text book of Engineering chemistry : Jain

BAC-C 151/ BAC-C 251
DSC9-ENGINEERING CHEMISTRY LAB

MM: 100 **Sessional: 30**

Time: 2 hrs **ESE: 70**

L T P **Credit: 2**

0 0 2

LIST OF EXPERIMENTS

1. Find out the surface tension of given liquid by stalagnometer.
2. Find out the viscosity of given liquid by Ostwald's viscometer.
3. Find out pH of given acid/base solution by using pH meter.
5. Determine Na^+ and K^+ concentration using flame photometer.
6. Determine the turbidity of given solution/water sample by turibidimeter.
7. Determination of D.O. of water sample.
8. Find out distribution constant for the distribution of I_2 between CCl_4 and water.
9. Separate the given mixture indicator by using TLC.
10. Separate the given mixture by using paper chromatography
11. Determine the angle of rotation of given solution by using polarimeter.
12. Determination of strength of oxalic acid/Mohr salt by $KMnO_4$.
13. Determination of strength of oxalic acid/Mohr salt by $K_2Cr_2O_7$.
14. Determine the refractive index of given liquid by using Abbe's refractrometer.
15. Determine conductivity of given compound.
16. Determine absorption maxima and concentration of given $KMnO_4$ solution.
17 To observe fluorescence of fluorescent materials.
18. Determine acid value of given oil sample.
19. Determine iodine value of given oil sample.
20. Determine saponification value of given oil sample.

REFERENCES

1. Advanced practical physical chemistry : J.B. Yadav
2. Analytical chemistry Vol. I, II, III : Subhash, Satish
3. Applied chemistry : Virmani and Narula

NOTE

6. In practical examination the student shall be required to perform two experiments.
7. A teacher shall be assigned 20 students for daily practical work in laboratory.
8. No batch for practical class shall consist of more than 20 students.
9. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
10. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BME-C 151/ BME-C 251
DSC6-BASIC MECHANICAL ENGINEERING LAB

MM : 100 **Sessional: 30**

Time : 2 hrs **ESE: 70**

L T P **Credit :2**

0 0 2

LIST OF EXPERIMENTS

1. To conduct the tensile test on a UTM and determine ultimate tensile strength, percentage elongation for a steel specimen.
2. To conduct the compression test and determine the ultimate compressive strength for a specimen.
3. To determine the hardness of the given specimen using Brinell / Rockwell / Vicker testing machine.
4. To study the 2-stroke I.C. Engine models.
5. To study the 4-stroke I.C. Engine model.
6. To study close loop system example (Turbine)
7. To study model of Locomotive boiler.
8. To study model of Bibcock boiler.
9. Study of Fire Tube boiler
10. Study of water Tube boiler

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BCS-C 151/BCS-C 251
DSC7 -COMPUTER PROGRAMMING LAB

MM: 100 **Sessional: 30**

Time: 2 hrs **ESE: 70**

L T P **Credit: 2**

0 0 2

LIST OF EXPERIMENTS

1. Practice of all internal and external DOS commands.
2. Write simple batch program.
3. Giving exposure to windows environment.
4. File and program management in windows.
5. Practice of all UNIX commands.
6. Introduction to text editing and word processing.
7. Net surfing.
8. Creation and usage of E-mail account.
9. Write a program in C to perform different arithmetic operations.
10. Write a program in C to greater of two numbers.
11. Write a program in C to check whether no. is odd or even.
12. Write a program in C to check whether no. is prime or not.
13. Write a program in C to print Fibonacci series.
14. Write a program in C to print factorial of a no.
15. Write a program in C to add two matrices.
16. Write a program in C to search a no. in array.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BME-C153/BME-C253
DSC10-ENGINEERING GRAPHICS

MM : 100 **Sessional: 30**
Time : 2 hrs **ESE: 70**
L T P **Credit : 2**
0 0 2

LIST OF EXPERIMENTS

1. To understand graphics as a tool to communicate ideas, lettering and dimensioning, construction of geometrical figures.
2. To understand orthographic projection: principles of orthographic projections.
3. To understand principle and auxiliary planes.
4. To understand first and third angle projections.
5. To draw a sheet on projections of points.
6. To make two sheets based on projection of lines parallel to both the planes, parallel to one and inclined to other, inclined to both the planes, true length and traces of a line.
7. To make a sheet based on projection of planes, traces of planes, angles of inclinations of planes, parallel planes.
8. To make a sheet projection of solid in simple position, axis or slant edge inclined to one and parallel to other plane, solids lying on a face.
9. To make a sheet using section of solids lying in various positions, true shape of the section.
10. To make a sheet on development of lateral surfaces.
11. To understand isometric projection: principle of isometric projection, isometric projection using box and offset methods.
12. To practice two exercises using computer aided drawing: basic concepts and application.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BSP-S151

SEC2-PHYSICAL TRAINING & YOGA

MM : 100 **Sessional : 100**

L T P **Credits: 0**

0 0 2

1. Sports Activities and Development of motor abilities.
   Track and field events
   Game events
2. Yogic Exercises and Pranayam
   Surya Namaskar
   Bhujangasana
   Shalabhasana
   Shrishasana
   Anuloma – Viloma
   Kapal Bhati
   Shitali
   Bhramari

BMA-C301
DSC11-ENGINEERING MATHEMATICS – III

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Laplace Transform: Laplace transform of elementary functions. Shifting theorems. Transform of derivatives. Differentiation and Integration of transforms, Heaviside unit step and Dirac Delta functions. Convolution theorem. Solution of ordinary linear differential equations used in Mechanics, Electric circuits and Bending of beams. **9**

UNIT II

Fourier Transforms: Definition of Fourier transform, Fourier sine and cosine transforms. Fourier integral formula. Applications to solutions of boundry value problems. **7**

UNIT III

Z - transform : Definition, Linearity property, Z - transform of elementary functions, Shifting theorems, Initial and final value theorem, Convolution theorem, Inversion of Z - transforms, Solution of difference equations by Z - transforms. **7**

UNIT IV

Functions of a Complex Variable - I : Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem. **9**

UNIT V

Functions of a Complex Variable - II: Representation of a function by power series, Taylor's and Laurent's series, Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type $\int_{o}^{2\pi} f(\cos\theta, \sin\theta)\,d\theta$ and $\int_{-\infty}^{\infty} f(x)/F(x)\,dx$, Conformal mapping and bilinear transformations. **8**

References

1. Prasad C., Advanced mathematics for Engineers, Prasad Mudranalaya
2. Schaum outline Series, Integral Transform,TMH
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
4. Brancewel, Fourier Transforms and their applications, McGraw
5. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999

BME-C302
DSC12-MATERIAL SCIENCE

MM : 100
Time : 3 Hr
L T P
3 1 0

Sessional : 30
ESE : 70
Credit : 4

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Crystallography and Imperfections: Introduction of crystal structures, Concept of unit cell space, Miller indices. Xraycrystallography techniques. Imperfections, Defects & Dislocations in solids.

Microstructural Examination: Microscopic principles and methods. Preparation of samples and Microstructure examination and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild Steel, CI, Brass.

UNIT II

Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type.Iron-carbon equilibrium diagram.

UNIT III

Ferrous Materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

UNIT IV

Magnetic Properties: Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.

Electric Properties: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Diffusion of Solid. Super conductivity and its applications. Messier effect. Type I & II superconductors. High Tc superconductors.

UNIT V

Ceramics: Structure types and properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/plastics and its applications. Mechanical behavior and processing of plastics. Future of plastics.

Other Materials: Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smartmaterials & Nano-materials and their potential applications

References

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesley Publication .
2. K.M.Gupta, Materials Science, Umesh Publication.
3. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.
4. V. Raghvan - Material Science, Prentice Hall.
5. Narula - Material Science, TMH.
6. Srivastava, Srinivasan - Science of Materials Engineering, NewAge Publication..

BME-C303
DSC13-APPLIED THERMODYNAMICS

MM : 100
Time : 3 Hr
L T P
3 1 0

Sessional : 30
ESE : 70
Credit : 4

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Review of Thermodynamics: Brief review of basic laws of thermodynamics, Helmholtz & Gibb's function, Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility. Availability & Irreversibility.

UNIT II

Properties of Steam and Boilers: Properties of steam. Use of steam table & Mollier Chart. Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

UNIT III

Steam Engines: Rankine and modified Rankine cycles, working of stream engine Indicator diagram.Steam & Gas Nozzles : Flow through nozzle, variation of velocity, area and sp. Volume, nozzle efficiency, Throat area. Super saturated flow.

UNIT IV

Vapour Power cycles: Effect of Pressure & temp. on Rankine cycle Reheat cycle, Regenerative cycle, feed water heaters. Steam Turbines: Classification, impulse and reaction turbines, Staging, Stage and overall efficiency, re-heat factor, bleeding, comparison with steam engines. Governing of turbines. Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, impulse Reaction Turbines, state point locus, Reheat factor.

UNIT V

Gas Turbine & Jet Propulsion: Gas turbine classification Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat & regeneration stage efficiency, polytropic efficiency. Deviation of actual cycles from ideal cycles. Introduction to the principles of jet propulsion, Turbojet & turboprop engines & their processes, Introduction to Rocket Engine.

References

1. Onkar Singh, Applied thermodynamics, New Age International (P) Publishers Ltd.
2. Thermal Engg. By P.L. Ballaney, Khanna Publisher
3. Theory of Stream Turbine by W.J. Kearton

4. Steam & Gas Turbine by R.Yadav, CPH Allahabad
5. Thermal Engg. by R.K. Rajput, Laxmi Publication
6. Turbine Compressors & Fans by S.M. Yahya, TMH
7. Gas Turbine, by Ganeshan, Tata McGraHill Publishers.
8. Heat Engines by R. Yadav, CPH Allahabad.
9. Engg. Thermodynamics by Nag
10.Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man Ltd.

BME-C304
DSC14-STRENGTH OF MATERIAL

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

(a) Stress and strain: Definition of stress, stress tensor, stresses in axially loaded members. Strain, axial deformation. Compound bars. Thermal strains.

(b) Transformation of stress and strain: Principal Stresses. Maximum shearing stress. Mohr's circle, Principal strains, Strain rosettes, Relation between E,K,G and υ.

UNIT II

(a) Torsion: Torsion of Circular shafts, Torsion formulas, Shearing stress, Close coiles helical springs.

(b) Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Godson Formulae, Examples of columns in mechanical equipments and machines.

UNIT III

(a) Stresses in Beams: Review of pure Bending. Direct and shear stresses in beams due to transverse and axial loads, composite beams.

(b) Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulys method, area moment method, fixed and continuous beams.

UNIT IV

Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

UNIT V

(a) Thin Shells of Revolution: Cylindrical and spherical shells. Stress due to internal pressure, change in volume due to internal pressure.

(b) Compound stresses: Stresses in different machine parts subjected to combined internal pressure and bending, twisting and axial loads.

References

1. Strength of Materials by Ryder
2. Strength of Materials by Singer
3. Strength of Materials by Timoshenko and Timoshenko & Yσung
4. Engineering Mechanics of Solids by Popov
5. Mechanics of Materials by Bear Jhonson
6. Strength of Materials by R.K. Rajput
7. Strength of Materials by Ramamrutham & Narain

BME-C305
DSC15-KINEMATICS OF MACHINES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Links-types, Kinematics pairs-classification, Constraints-types, Degree of Freedom, Grubler's equation, linkage mechanisms, inversions of four bar linkage, slider crank chain and double slider crank chain

Velocity in Mechanisms: Velocity of point in mechanism, relative velocity method, instantaneous point in mechanism, Kennedy's theorem, instantaneous center method.

UNIT II

Acceleration in Mechanisms: Acceleration diagram, Coriolis component of acceleration, Klein's construction for Slider Crank and Four Bar mechanism, Analytic method for slider crank mechanism.

Mechanisms with Lower Pairs: Pantograph, Exact straight line motion mechanisms - Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms – Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hook's joint, Davis and Ackermann Steering gears.

UNIT III

Kinematics Synthesis of Planar Linkages: Movability of four bar linkages, Grashoff's law, Graphical methods of synthesis – Two and Three position synthesis of four bar and slider crank mechanisms, Analytical method-Freudenstein's equation for function generation (three position)

UNIT IV

Cams: Cams and Followers - Classification & terminology, Cam profile by graphical methods for uniform velocity, simple harmonic motion and parabolic motion of followers, Analytical cam design – tangent and circular cams.

UNIT V

Gears: Classification & terminology, law of gearing, tooth forms, interference, under cutting, minimum number of teeth on gear and pinion to avoid interference, simple, compound and planetary gear trains.

References:

1. Theory of machines - Thomas Bevan
2. Theory of machines and mechanisms- Shigley
3. Theory of machines and mechanisms-Ghosh & Mallik
4. Theory of machines and mechanisms- Rao & Dukkipati
5. Theory of Machines – R. K. Bansal
6. Theory of Machines – V. P. Singh
7. Theory of Machines – Malhotra & Gupta
8. Theory of Machines – Khurmi & Gupta; 9. Mechanics of Machines – V. Ramamurti

BEC-C301
DSC16-ELECTRONICS DEVICES & CIRCUITS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Varactor, tunnel, Schottkey barrier, LED, Photodiode and their characteristics, p-n-p-n diode and their characteristics, SCR, UJT. Ebers-Moll model of BJT, T model of BJT, Hybrid model of BJT at low frequency, computation of voltage gain, current gain and power gain, Z_i and Z_o and approximate formulas, high frequency transistor hybrid π model. (9)

UNIT II

Field Effect Transistor: JFET and its characteristics, biasing of JFET, small signal low frequency and high frequency model of JFET amplifier, configurations of JFET, MOSFET, MESFET (Enhancement & depletion types) their construction and characteristics, configuration of MOSFET, AND, OR, NAND, and NOR Gates using PMOS, NMOS and CMOS. (9)

UNIT III

Multistage Amplifier: Effect of coupling and by-pass capacitors, types of coupling (DC, RC, and TC), Darlington connection, cascode amplifier, coupling schemes for multistage amplifier and frequency response of transistor amplifier.

Power amplifiers: Class A, Class B, Class C and Class AB amplifiers and their efficiencies, harmonic distortion, push-pull amplifier. Basic idea of tuned amplifier. (9)

UNIT IV

Feedback Amplifiers: Principles of feedback in amplifiers, advantages of negative feedback, classification of feedback(voltage-series, voltage-shunt, current-series, current-shunt)amplifiers, effect of negative feedback on gain, stability of gain, input and output impedances, bandwidth and gain-bandwidth product. (7)

UNIT V

Oscillators: Positive feedback, Berkhausen criterion for sinusoidal oscillation, Phase-shift oscillator, Weinbridge oscillator, Tuned oscillator, Hartley, Colpitts and Crystal oscillator. (6)

Text Book

J.Millman & A. Grabel, 'Microelectronics', TMH

References

1. R.L. Boylestad L. Nashelsky, 'Electronics Devices & Circuit Theory. Prentice hall
2. J.Millman & Halkias, 'Integrated Electronics', MGH
3. Sedra & smith, "Microelectronics circuit."

Effective from 2016-17

BME-C351
DSC17-MACHINE DRAWING

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. **Introduction:** Graphic language, Classification of drawings, Principles of drawing: IS codes for Machine drawing, Lines, Scales, Sections, Dimensioning, Standard abbreviations. Orthographic Projections: Principles of first and third angle projections, drawing and sketching of machine elements in orthographic projections, spacing of views.
2. **Screwed (Threaded) Fastners:** Introduction, Screw thread nomenclature, Forms of threads, Thread series, Thread designation. Representation of threads, Bolted joints, Locking arrangements for nuts, Foundation bolts.
3. **Keys and Cotters:** Keys, Cotter joints, Shaft couplings : Introduction, Rigid and flexible coupling. Riveted Joints : Introduction, Rivets and riveting, Rivet heads, Classification of riveted joints.
4. **Assembly Drawing:** Introduction, Engine parts, Stuffing box etc.
5. **Specification of Materials:** Engineering materials, code designation of steels, copper and aluminum and its alloys.
6. Limits, Tolerance and fits: Introduction, Limit systems, tolerance, fits, Drawings and exercises.
7. **Surface Roughness:** Introduction, surface roughness, machining symbols, indication of surface roughness, drawing exercises.
8. **Computer Aided Drafting:** Introduction, input, output devices, introduction to drafting software like Auto CAD, basic commands and development of simple 2D and 3D drawings.
9. **Fee Hand Sketching :** Introduction, Need for free hand sketching, Free hand of sketching of some threaded fasteners and simple machine components.

References

1. N. Siddeshwar, P.Kannaiah, V.V.S. Shastry: Machine drawing, TMH, New Delhi.
2. K.L. Narayana, P. Kannaiah, K. Venkat Reddy: Machine drawing, New Age Intemational Publications, 2nd edition.
3. Engineering drawing practice for schools and colleges, SP46-1998 (BIS)

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BME-C352
DSC12-MATERIAL SCIENCE AND TESTING LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

Material Science Lab Experiments: (at least 5 of the following)

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain Size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, cooper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of say 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & Micro examination.

Material Testing Lab Experiments: (at least 5 of the following)

1. Other tests such as shear, bend tests on UTM.
2. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
3. Spring index testing on spring testing machine.
4. Fatigue testing on fatigue testing machine.
5. Creep testing on creep testing machine.
6. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
7. Torsion testing of a rod on torsion testing machine.
8. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.
9. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BME-C353
DSC13-APPLIED THERMODYNAMICS LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

Experiments: Say minimum 10 experiments out of following in depth and details according to theory covered in applied thermodynamics theory subject (BME-C303)

1. Study & working of Refrigerator
2. Study of velocity compounded steam turbine
3. Study of pressure compounded steam turbine
4. Study of impulse & Reaction turbine
5. Study of steam Engine model.
6. Study and working of two stroke petrol Engine
7. Study and working of Four stroke petrol Engine
8. Determination of Indicated H.P. of I.C. Engine by Morse Test
9. Study of Gas Turbine Model
10. Study & working of Air conditioner
11. Prepare the energy balance for Diesel/Petrol Engine
12. Study and working of two stroke Diesel Engine
13. Study and working of four shope Diesel Engine.
14. Study of Ignition system of I.C. Engine.
15. Study of Breaking system of any vehicle.

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BEC-C351
DSC16-ELECTRONICS DEVICES AND CIRCUITS LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

LIST OF EXPERIMENTS:

1. To draw the input and output characteristics of FET and to measure the pinch off voltage.
2. To draw the drain and transfer characteristic curve of MOSFET.
3. To draw the frequency response of FET amplifier.
4. To design and study various logic gates using MOS.
5. To draw the frequency response curve of RC Coupled Amplifier.
6. To draw the frequency response curve of Transformer Coupled Amplifier.
7. To draw the frequency response curve of Emitter Follower.
8. To find the efficiency of A, B & AB Push pull Amplifier.
9. To find the frequency of oscillation of Hartley Oscillator.
10. To find the frequency of oscillation of Colpitt Oscillator.
11. To find the frequency of oscillation of R-C phase shift oscillator.
12. To find the frequency of oscillation of Wein Bridge Oscillator
13. To find the frequency of oscillation of Crystal Oscillator.
14. To draw the characteristic of SCR.
15. To draw the characteristic of UJT.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

BME-C401
DS18-FLUID MECHANICS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Fluids and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, Vapour Pressure; Cavitation; Classification of fluids including rheological classification.

Fluid Statics: Pascal's law; Pressure-density-height relationship; Measurement of pressure by Manometers and mechanical gauges; Pressure on plane and curved surfaces; The Hydrostatic law; Total Pressure and Centre of pressure; Buoyancy; Stability of immersed and floating bodies; Fluid masses subjected to uniform horizontal and vertical accelerations.

UNIT II

Fluid Kinematics: Description of Fluid flow: Lagrangian and Eulerian approach; Types of fluid Flows: Steady and unsteady, Uniform and non-uniform, Laminar and turbulent flows, 1, 2 and 3-D flows; Stream lines, Path lines and Streak lines; Stream tube; Acceleration of a fluid particle along a straight and curved path; Differential and Integral form of Continuity equation; Rotation, Vorticity and Circulation; Elementary explanation of Stream function and Velocity potential; Flow net characteristics, uses and experimental and graphical methods of drawing.

Fluid Dynamics-I: Concept of control volume and control surface, Reynolds Transport Theorem, Introduction to Navier-Stokes Equations, Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Flow through orifices, Mouthpieces, Nozzles, Free and Forced vortex motion.

UNIT III

Fluid Dynamics-II: Impulse-Momentum Principle; Moment of momentum equation; flow measurements, Venturimeter, Orificemeter, determination of coefficients of discharge, velocity and contraction and energy loss.

Laminar Flow: Reynolds Experiment; Equation of motion for laminar flow through pipes; Flow between parallel plates; Kinetic energy and Momentum correction factors; Stokes law; Flow through porous media; Measurement of viscosity; Transition from laminar to turbulent flow.

UNIT IV

Turbulent Flow: Turbulence; Equation for turbulent flow; Reynolds stresses; Eddy viscosity; Mixing length concept and velocity distribution in turbulent flow; Working principle of Hot-wire anemometer and Laser Doppler anemometer (LDA).

Boundary Layer Analysis: Boundary layer thicknesses; Boundary layer over a flat plate; Laminar boundary layer; Application of Von-Karman Integral Momentum Equation; Turbulent boundary layer; Laminar sub layer; Hydro-dynamically Smooth and rough boundaries; Local and average friction coefficient; Total drag; Boundary layer separation and its control.

UNIT V

Flow Through Pipes: Nature of turbulent flow in pipes; Equation for velocity distribution over smooth and rough surfaces; Major and Minor energy losses; Darcy's Law; Resistance coefficient and its variation; Hydraulic gradient and total energy lines; Flow in sudden expansion, contraction, diffusers, bends, valves and siphons; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Simple pipe networks.

Flow Past Submerged Bodies: Drag and lift, Types of drag force, Drag on sphere, Cylinder and airfoil; Circulation and Lift on a cylinder and airfoil; Magnus effect.

References

1. R J Fox: Introduction to Fluid Mechanics
2. Hunter Rouse: Elementary Mechanics of Fluids, John Wiley and sons, Omc/ 1946.
3. L H Shames: Mechanics of Fluids, McGraw Hill, International student edition.
4. Garde, R J and A G Mirajgaonkar: Engineering Fluid Mechanics (including Hydraulic machines), second ed., Nemchand and Bros, Roorkee, 1983.
5. K L Kumar: Engineering Fluid Mechanics
6. Munson, Bruce R, Donald F Young and T H Okishi, Fundamentals of Fluid Mechanics, 2nd ed, wiley Eastern.
7. V Gupta and S K Gupta, Fluid Mechanics and its Applications, Wiley eastern ltd.
8. Som and Biswas: Introduction to Fluid Mechanics and Machines, TMH.
9. R K Bansal: Fluid Mechanics and Hydraulic Machines
10. Modi and Seth: Fluid Mechanics and Fluid Machines

BME-C402
DSC19-DYNAMICS OF MACHINES

MM : 100 **30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Force Analysis, Turning Moment & Fly Wheel: Static force analysis of linkages, Equivalent offset inertia force, Dynamic analysis of slider crank & Bar mechanism. Piston and Crank effort, Inertia, Torque, Turning moment diagrams, Fluctuation of energy, Flywheel.

UNIT II

Balancing of Machines: Static and dynamic balancing, Balancing of rotating and reciprocating masses, Primary and secondary forces and couples.

UNIT III

Friction: Pivot and collar friction, Friction circle, Single plate, Multiplate and Cone clutches, Michelle & Kingsbury thrust bearing and rolling contact bearing, Belts and pulleys, Flat and V-belts, Design and selection.

Brakes and Dynamometers (Mechanical Type): External and internal shoe brakes, Band and Block brakes, Hydraulic brakes, Absorption and Transmission dynamometers.

UNIT IV

Governors: Dead weight and spring loaded governors, Sensitivity, Stability, Hunting, Isochronism, Effort and Power, Friction and Insensitivity, Introduction to inertia governors.

UNIT V

Gyroscopic Motion: Principles, Gyroscopic acceleration, Gyroscopic couple and Reaction. Effect of gyroscopic couple upon the stability of airplanes, ship, two & four wheelers.

References

1.Theory of Machine: Thomas Bevan (ELBS/CBS pub. New Delhi)
2.Theory of Machine: S.S.Ratan (TMH)
3. Mechanisms & Dynamics of Machines-Mabie
4. Theory of Machine & Mechanism-Shiglay
5. Theory of Machine- R.K.Bansal (Laxmi publication)
6. Mechanisms and Machine Theory-A.K.Ambekar (Jain Bros)
7. Theory of Machines- W.T.Green
8. Mechanisms and Machine Theory- Rao & Dukhipati(New Age)
9. Theory of Machine & Mechanism- Ghosh & Mallik

BME-C403
DSC20-MANUFACTURING SCIENCE- I

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Importance of manufacturing. Economic & technological considerations in manufacturing. Survey of manufacturing processes. Materials & manufacturing processes for common items.

Metal Forming Processes I: Elastic & plastic deformation, yield criteria. Hot working vs cold working. Load required to accomplish metal forming operation.

Analysis (equilibrium equation method) of forging process with sliding friction sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging

UNIT II

Metal Forming Processes II: Analysis of Wire/strip drawing and max. reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills. Design, lubrication and defects in metal forming processes.

UNIT III

Sheet Metal Working: Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs Piercing. Compound vs Progressive die. Flat-face vs Inclined-face punch and Load(capacity) needed. Analysis of forming process like cup/deep drawing and bending.

UNIT IV

Powder Metallurgy: Powder metallurgy manufacturing process. The process, advantage and applications.

Jigs & Fixtures: Locating & clamping devices/principle. Jigs and Fixtures and its applications.

Manufacturing of Plastic Components: Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

UNIT V

Introduction to non conventional Machining: Benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM.

Unconventional Metal forming processes : Unconventional metal forming processes such as explosive forming, electro- magnetic, electro-hydraulic forming.

References:

1 Manufacturing Science by Ghosh and Mallik
2 Production Engg. Science by P.C. Pandey
3 Production Technology by R.K. Jain
4 Manufacturing Technology by P.N. Rao.
5 Materials and Manufacturing by Paul Degarmo.

BHU-C401
DSC21-ENGINEERING ECONOMICS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Nature and Purpose of Engineering Economics, Economic Decisions, Role of engineers in Business, Large Scale Engineering Projects, Types of Strategic Engineering.

Understanding financial statements: The balance sheet, the income statement, the cash flow statement, The fund flow statement using ratios to make business decisions.

UNIT II

Demand Analysis: Meaning of Demand, Types of demand, Determinants of demand, Elasticity of Demand, Demand Forecasting.

UNIT III

Production Function: Input output relationship, Production Function, Least cost combination of inputs, Returns to scale, Managerial uses of production functions, Economies of scale.

UNIT IV

Cost Analysis and Market Structure: General cost terms, Classification of costs, Cost concepts relevant to decision making, Break Even analysis, Cost Volume Profit Analysis.

Introduction of different market structures- Perfect competition,Monopoly, Monoptestic competition, Price discrimination, Oligopoly.

UNIT V

Depreciation: Introduction, Straight line method of depreciation, declining balance method of depreciation-sum of the years digits method of depreciation, sinking fund method of depreciation/Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives - introduction, Examples, Inflation adjusted decisions -procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

References

1. Chan S. Park, Contemporary Engineering Economics, Prentice Hall (3/e) 2002.
2. Mote VL and Paul Samuel, Managerial Economics Concepts and Cases.
3. D N Dwivedi, Managerial Economics.
4. Koutsoylannis A, "odern Microeconomics" Macmillon Press Ltd., Hampshire, London
5. Dean J, Managerial Economics, New Delhi, PHI
6. Singh S P, Industrial Economics and Management, AITBH, New Delhi.
7. K.K. Dewett, "Modern Economics Theory, 1997, S. Chand & Co., New Delhi.

BMA-C402
DSC22-NUMERICAL ANALYSIS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper

UNIT I

Errors and Roots of Equations: Absolute, relative, round-off and truncation errors. Significant digits. Algebraic and Transcendental Equations, Numerical solution, Method of bisection, Newton-Raphson method, Direct iterative method, convergence. **8**

UNIT II

Linear Simultaneous Algebric Equations : Method of Gauss elemination, LU - decomposition Jacobi's and Gauss- Seidal methods, Largest eigen value and corresponding eigen vector (Powers method). **7**

UNIT III

Interpolation: Finite difference operators, Greogory- Newton, Stirling, Bessel and Lagrange's formula. Errors in interpolation. Divided differences. **8**

UNIT IV

Numerical Differentiation and Integration: Differentiation, Newton- Cotes formula of Inegration, Gaussian Quadrature formula. Extension of Trapezodial and Simpson's rules to multiple integration. **7**

UNIT V

Ordinary Differential Equations: Picard, Taylor, Eulers, Runge-Kutta, Adams-Bash forth and Milne's method. System of ordinary differential equations, Partial Differential Equations: Numerical solutions of Laplace and Poisson equations by finite difference method. **9**

References

1. Jain M.K, Iyengar S.R.K., Jain R.K., Numerical Methods for scientific & Engineering Computation, Wiley, 1987
2. Grewal, B.S., Numerical Methods in Engineering & Sciences, Khanna, New Delhi,
3. Sastry B., Introductory Method of Numerical Analysis, PHI
4. Flowers, Numerical Methods in C++, Oxford
5. Gerald C.F. (5/e), Applied Numerical Analysis, Addison Wesley, 1994

BEE-C404
DSC23-ELECTRICAL MACHINES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Transformer: Construction, polarity test, Sumpner's test, all day efficiency.
Autotransformer: Volt- amp relation, efficiency, advantages & disadvantages and applications; Three- phase transformers: Connections, three- phase bank of single phase transformers, Scott connections; Instrument Transformers.

UNIT II

D.C. Machines: Construction, emf and torque equations. Armature reaction, commutation, performance characteristics of motors and generators, starting of motors, speed control losses and efficiency.

UNIT III

Three-Phase Induction Motor: Construction, rotating magnetic field and principle of operation, of equivalent circuit, torque production, Torque- slip characteristics, speed control, starting of squirrel cage and slip ring induction motors.

UNIT IV

Three-phase Synchronous Machines:
Alternator: Construction, emf equation & effects of pitch and distribution factors phasor diagram, armature reaction, Voltage regulation and its determination by synchronous impedance method, methods of synchronization
Synchronous Motor: Principle of operation and starting torque and mechanical power developed, effect of excitation on line current, v-curves.

UNIT V

Fractional H.P. Motors: Single phase induction motor: Construction, revolving field theory and principle of operation, equivalent circuit and starting methods. Two-phase servo - motor, stepper motor, and their applications.
Industrial Applications: Concept of braking in dc and ac motors, two quadrant and four quadrant operation of dc and three phase induction motors, industrial applications of dc and ac motors.

References

1. Electric Machines by I J Nagrath & D P Kothari , Tata McGraw Hill , 1997
2. Elec tric Machines by Ashfaq Husain , Dhanpat Rai & Com. , 2005
3. Generalised Theory of Electrical Machines by Dr. P S Bimbhra , 1996
4. Irvin L.Kosow, Electric Machinery and Transformers Prentice Hall of India.
5. P.S. Bimbhra, Electric Machinery Khanna Publishers.

BME-C451
DSC18-FLUID MECHANICS LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

LIST OF EXPERIMENTS:

1. To measure the surface tension of a liquid.
2. To determine the metacentric height of a ship model experimentally.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape. To plot the flow net for a given model using the concept of electrical analogy.
5. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
6. To verify the Bernoulli's theorem.
7. To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.
8. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
9. To verify Darcy's law and to find out the coefficient of permeability of the given medium.
10. To verify the momentum equation.
11. To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also to determine the exponent in the power law of velocity distribution.
12. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
13. To determine the loss coefficients for the various pipe fittings.
14. To study the flow behavior in a pipe bend and to calibrate the pipe bend for discharge measurement.

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BME-C452
DSC19-THEORY OF MACHINES LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 4**

0 0 2

LIST OF EXPERIMENTS:

1. Study of simple linkes/models/mechanisms.
2. Exp. on cam.
3. Various commonly used mechanisms and its inversions in machines
4. Journal bearing apparatus
5. Exp. on synthesis of planner linkages
6. Experiment on critical speed of shaft (whirling of shaft)
7. Experiment on static Balancing
8. Experiment on Dynamic Balancing
9. Experiment on Brakes
10. Experiment on clutch
11. Experiment on Engine
12. Experiment on Gyroscope
13. Experiment on Governor

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BME-C453
DSC20-MANUFACTURING SCIENCE- I LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

LIST OF EXPERIMENTS:

1. Design of pattern for a desired casting (containing hole)
2. Pattern making
3. Making a mould (with core) and casting.
4. Sand testing (at least one such as grain fineness number determination)
5. Injection moulding with plastics

a. Forging hand forging processes

6. Forging - power hammer study & operation
7. Tube bending with the use of sand and on tube bending m/c.
8. Press work experiment such as blanking/piecing, washer, making etc.
9. Wire drawing/extrusion on soft material.
10. Rolling-experiment.
11. Bending & spring back.
12. Powder metallurgy experiment.
13. Jigs and Fixture experiment.

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

BEE-C454
DSC23-ELECTRICAL MACHINES LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

LIST OF EXPERIMENTS:

1. To perform polarity test on single-phase transformer.
2. To perform open circuit test on single phase transformer & find its equivalent circuit parameters.
3. To perform short circuit test on single phase transformer & find its equivalent circuit.
4. To study Scott connection on single phase transformer.
5. To obtain magnetization characteristics of DC shunt generator.
6. To obtain load characteristics of DC shunt motor.
7. Speed control of DC shunt motor by armature control and field control.
8. To perform No load and block rotor lest on three phase induction motor & determine equivalen circuit.
9. To study speed control of three phase induction motor by varying supply voltage.
10. To determine V-curve and inverted V-curve of three phase synchronous machine.
11. To perform No load and block rotor test on single phase induction motor.

NOTE

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BMA-C501
DSC24-OPTIMIZATION TECHNIQUES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Linear Programming: Introduction, Construction of LP Model, Graphical of Solution LP. Simplex Method, Introduction, Standard LP Form and its basic Solutions, Simplex Algorithm, Artificial Starting Solution, Special cases in Simplex Method, Applications. **8**

UNIT II

Duality: Introduction, Definition of Dual Problems, Relationship between the Optimal Primal and Dual Solutions, Economic Interpretation of Duality, Dual Simplex Method, Primal Dual Computation **8**

UNIT III

Integer Programming: Methods of Integer Programming, Cutting-Plane Method: Fractional (Pure Integer) Method, Mixed-Cut method, Branch and Bound Technique. .

Deterministic Dynamic Programming: Introduction, Recursive Nature of Computing, Forward and Backward Recursion, Applications of Dynamic Programming in Shortest Route Problem, Cargo Loading Problem, Work Force Size Model. **8**

UNIT IV

Transportation and Assignment Model: Definition of Transportation Model, Non Traditional Transportation Model, Transportation Algorithms, Assignments Model.

Game Theory: Minimax-Maximin criterion, Pure strategies, Mixed strategies and Expected Payoff, Concept of Dominance, Graphical Solution of m x 2 and 2 x n Games. Solution by Linear Programming method **7**

UNIT V

Queuing Theory : Definition of Queuing System, Characteristics of Queuing Models, Notation, Transient and Steady State of Queuing System, Birth-Death process, Pure birth & Pure Death processes, (M/M/1):(FIFO/ ∞ / ∞); (M/M/s):(FIFO/ ∞ / ∞); (M/M/1):(FIFO/N/∞) Models, Their Characteristics, State Transition Diagrams. **9**

References

1. Taha, Hamdy A., Operations Research, (Maxwell Macmillan)
2. Kanti Swarup, P.K. Gupta, Man Mohan Operations Research, (Sultan Chand & Sons)
3. Gillet, Billy E.,Introduction to Operations Research, A Computer Oriented Algorithmic Approach (TMH)

Effective from 2017-18

BME-C501
DSC25-FLUID MACHINES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Classification of Fluid Mechanics, Application of momentum and momentum equation to flow through hydraulic machinery, Euler s fundamental equation.

Impact of Jet: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), effect of inclination of jet with the surface.

Hydraulic Turbines: Classification of turbines, Impulse turbines, constructional details, velocity triangles, power and efficiency calculations, governing of Pelton wheel.

UNIT II

Reaction Turbines: Fransis and Kaplan turbines, constructional details, velocity triangles, power and efficiency calculations, degree of reaction, draft tube, cavitation in turbines, principles of similarity, unit and specific speed, performance characteristics, selection of water turbines.

UNIT III

Centrifugal Pumps: Classifications of centrifugal pumps, vector diagram, work done by impellor, efficiencies of centrifugal pumps, specific speed, model testing, cavitation and separation, performance characteristics.

UNIT IV

Positive Displacement Pumps: Reciprocating pump theory, slip and coefficient of discharges, indicator diagram, effect and acceleration, work saved by fitting air vessels, comparison of centrifugal and reciprocating pumps, positive rotary pumps, Gear and Vane pumps, performance characteristics.

UNIT V

Other Machines: Hydraulic accumulator, Intensifier, Hydraulic press, Lift and Cranes, theory of hydraulic coupling and torque converters, performance characteristics.

Water Lifting Devices: Hydraulic ram, Jet pumps, Airlift pumps.

References

1 Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
2 Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
3 Applied Hydraulics by Addison
4 Hydraulic Machines by R K Rajput, S.Chand & co Ltd.
5 Hydraulic Machines by D S Kumar

Effective from 2017-18

BME-C502

DSC26-MEASUREMENT, METROLOGY AND CONTROL

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Mechanical Measurements: Introduction to measurement and measuring instruments, Generalised measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. Signal transmission and processing: Devices and systems. Signal Display & Recording Devices

UNIT II

Time Related Measurements: Counters, stroboscope, frequency measurement by direct comparison.1 Measurement of displacement. Measurement of pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures, Strain measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

UNIT III

Measurements of Force and Torque: Different types of load cells, elastic transducers, pneumalic & hydraulic systems. Temperature measurement: By thermometers, bimetallic, thermocouples, thermistors and pyrometers. Vibration: Seismic instruments, vibration pick ups and decibel meters, vibrometers accelerometers.

UNIT IV

Metrology and Inspection: Standards of linear measurement, line and end standards. Limit, fits and tolerances. Interchangeability and standardization, Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design.

UNIT V

Measurement of Geometric Forms: Straightness, flatness, roundness. Tool makers microscope, profile project autocollimator. Interferometry: principle and use of interferometry, optical flat. Measurement of screw threds and gears, Surface texture: quantitative evaluation of surface roughness and its measurement.

References

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", Dhanpat Rai & Sons, New Delhi, 1994
6. Sirohi, "Mechanical Measurement" New Age Publishers
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

Effective from 2017-18

BME-C503
DSC27-MANUFACTURING SCIENCE-II

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Metal Cutting and Machine Tools:

Metal Cutting: Mechanics of metal cutting. Geometry of tool and nomenclature, ASA system Orthogonal vs. oblique cutting, Mechanics of chip formation, types of chips. Shear angle relationship. Merchant s force circle diagram. Cutting forces, power required. Cutting fluids/lubricants, Tool materials, Tool wear and tool life, Machinability, Brief introduction to machine tool vibra tion and surface finish

UNIT II

Machine Tools:

(i) Lathe: Principle, types, operations, Turret/capstan, semi/Automatic, Tool layout

(Ii) Shaper, Slotter, Planer: operations & drives.

UNIT III

(i) Milling: Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

(ii) Drilling and Boring: Drilling, boring, reaming tools. Geometry of twist drills.

UNIT IV

Grinding & Super Finishing:

(i) Grinding: Grinding wheels, abrasive, cutting action. Grinding wheel specification, Grinding wheel wear - attritions wear, fracture wear, Dressing and Truing. Max chip thickness and Guest criteria. Surface and Cylindrical grinding. Centerless grinding.

(ii) Super Finishing: Honing, lapping, polishing.

UNIT V

Metal Joining (Welding): Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing . Thermodynamic and Metallurgical aspects in welding and weld,. Shrinkage/residual stresses and distortion in welds. Defects in welds and remedies. Weld decay in HAZ. Introduction off nonconnentional welding such as LBW, USW, EBW, Plasma Arc welding and explosive welding.

References

1. Manufacturing science by Ghosh and Mullick
2. Fundamentals of Metal Cutting and Machine tools by Boothroyd
3. Production Technology - H.M.T.
4. Production Engineering Science by P.C. Pandey
5. Modern Machining Processes by P.C. Pandey & H.S. Shan
6. Manufacturing science by Degarmo
7. Process & materials of manufacturing - Lind burg.

Effective from 2017-18

BHU-C502
DSC28-PRINCIPLES AND PRACTICES OF MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction, Relation of Management with other disciplines, Management and Manager, evolution of Management with special emphasis on Scientific management, Introduction of managerial environment and levels of management, Management skills

UNIT II

Functions of Management: Planning, Decision making, Organization designs, leading and controlling, control systems.

UNIT III

Introduction of Marketing, Marketing Environment, Target marketing, Marketing Mix, P's of Marketing, Product life cycle.

UNIT IV

Introduction to Operations Management: Operations Planning and Control, Management of Supply Chain, Introduction to Material Management, Systems and procedures for inventory management.

UNIT V

Human Behavior: Factors of individual behavior, Perception, Learning and personality development, Interpersonal relationship and Group Dynamics, Training and development.

References

1. S.P. Robbins, David A. DeCenzo, Fundamentals of Management, Pearson Education.
2. Kotler P., Principles of Marketing, Person education
3. Schermerhorm, Management, Wiley India
4. Russell & Taylor, Operations Management
5. K Aswathappa, Human Resource and Personnel Management, Tata McGraw Hill
6. Griffin, Fundamentals of Management, 2000, All India Publishers & Destitutions, Chennai
7. Biswanath Ghosh, Human Resource Development and Management, Vikas Publishing House, Pvt. Ltd., 2000.
8. G.B. Gupta, Principles & Practice of Management, Mayoor Paperbooks
9. Harold Koontz and Heinz Weihich, "Essemteals of Management" Mc-Grow Hill, Fifth Education.

Effective from 2017-18

BEE-C503
DSC29-AUTOMATIC CONTROL SYSTEM

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

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

UNIT II

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

UNIT III

Control System Components: Constructional and working concept of ac servomotor, synchros and stepper motor.

Stability and Algebraic Criteria: Concept of stability and necessary conditions, Routh- Hurwitz criteria and limitations.

Root Locus Technique: The root locus concepts, construction of root loci.

UNIT IV

Frequency Response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots.

Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.

UNIT V

Introduction to Design: The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of State Variable Technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books

1. Nagrath & Gopal, Control System Engineering, 4th Edition, New age International.
2. K. Ogata, Modern Control Engineering, Prentice Hall of India.

Reference Books

1. Norman S. Mise, Control System Engineering 4th edition, Wiley Publishing Co.
2. M.Gopal, Control System; Principle and design, Tata McGraw Hill.
3. M.Gopal, Modern Control system, Tata McGraw Hill.
4. D.Roy Choudhary, Modern Control Engineering, Prentice Hall of India.

Effective from 2017-18

BME-C551
DSC25-FLUID MACHINES LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

(Min. 8 experiments from following experiments)

1. Impact of Jet experiment.
2. Turbine exp. on Pelton wheel.
3. Turbine exp. on Francis turbine.
4. Tubrine exp. on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through first visit of any pumping station/plant
11. Study through second visit of any pumping station/plant.
12. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BME-C552

DSC26-MEASUREMENT, METROLOGY AND CONTROL LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Study & working of simple measuring instruments. Like vernier calipers, micrometer, tachometer etc.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sine bar & slip gauges.
4. Study of limit gauges.
5. Study of angular measurement using level protector
6. Adjustment of spark plug gap using feeler gauges.
7. Study of dial indicator and its constructional details.
8. Use of dial indicator to check a shape run use.
9. Pressure measuring experiment
10. Temperature measurement experiment
11. Strain gauge measurement
12. Speed measurement using stroboscope

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BME-C553
DSC27-MANUFACTURING SCIENCE- II LAB

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

Min 8 experiments out of the following experiments along with study of the machining processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Finishing of a surface on surface-grinding machine.
6. Drilling holes on drilling machine and study of twist-drill.
7. Study of different types of tools and its angles & materials.
8. Experiment on tool wear and tool life.
9. Experiment on jigs/Fixtures and its uses
10. Resistance welding experiment.
11. Soldering & Brazing experiment
12. Experiment on TIG/MIG Welding.

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BME-C554
DSC30-SEMINAR

MM : 100 **Sessional : 30**

Time : 2 Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

Objective: To increase the communication ability on students and to prepare then for presenting seminar on advanced topics of their branch.

The students will be required to deliver a seminar on a topic of general interest in or any advanced technical topics related to the theory papers studied. The topic will be decided by mutual consent of the Faculty- in- charge and students.

* Total 50 marks include 25 marks for report and 25 marks for presentation.

Effective from 2017-18

BME-C601
DSC31-MACHINE DESIGN- I

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction, Definition, Methods, standards in design & selection of preferred size. Selection of materials for static & fatigue loads, Materials for components subjected to creep, BIS system of design ation of steels, steels, plastics & rubbers. AISI (American Iron & Steel Institution), ASTM rubber testing methods.

UNIT II

Design against static load, Modes of failure, Factor of safety, stress-strain relationship, principal stresses, theories of failure. Design against fluctuating load stress concentration, stress concentration factors, Fluctuating/alternting stresses, fatigue failure, endurance limit, design for finite & infinite life, Soderberg & Goodman criteria.

UNIT III

Joints: Welded joint, screwed joints, ecentric loading of above joints, design for fatigue loading. Shaft, keys & coupling. Design against static and fatigue loads, strength & rigidity design, Selection of square & flat keys & splines, rigid & flexible couplings.

UNIT IV

Mechanical springs Design of Helical and leaf springs, against static & fatigue loading.
Design analysis of Power Screws Form of threads, square threads, trapezoidal threads, stresses in screw, design of screw jack.

UNIT V

Introduction to Product Development & Design Process. Definition of Design, Design Process, Need Analysis, Need based developments, Design by Evolution, Technology based developments, Examples. Case Studies. Brain-storming.

References

1. Design of M/c Elements : Bhandari, TMH
2. Machine design : Sharma & Agarwal, Kataria
3. M/C Design : Maleev & Hartman,
4. Machine Design SI edition by Shigley, Mcgraw Hill
5. Machine Design by Black & Adams, Mcgraw Hill.

Effective from 2017-18

BME-C602
DSC32-HEAT & MASS TRANSFER

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and radiation; effect of temperature on thermal conductivity of materials; introduction to combined heat transfer mechanism.

Conduction: One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; initial and boundary conditions.

Steady State one-dimensional Heat conduction: Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; thermal resistance concept; Analogy between heat and electricity flow; thermal contact resistance; critical thickness of insulation.

UNIT II

Fins of uniform cross-sectional area; errors of measurement of temperature in thermometer wells.

Transient Conduction: Transient heat conduction Lumped capacitance method, Time constant unsteady state heat conduction in one dimension only, Heisler charts.

UNIT III

Forced Convection: Basic concepts; hydrodynamic boundary layer; thermal boundary layer, flow over a flat plate; flow across a single cylinder and a sphere; flow inside ducts; empirical heat transfer relations; relation between fluid friction and heat transfer; liquid metal heat transfer.

Natural Convection: Physical mechanism of natural convection; buoyant force; empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and aylinders, and sphere.

UNIT IV

Thermal Radiation: Basic radiation concepts; radiation properties of surfaces; black body radiation laws; shape factor; black-body radiation exchange; Radiation exchange between diffuse non-black bodies in an enclosure; radiation shields; solar radiation.

UNIT V

Heat Exchanger: Types of heat exchangers; fouling factors; overall heat transfer coefficient; logarithmic mean temperature difference (LMTD) method; effectiveness-NTU method; compact heat exchangers.

Condensation and Boiling: Introduction to condensation phenomena; heat transfer relations for laminar film condensation on vertical surfaces and on a horizontal tube; Boiling modes pool boiling, curve, forced convective boiling.

Introduction To Mass Transfer: Introduction; Flick's law of diffusion; steady state equimolar counter diffusion; steady state diffusion though a stagnant gas film.

References

1. Elements of Heat transfer by Bayazitouglu & Ozisik, McGraw-Hill Book Company.
2. Heat Transfer By J.P. Holman, McGraw-Hill International edition.
3. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill International edition.
4. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Bo ok co.
5. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons(Pvt).Ltd.
6. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers
7. Heat Transfer, by Y.V.C. Rao, University Press.

Effective from 2017-18

BME-C603
DSC33-I. C. ENGINES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to I.C. Engines: Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson cycles, Actual cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, stratified charge engine.

Fules: Fules for SI and CI engine , important qualities of SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

UNIT II

SI Engines: Carburetion, Mixture requirements, Carburetor types Theory of carburetor, MPFI. Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition.

UNIT III

CI Engine: Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines. Scavenging in 2 Stroke engines, pollution and it's control.

UNIT IV

Engine Cooling: Different cooling systems, Radiators and cooling fans.

Lubrication: Engine friction, Lubrication principal, Type of lubrication, Lubrication oils, Crankcase ventilation. Supercharging: Effect of altitu de on power output, Types of supercharging. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines.

UNIT V

Compressors: Classification, Reciprocating compressors, Single and multi stage, Intercooling, volumetric efficiency. Rotary compressors, Classification, Centrifugal compressor, Elementary theory ,Vector diagram efficiencies, Elementary analysis of axial compressors, Surging and stalling, Roots blower, Waned compressor, Performance analysis.

References

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziu rs, Oxford & IBH Publishing COIC
2. Engines, by Rogowsky, international Book Co.
3. A Course in International Combustion Engines, by Mathur & Sharma, Dhanpat Rai & Sons.
4. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications Czechoslovakia .
5. I.C Engine Analysis & Practice by E.F Obert.
6. I.C Engine, by Ganeshan, Tata Mc Graw Hill Publishers.
7. I.C Engine, by R. Yadav, Central Publishing House, Allahabad

Effective from 2017-18

BME-C604
DSC34-INDUSTRIAL ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: Ten questions are to be set taking two questions from each unit. The student has to attempt FIVE questions selecting one question from each unit. The previous year papers / model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Productivity: Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System.

Work Study: Meaning and benefits of work study, time & motion study. Micromotion study P.M.T.S. man machine Diagram flow chart. Motion economy.

UNIT II

Method Study: Objectives and scope of method study, recording techniques, micromotion study and memo-motion study, fundamental motion and therbligs, principal of motion economy, critical examination.

Work Measurement: Objectives of work measurement, work measurement techniques, procedure. Work sampling, determining the sample size, determining time standards by work sampling. Absolute error or desired absolute accuracy.

UNIT III

Plant Layout and Materials Handling: Plant location, type of layout, principles of facility layout principles of material handling, Material Handling eqpts.

Production Planning and Control: Objectives, Forecasting, product design and development functions, steps in PPC. Planning roating, scheduling, Dispatching & follow-up, Effectiveness of PPC, Introduction of JIT.

UNIT IV

Inventory Control: Inventory, function, cost, deterministic models.

Introduction to MRP, supply chain Management

UNIT V

Industrial Ownership: Proprietorship, partnership, Joint stock & co-operative stores.

Manpower Planning: Resources, Human relationship.

Organization: Principles of organization, Development of Organizational charts like line, staff, line and staff & Functional types.

Job Evaluation & Merit Rating: Job analysis, Job description job simplification and job evaluation methods & description, merit rating, wage incentive plans.

References

1. Principles of management. An analysis of management functions-H.Koontz & C.O. Donnel. Tata McGrow-Hall Co.
2. Manufacturing Management-J Moore Prentice Hall Englewoon cliffs: New Jersey.
3. Modern production operations Management-Buffam E.S. Wiley eastern.
4. Industrial Engg. & Management O.P. Khanna.
5. Industrial Engineering by Ravi Shanker.
6. Industrial Engineering by Mahajan.

Effective from 2017-18

BME-C605
DSC35-QUALITY CONTROL AND RELIABILTY ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability. Sampling techniques and acceptance sampling.

UNIT II

Control Charts for SQC: Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

UNIT III

Reliability: Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure. MTBF. Maintainability, Condition monitoring and dignostic techniques.Value Engineering : Elements of value analysis, Techniques.

UNIT IV

TQM: Inspection, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO its series, Zero defect. Quality circle . Taguchi method. Six sigma concept, quality excellence awards.

UNIT V

Other Factors in Quality: Human Factors such as attitude and errors. Material-Quality. Machine Capability and Manufacturing process limitations. Quality in sales & service. Methods for improving accuracy & quality.

Reference

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.
3. Elements of Production Planning & Control Eilon
4. Production Planning & Control Jain and Agarwal

Effective from 2017-18

BME-C606
DSC36-MECHANICAL VIBRATIONS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis

Single Degree Freedom System: Free vibration, Natural frequency, Equivalent systems, Energy method for determining natural frequency, response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement

UNIT II

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

UNIT III

Two Degree Freedom Systems: Introduction, Principal modes, double pendulum, Torsional system with damping, coupled system, undamped dynamic vibration absorbers, Centrifugal pendulum absorbers, Dry friction damper

UNIT IV

Multi Degree Freedom System: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence number, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts

UNIT V

Multi Degree Freedom system: Numerical Analysis: Rayleigh's, Dunkerely's, Holzer's ad Stodola methods, Rayleigh-Ritz method

Critical speed of Shafts: Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

References

1. Mechanical Vibrations – P. Srinivasan, TMH
2. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
3. Mechanical Vibrations – W. T. Thomson
4. Mechanical Vibrations – JS Rao & K Gupta, New Age
5. Mechanical Vibrations – Tse, Morse & Hinkle
6. Mechanical Vibrations – V. Rama Murthy, Narosa Publications

Effective from 2017-18

BME-C651
DSC31-MACHINE DESIGN-I LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Design & drawing of Riveted joints for given operating conditions.
2. Design of an eccentrically loaded welded, riveted of bolted joint.
3. Design of bolted joint for fluctuating loads.
4. Design & drawing of a cotter joint.
5. Design & drawing of a knuckle joints.
6. Design & drawing of a simple screw jack.
7. Design of shaft for different loading conditions.
8. Design & drawing of rigid coupling(flanged type).
9. Design & drawing of a flexible coupling (pin-bush type)
10. Design & drawing of a leaf spring for an automobile.
11. Design & drawing of a helical spring for a given application
12. Product Development Design problems/exercise

Note:

1. Students may be advised to use design data book for design.
2. Drawing shall be made wherever necessary on small drawing sheets.
3. Each student shall be required to perform one experiment in the practical examination.
4. A Teacher shall be assigned 20 students for daily practical work in laboratory.
5. No batch for practical class shall consist of more than 20 students.
6. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
7. Every student shall have to perform minimum ten experiments during the semester.
8. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BME-C652
DSC32-HEAT & MASS TRANSFER LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Conduction - Composite wall experiment
2. Conduction - Composite cylinder experiment
3. Convection - Pool Boiling experiment
4. Convection - Experiment on heat transfer from tube-natural convection.
5. Convection - Heat Pipe experiment.
6. Convection - Heat transfer through fin-natural convection.
7. Convection - Heat transfer through tube/fin-forced convection.
8. Any experiment - Such as on Stefen's Law, on radiation determination of emissivity, etc.
9. Any experiment - Such as on solar collector, etc. on radiation
10. Heat Exchanger - Parallel flow experiment
11. Heat Exchanger - Counter flow experiment
12. Any other suitable exp such as on critical insultation thickness.
13. Conduction - Determination of thermal conductivity of fluids.
14. Conduction - Thermal Contact Resistance Effect.

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BME-C653
DSC33-I.C. ENGINES LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Ignition system of I.C. Engine.
6. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
7. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
8. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
9. Comparative study & technical features of common scooters & motorcycles available in India.
10. Experiment on Engine Tuning.
11. Experiment on Exhaust Gas Analysis of an I.C. Engine.

Note

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2017-18

BHU-C351 / BHU-C551 / BHU-C651
DSC37-TECHNICAL COMMUNICATION LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills with emphasis on Paralinguistics/Kinesics.
4. Presentation Skills based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Argumentative Skills/Role Play Presentation with Stress and Intonation.
7. Comprehension Skills based on Reading and Listening Practical on a model Audio-Visual Usage.
8. Word formation, Synonyms and Antonyms, Homophones
9. Selection of vocabulary of about 100-200 New words;

Recommended Books

1. Agarwal, S K. & Singh, *P K. Effective Business Communication*. New Delhi: Himanshu publications.
2. Balasubramaniam, T. *Phonetics for Indian Students*. Macmillan India Ltd.
3. Krishnaswamy, N. "*Modern English*. Macmillan India Ltd.
4. Koneru, Aruna. Professional Communication. New Delhi: Tata Mc Graw-Hill Publishing Company Ltd.
5. Mohan, Krishna & Banerji, Meera. *Developing Communication Skill*. Macmillan India Ltd.
6. Pandey, L.U.B. & Singh, R.P. *A Manual of Practical Communication*. A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
7. Rizvi, M Ashraf. *Effective Technical Communication*. New Delhi: Tata Mc Graw-Hill Publishing Company Ltd.

Dictionaries

1. Daniel, Jones. *English Pronouncing Dictionary*. Cambridge University Press.
2. *Oxford Advanced Learners' Dictionary.*
3. *Longman's Dictionary of Contemporary English*

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

Effective from 2018-19

BME-C701
DSC38-MACHINE DESIGN –II

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT 1

Spur Gears: Conjugate action, involute gears, gear cutting methods, tooth loads, strength of spear gears in bending and in wear. Dynamic loading, Gear materials, design of gears and involute splines. Gear profile corrections, AGMA and Indian standards.

UNIT II

Helical Gears: Tooth relationship, tooth proportions. Design of helical gears, crossed helical gears, AGMA and Indian standards.

Worm and Bevel Gears: Analysis of loads and stresses, power rating, efficiency. Gear standard and proportions.

UNIT III

Bearing and Lubrication: Types of ball bearings, roller bearing, needle roller bearing, life of bearing, reliability considerations, Selection of ball, roller, tapered roller and thrust bearings, Lubrication and sealing. Mounting of bearings.

UNIT IV

Sliding Bearings: Hydrodynamic theory of lubrication, types of bearings, design of bearings using design charts, boundary lubrication, hydrostatic bearings, hydrodynamic thrust bearing. Lubrication and lubricants.

UNIT V

Engine Parts: Design of engine parts such as connecting rod, crankshaft and cylinder & piston.

References

1. Mechanical Engineering Design- Joseph E. Shigley Mc Graw Hill Publications.
2. Design of Machine Members- Alex Valance and V1 doughtie, Mc- Graw- Hill Co.
3. Machine Design- D.N.Reshetov, Mir publishers: Moscow.
4. Machine Design- M.F. Spott. Prentice Hall: India
5. Fundamental Of Machine Design(vol:1, 1-5) Porlov, Mir pub. Moscow
6. Machine Elements: Dobrovsky, Mir. Pub.moscow data books
7. Fundamentals of machine design- Richard M.Phelan, Tata Mc-graw Hill pub.
8. Machine Design- Maleev and Hartman, CBS
9. Machine Design- Sharma and Agrawal, Kataria
10. Design of Machine Elements-Bhandari,TMH

Effective from 2018-19

BME-C702
DSC39-REFRIGERATION AND AIR CONDITIONING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration Cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

UNIT II

Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

UNIT III

Vapour Absorption system: Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison.

Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.

UNIT IV

Air Conditioning: Introduction to air conditioning, Psychometric properties, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).

UNIT V

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

References

1. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
2. Refrigeration and Air conditioning by C.P Arora.
3. Refrigeration and Air conditioning by Arora & Domkundwar.
4. Refrigeration and Air conditioning by stoecker & Jones.
5. Refrigeration and Air conditioning by Roy J. Dossat.
6. Refrigeration and Air conditioning by P.L. Baloney.
7. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.

Effective from 2018-19

BME-C703
DSC40-ENERGY RESOURCES AND MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Energy Resources and Their Utilization : Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation.

Solar Radiations: Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

UNIT II

Solar Energy: Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing . Solar thermal energy storage, Different systems, Solar pond. Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants.

Solar Photovoltaic System: Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system.

UNIT III

Biogas: Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power

generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India.

Wind Energy: Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development.

UNIT IV

Electrochemical Effects and Fuel Cells: Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells, Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells .

Tidal power: Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy, limitations of tidal energy conversion systems.

Hydrogen Energy: Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use..

UNIT V

Thermoelectric Systems: Kelvin relations, power generation, Properties of thermoelectric materials, Fusion Plasma generators.

Geothermal Energy: Structure of earth’s interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion.

Ocean Energy: Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, Economics. Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity production from different energy sources, Energy options for Indian economy.

Reference

1. Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.
2. Kothari D.P., “Renewable energy resources and emerging technologies”, Prentice Hall of India Pvt. Ltd.
3. Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.
4. Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.

Effective from 2018-19

BME-C751
DSC38-MACHINE DESIGN- II LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Design and Drawing of Spur Gear.
2. Design and Drawing of Helical Gear.
3. Design and Drawing of Worm and Bevel Gear.
4. Design and Drawing of a Gear Train.
5. Design and Drawing of Connecting road
6. Design and Drawing of Crank shaft.
7. Design and Drawing of Ball bearing.
8. Design and Drawing of Roller bearing.
9. Design and Drawing of Hydrostatic bearing.
10. Design and Drawing of Hydrodynamic thrust bearing.

Note

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum eight experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2018-19

BME-C752
DSC39-REFRIGERATION AND AIR CONDITIONING LAB

MM : 100 **Sessional : 30**

Time : 2Hr **ESE : 70**

L T P **Credit : 2**

0 0 2

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. To study different types of expansion devices used in refrigeration system.
3. To study different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. To study air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

Note:

1. Each student shall be required to perform one experiment in the practical examination.
2. A Teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Every student shall have to perform minimum ten experiments during the semester.
6. Any Experiment based on syllabus may be added by permission of Head / Dean.

Effective from 2018-19

BME-C760
DSC40-MINOR PROJECT

MM : 100 **Sessional : 50**

Time : 4 Hr **ESE : 150**

L T P **Credit : 4**

0 0 4

Each student shall be assigned a Minor Project by departmental committee. The student shall be required to perform his project work under the supervision of the supervisor(s). There shall be a seminar on the project work of the student to be evaluated by a departmental committee chaired by H.O.D. The student shall be required to submit his project report in the form of dissertation 15 days before the end of VII semester. The student shall be required to submit three copies of the project work with certificate from the supervisor(s) that the work is authentic record of the work performed by him. The report shall be forwarded by H.O.D. The report of the project work shall be evaluated by the external examiner(s). The same external examiner(s) shall hold the viva-voce examination.

THE DISTRIBUTION OF MARKS FOR THE MINOR PROJECT SHALL BE AS FOLLOWS:

MINOR PROJECT	
Project**	100
Viva-voce/Presentation**	50
Seminar (Internal)***	50
Total	200

** - Marks for the project work shall be awarded jointly by the external and internal examiners after viva-voce examination.

*** - There shall be a seminar on the project work of the student to be evaluated by the departmental committee chaired by H.O.D.

Effective from 2018-19

BME-C801
DSC41-MACHINE TOOL DESIGN

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, d rill, milling shapes and planers, grinding machine etc. General requirement of machine tool design. Machine tool design process. Tool wear, force Analysis.

UNIT II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, Selection of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

UNIT III

Regulation of Speed and Feed Rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

UNIT IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design. Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance, hydrostatic and antifriction grandways. Design of sliding friction power Screws. Design of spindlier & spindle supports. Layout of bearings, selection of bearings for machine tools

UNIT V

Dynamics of Machine Tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools. Control Sy stems : Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls. Basics of numerical controls. Machine tool testing.

References

1 Machine Tools Design & Numerical Controls N.K. Mehta, T.M.H. New Delhi.
2 Design of Machine Tools S.K. Basu Allied Publishers.
3 Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.

Effective from 2018-19

BME-C860
DSC41-MAJOR PROJECT

MM : 100 **Sessional : 100**

Time : 8 Hr **ESE : 300**

L T P **Credit : 8**

0 0 8

Each student shall be assigned a Major Project by departmental committee. The student shall be required to perform his project work under the supervision of the supervisor(s). There shall be a seminar on the project work of the student to be evaluated by a departmental committee chaired by H.O.D. The student shall be required to submit his project report in the form of dissertation 15 days before the end of VIII semester. The student shall be required to submit three copies of the project work with certificate from the supervisor(s) that the work is authentic record of the work performed by him. The report shall be forwarded by H.O.D. The report of the project work shall be evaluated by the external examiner(s). The same external examiner(s) shall hold the viva-voce examination.

THE DISTRIBUTION OF MARKS FOR THE MAJOR PROJECT SHALL BE AS FOLLOWS:

MAJOR PROJECT	
Project**	200
Viva-voce/Presentation**	100
Seminar (Internal)***	100
Total	400

** - Marks for the project work shall be awarded jointly by the external and internal examiners after viva-voce examination.

*** - There shall be a seminar on the project work of the student to be evaluated by the departmental committee chaired by H.O.D.

Effective from 2018-19

BME-E711
ADVANCED MATERIALS TECHNOLOGY

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Ferrous Materials: Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons. Recognised patterns of distribution of graphite flakes in grey cast iron.

UNIT II

Heat Treatment of Steels: TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austempering and martempering of steel. Surface hardening of steel-Carbonising nitriding carbonitriding cyniding, flues and inducation hardenirng microscopic determination of case depth and depth of hardening.

UNIT III

Nonferrous materials: Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials. Heat treatment of nonferrous materials– soputionizing, Aging and precipitations hardening.Composites. Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites. Refractory materials and coatings for high temperature applications. Smart Materials-introduction, types and applications. Thin film shape memory alloys.

UNIT IV

Biomaterials: Classes and application of materials in medicine and dentistry. Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion.

UNIT V

Nuclear Materials: Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials. Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers. Radiation proof materials. Brief discussion of safety and radioactive waste disposal.

References

1. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, A.S. Hoffman, F.J. Sckoen, and J.E.L Emons, Academic Press, second edition, 2004.
2. Biomaterials: An Introduction (second edition) Joon B.Park & Roderic S.Lakes, Plenum Press, 1992.
3. Handbook of Materials for Medical Devices, Edited by J. R. Davis, ASM international, 2003.
4. Introduction to Nuclear Engineering, by J.R Lamarsh.
5. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.

Effective from 2018-19

BME-E712
ADVANCED SYNTHESIS OF MECHANISMS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Basic Concepts: Mechanisms, Classifications, Rigid & Absolute motion, Connections & degree of Freedom, 4-bar mechanisms planar & spatial, Inversion and equivalent linkage, Transmission angle.

Kinematic Analysis of Planar Motion: Relative velocity, Instantaneous center, Poles and Centrodes, Acceleration, Acceleration difference.

UNIT II

Type, Number & Dimensional Synthesis: Kinematic synthesis, Type synthesis, Number synthesis, Dimensional synthesis, Accuracy points, Chebyshev polynomial.

Four Bar Coupler Point Curves: 4-bar linkages, Equation of coupler curves, Double points and symmetry, Robert- Chebyshev theorem.

UNIT III

Geometrical Methods of Synthesis: Poles and Relative Poles of 4-bar linkage, Poles & Relative Poles of Slider crank mechanism, Synthesis with 3 accuracy points, Pole triangle, 4 position synthesis, example.

UNIT IV

Algebraic Method of Synthesis: Displacement equation of 4- bar linkage, Crank- follower synthesis with 3 accuracy points, Four bar function generator with 3 accuracy points, Crank and follower synthesis angular velocities and acceleration.

UNIT V

4-accuracy point synthesis of slider- crank mechanism and 4- bar mechanism, five accuracy point synthesis of crank and follower mechanisms, Structural error, Mechanical errors in 4 bar mechanisms.

References

1. Kinematic Synth esis of Linkages: Hartenberg RS and Denavit J, Mc Graw Hill.
2. Kinematic & Linkage Design: AS Hall Jr., Prentice Hall India.
3. Mechanisms & Machine Theory: Amitabh Ghosh & AK Mallick.
4. Mechanism Design: Analysis & Synthesis: Erdman & Sandor, Prentice Hall.

Effective from 2018-19

BME-E713
THERMAL TURBO MACHINES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam & gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbo machinery, Energy transfer in turbo machines, Euler s equation, Velocity diagrams for axial & radial turbo machinery and pumps. Definition of various efficiencies, Introduction to blowers, pumps, compressors, steam & gas turbines turbojet.

UNIT II

Centrifugal Compressors: Principle of operation, work done and pressure rise, Diffuser, state losses, ship factors, Performance, characteristics.

Axial Flow Compressor: Basic operation, Elementary theory, Factors affecting stage pressure ratio, Blockage in compressor annulus, Degree of reaction, 3-D flow, Design process, blade design, calculation of stage performance. Supersonic & transonic stages, Performance.

UNIT III

Axial Flow Turbines: Elementary theory of axial flow turbine, Vortex theory, Choice of blade profile, pitch and chord, Estimation of stage performance.

UNIT IV

Steam Turbines: Constructional details, working of steam turbine.

Pumps: Pumps, main components, indicator diagram and modification due to piston acceleration, performance and characteristics, axial flow pumps.

Radial Flow Turbines: Single velocity triangle Enthalpy- Entropy diagram, State losses, performance, Characteristics.

UNIT V

Gas Turbine Starting & Control Systems: Starting ignition system, combustion system types, safety limits & control.

Turbine Blade Coding: Cooling techniques, types

Mechanical Design Consideration: Overall design choices, Material selection, Design with traditional materials.

Text Books

1. Gas turbine theory : Gohen & Rogers, Addison Weslay Longman Ltd.
2. Design of high efficiency turbomachinery and gas turbines, David Gordon Wilson, Theodosios Korakianitis, Pren tice Hall In ternational.
3. Turbomachinery : S.M. Yahya.
4. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.
5. Gas Turbine- Ganeshan, Tata Mc Graw Hill.

Effective from 2018-19

BME-E714
UNCONVENTIONAL MANUFACTURING PROCESSES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes and its classification.

UNIT II

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electro-chemical machining, ultrasonic machining, Abrasive jet machining etc.

UNIT III

Principle and working and application of unconventional machining processes such as laser beam machining, Electron beam machining, Ultrasonic machining etc.

UNIT IV

Unconventional Welding Processes: Explosive welding, Cladding etc. Under water welding, Metallising, Plasma are welding/cutting etc.

UNIT V

Unconventional Forming Processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc.

Text Books

1. Modern Machining Processes P.C. Pandey
2. Unconventional Machining V.K. Jain

Effective from 2018-19

BME-E715
AUTOMOBILE ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Power Unit and Gear Box: Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient Resistance. Tractive effort. Gear Box. Gear ratio determination. Design of Gear box.

UNIT II

Transmission System: Requirements. Clutches. Toque converters. over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Fron t Axle. Castor Angle, wheel camber & Toe in Toe out etc. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

UNIT III

Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vaccum and air brakes. Thermal aspects.

Chasis and Suspension System: Loads on the frame. Strength and stiffness. Various suspension systems.

UNIT IV

Electrical System: Types of starting motors, generator & regulators, lighting system, Ignition system , Horn, Battery etc.

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

UNIT V

Automobile Air Conditioning: Requirements, Cooling & heating systems

Cooling & Lubrication System: Different type of cooling system and lubrication system.

Maintenance System: Preventive maintenance, break down maintenance, and over hauling system.

References

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

Effective from 2018-19

BME-E716
COMPUTER AIDED DESIGN (CAD)

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction and Review of Computer Programming: Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity. Review of C, C++, statements such as if else for while & switch, functions, pointer-notations, structure & class, concept of OOP.

Computer Graphics I - Computer systems, Graphics input devices- cursor control devices, Digitizers, Scanners, speech oriented devices and touch panels, Graphics display devices CRT, colour CRT monitors, DVST, Flat- panel display, Graphics output Devices.

UNIT II

Computer Graphics-II: Graphics software, Graphics functions, output primitives- Bresenham's line drawing and Mid-point circle algorithms.

Geometric Transformations - Word/device co-ordinate representations, 2D and 3D geometric transformations, Matrix representation-translation, scaling, shearing, rotation and reflection, composite transformations, concatenation, rotation about arbitrary axis. Exercise and programs.

UNIT III

Plane Curves: Curve representation, Interpolations Vs approximatio n, Parametric Continuity co nditions, Spline Curves- Hermite spline, Bezier spline and B- spline Curves and its Properties.

3-D Graphics: Polygon surfaces Polygon mesh representations, Quadric and Superquardic surfaces and Blobby objects, Fractals. Solid modeling- wire mesh and sweep representation, constructive solid geometry, Boolean operations, Boundary representations. Colour models.

UNIT IV

Computer Aided Design of Machine Elements and other Systems: CAD of machine elements such as shaft, springs, bearings and problems from other systems such as heat exchanger, inventory control etc. Writing Computer program in C, Drafting/Design of software such as Auto-CAD and Pro-E.

UNIT V

Numerical Methods: Introduction, Errors in numbers, Binary, octal and Hexadecimal number representation. Root-finding & Optimisation. Interactive methods- Bisection method, Regula-Falsi method, Newton Raphson method, Interpolation- Lagrange and Newton s interpolation, Curve fitting-Least Square method, Numerical differentiation-interpolation methods, Numerical integration-Trapezoidal and Simpson Method.

Finite Element Methods - Introduction and Application of FEM, Stiffness Matrix/ Displacement Matrix, One/Two Dimensional bar & beam element (as spring system) analysis.

Text Books/References

1. Computer Graphics by Hearn & Baker (Pearson / Prentice hall)
2. Computer Aided Design by R.K.Srivastava.
3. Computer Graphics Theory & Practice- Foley, Van Dam, Feiner, (Pearson Education)
4. CAD/CAM Theory and Practice Ibrahim Zeid (Mc Graw Hill International)
5. Computer Aided Analysis & Design of Machine Elements (Rao & Dukkipati)
6. Mathematical Elements for Computer Graphics Rogers & Adams (Mc Graw Hill)

Effective from 2018-19

BME-E717
COMPUTER AIDED MANUFACTURING (CAM)

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

1. Introduction: Introduction to Automation and need and future of NC systems and CAM. Advantages & disadvantages. Classification. Open and closed loop systems. Historical development and future trends.

2. Features of NC Machines: Difference between ordinary and NC machine tools. Methods for improving Accuracy and Productivity.

UNIT II

3. NC Part Programming:

(a) Manual (word address format) programming. Examples Drilling and Milling.

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement.

UNIT III

4. System Devices: Introduction to DC motors, stepping motors, feed back devices such as encoder, counting devices, digital to analog converter and vice versa.

5. Interpolators: Principle, Digital Differential Analysers. Linear interpolator, circulator Interpolator and its software interpolator.

6. Control of NC Systems: Open and closed loops. Automatic control of closed loops with encoder & tachometers. Speed variation of DC motor. Adaptive control.

UNIT IV

7. Computer Integrated Manufacturing system: Group Technology, Manufacturing cell, Transfer lines, FMS, CIM, CAD/CAM, CAPP, Concept of Mechatronics & MEMS.

UNIT V

8. Intelligent Manufacturing: Introduction to Artificial Intelligence for Intelligent manufacturing.

Text Books/References

1. Computer control of Manufacturing systems by Koren
2. NC Machines by Koren
3. CAD/CAM by Groover.
4. NC Machine Tools by S.J. Martin.

BME-E718
PRODUCT DEVELOPMENT & DESIGN

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Product, Definition, Scope, Terminology etc.
Design definitions, old and new design methods, Design by evolution, Examples such as evolution of sewing m/c, bicycle, safety razor etc., Need based developments, Technology based developments.
Physical realisab ility & Economic feasibility of design concepts.

UNIT II

Morphology of design, Divergent, transformation and convergent phases of product design, identification of need, Analysis of need.
Design for what? Design criteria, functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocks, Ideation techniques, Creativity, Check list.

UNIT III

Transformations, Brainstorming & Synetics, Morphological techniques.
Utility concept, Utility value, Utility index, Decision making under Multiple criteria.
Economic aspects, Fixed and variable costs, Break-even analysis

UNIT IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man-machine interface, Compatibility of displays and controls.
Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.

UNIT V

Existing techniques such as work-study, SQC etc. which could be used to improve method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.

Text Books/References

1. Product Design & Manufacturing - A.K.Chitab &R.C.Gupta, PHI (EEE).
2. The Technology of Creation Thinking- R.P.Crewford Prentice Hall
3. The Art of Thought Grohem Walls Bruce &Co., New York
4 Product Design & Decision Theory- M.K. Starr - Prentice Hall
5. Engg . Product Design- C .D. Cain, Bussiness Books.
6. Industrial design for Engineers W .H. Mayall, Itiffe.
7. Human Factor Engg. Mccormick EJ , Mc GrowHill.

BME-E719
ROBOTICS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Brief History, Types of robots, uses of robots, Present status and future trends in robotics, Overview of robot subsystems.

Issues in Designing and Controlling Robots: resolution, repeatability and accuracy, transmission, Robot configurations and concept of workspace, Mechanisms and transmission.

Robot Anatomy: End effectors and actuators .Different types of grippers, vacuum and other methods of gripping. Pneumatic, hydraulic and electric actuators.

Robot applications, Robot programming methods. VAL and AML with examples.

UNIT II

Sensors and Controllers: Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder, camera. Micro-controllers, DSP, centralized controllers, real time operating systems.

Task Specification: Point to point and continuous motion specifications for typical applications, joint interpolation, task space interpolation, executing user specified tasks.

UNIT III

Robot Analysis: Position and orientation of rigid bodies, spatial mechanism description, Denavit-Hartenberg notation, homogenous transformation. Forward and inverse position analysis, velocity mapping, static force analysis, singularities, acceleration mapping.

UNIT IV

Robot Control: Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control

Motion Planning: Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.

UNIT V

Robot Vision: Camera model and perspective transformation, image processing fundamentals for robotic applications, image acquisition and preprocessing.

Segmentation and region characterization object recognition by image matching and based on features, Problem of bin-picking.

Text Books/References

1. Robots by Koren
2. Robot Programmer's Bonanza by John Blankenship and Samuel Mishal
3. Programming Robot Controllers by Mike Predko, McGraw Hill

BME-E720
OPERATIONS MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: System Concept and Types of OM Systems; Linking Between Manufacturing and Product Life Cycle; Operations Strategy and Competitive Advantage, Product Design

UNIT II

Process selection and Design: Process analysis, types of processes, job design, method study and work measurement, manufacturing process selection and design
Facility layout: Basic formats, process layout, product layout, group technology layout, retail service layout

UNIT III

Forecasting Methods: Demand management, types of forecasting, components of demand, Qualitative Techniques in forecasting; Time series analysis, simple moving average, weighted moving average, exponential smoothing, forecast errors, linear regression analysis; Causal relationship forecasting; Collaborative Planning, forecasting and replenishment (CPFR).

UNIT IV

Inventory Control: Definition of Inventory, Purpose of Inventory, Inventory costs, Independent versus dependent demand, Inventory systems, fixed order quantity models, fixed time period models, price break models, ABC inventory planning.

UNIT V

Supply Chain Design: Supply chain strategy, measuring supply chain performance, design strategy, outsourcing, design for logistics

Suggested Books

1 Chase R B, Jacobs F R, Aquilano N J, Agarwal N K, “Operations Management” 11/e, TATA McGraw Hill, 2009
2 Stevenson W J, “Operations Management”, 9/e, TATA McGraw Hill, 2009
3 Kachru U, “Production and Operations Management”, Excel Books, 2007

BME-E821
TOTAL QUALITY MANAGEMENT (TQM)

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

Control on Purchased Product

Procurement of various products, evalu ation of supplies, cap acity verification, Development of sources, procurement procedure.

Manufacturing Quality

Methods and Tech niques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

UNIT II

Quality Management: Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

UNIT III

Control Charts: Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

UNIT IV

Defects Diagnosis and Prevention: Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT V

IS0-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

References

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. Beyond Total Quality Management . McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

BME-E822
NON DESTRUCTIVE TESTING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Scope and advantages of N.D.T. some common NDT methods used since ages - visual inspection, Ringing test, and chalk test (oil-whiting test) their effectiveness in detecting surface cracks, bond strength and surface defects.

UNIT II

Common NDT Methods: Dye penetrant tests principle, scope, equipment and techniques. Zyglo testing.
Magnetic Particle Tests-cope of test, Principle equipment and technique. DC and AC magnetization, use of day and wet powders magnaglow testing. Interpretations of results.

UNIT III

Radiographic Method: X-ray radiography principle, equipment and methodology. Interpretation of radiographs, Limitations Gama ray radiography. Principle, equipment, source of radioactive material and technique. Precautions against radiation hazards, Advantage over x-ray radiography methods.

UNIT IV

Ultrasonic Testing Methods: Introduction Principle of Operation piezoelectricity. Ultrasonic probes, cathode ray oscilloscope techniques and advantages limitation and typical applications.

UNIT V

Testing of Castings, Forgings & Weldments: Application of NDT methods in inspection of castings, forgings and welded structures with illustrative examples. Case studies. Sample-testings in the lab.
[This course to be offered if NDT laboratory facilities are available]

Suggested Books

1 Paul E Mix, “Introduction to Nondestructive Testing”, 2/e, Wiley-Interscience, 2005
2 Charles J Hellier, “Handbook of Nondestructive Evaluation”, Tata McGraw Hill, 2001
3 McGonnagle W.J., “Nondestructive testing”, Gordon and Breach, 1977

BME-E 823
CONCURRENT ENGINEEIRNG

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Background and challenges faced by modern production environment, sequential engineering process, Concurrent engineering definition and requirement, meaning of concurrent objectives of CE, benefits of CE, Life cycle design of products, life cycle costs.
Support for CE: Classes of support for CE activity, CE organizational, structure CE, team composition and duties, Computer based Support, CE Implementation Process.

UNIT II

Design Product for Customer: Industrial Design, Quality Function Deployment, house of quality, Translation process of quality function deployment (QFD).
Modeling of Concurrent Engineering Design
Compatibility approach, Co mpatibility index, implementation of the Compatibility model, integrating the compatibility Concerns.

UNIT III

Design for Manufacture (DFM): Introduction, role of DFM is CE, DFM methods, e.g. value engineering, DFM guidelines, design for assembly, creative design methods, product family themes, design axioms, Taguchi design methods, Computer based approach to DFM. Evaluation of manufacturability and assemblability.

UNIT IV

Quality by Design: Quality engineering & methodology for robust product design, parameter and Tolerance design, Quality loss function and signal to noise ratio for designing the quality, experimental approach.

UNIT V

Design for X-ability: Design for reliability, life cycle serviceability design, design for maintainability, design for economics, decomposition in concurrent design, concurrent design case studies.

Text Books

1. Concurrent Engineering Kusiak John Wiley
2. Concurrent Engineering Menon Chapman & hall

BME-E824
AUTOMATIC CONTROLS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Concept of automatic controls-open loop and closed-loop systems, block diagrams, transfer functions. Application of Laplace Transform in control system.

Representation of control components and Systems: Translation and rotational mechanical components, electrical components, series and parallel combinations, cascade systems, analogous system.

UNIT II

System Response: First systems response to impulse, ramp and sinusoidal inputs, unit step response of second order system.

Modes of Controls: Basic control actions on off control proportional control.

UNIT III

Controller Mechanisms: Pneumatic, hydraulic and electric controllers, general principles for generating proportional control actions. Concept of control valve.

Control System Analysis: Stability of control system, Routh's criterion, Root locus Plot for simple system.

UNIT IV

Frequency Response Analysis: Polar plot, Bode plots Niquisth stability criteria, gain and phase margins.

Root Locus Plots: Simple Transfer functions, transient response from root locus plots.

UNIT V

Industrial Applications: Industrial applications such as for Temperature controls in furnace, oven etc.; Flow controls in fluid flow & fluid machines e.g. turbines; Industrial environment controls.

Case Studies: Illustration of use & importance of Controls with a few case-studies.

References/ Text Books

1. Automatic control Theory-Raven, McGraw-Hill Book Co.
2. Industrial Automatic Controls-Lajoy, Longmans Green & Co.
3. Automatic Control systems-B.C.Kuo, Prentice-Hall [19 76]
4. Modern Control Engineering-K. Ogata, Prentice-Hall of India
5. Introduction to Control Engineering and Linear Control
6. Systems-W. Leonhard, Allied Publishers Pvt. Ltd. [1976]
7. Control systems Engineering-I J. Nagrath and M. Gopal New Age Pvt. Ltd.
8. Automatic Process Control D P Eckman, Wiley Eastern Ltd.

BME-E825
OPTIMIZATION TECHNIQUES IN ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.

UNIT II

Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn Tucker Sufficient Conditions.

UNIT III

Optimization: Quasi-Newton Methods and line search , least squares optimization, Gauss-Newton, Levenberg- Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Linar Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Agorthms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches Blue.

UNIT IV

Optimization and Functions of a Complex Variable and Numerical Analysis: The Finite Difference Method for Poisson s Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Mehtod and the Runge-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson s 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi s Iteration Method.

UNIT V

Optimization in Operation Research: Dynamic Programming, Transportation Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods.

Text Books

1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming
6. G.L. Nemhauser and L.A. Wolsey: Intger and Combinational Optimizatio n.
7. R.G. Parker and R.L. Rardin:Discrete Optimization.

BME-E826
ADVANCED WELDING PROCESSES

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Importance and application of welding, classification of welding process. Selection of welding process.

Review of conventional welding process: Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS.CI, Al, Stainless steel & Maurer/Schacfflar Diagram. Soldering & Brazing.

UNIT II

Advanced welding Techniques: Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc.

UNIT III

Advanced welding Techniques (continued): Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Meetallising, Hard facing.

UNIT IV

Weld Design: Welding machines/equipments and its characteristics. Weld defects and distortion and its remedies, Inspection/testing of welds, Macrostructure & microstructure of welds, HAZ, Weld Design, Welding of pipe-lines and pressure vessels. Life predication.

UNIT V

Thermal and Metallurgical Consideration: Thermal considerations for welding, temperature distribution, Analytical analysis, heating & cooling curves. Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of weld and properties.

Text Books

Welding Hand Book

BME-E827
MAINTENANCE ENGINEERING & MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy-element, unit, standby, maintainability, availability, reliability and maintainability trade off.

UNIT II

Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency.

UNIT III

Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure.

UNIT IV

Break down maintenance planning, assignment model, waiting time models expected waiting time, minimum cost service rate, PERT.

UNIT V

Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management.

Text Books

1. Management of systems R.N. Nauhria & R. Prakash.
2. Operations Research Wangner.

BME-E828
ADVANCED DYNAMICS OF MACHINERY

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Dynamic Analysis of Mechanisms and Machines: Introduction, Motion of Rigid Body under a System of Forces, Principle of Virtual Work , D Alembert's Principle and Dynamic Equilibrium, Dynamic Force Analysis, Stresses in Moving Members, Motion Analysis, Equivalent Force and Mass Method.

UNIT II

Dynamics of Direct Acting Engine Mechanisms: Introduction, Piston Motion, Turning Moment on Crank-Shaft, Dynamically Equivalent Link, Approximate Expression for Turning Moment, Correction to the Approximate Expression, Turning Moment Diagram, Fluctuation of Crank-Shaft Speed, Flywheel Analysis.

UNIT III

Balancing of Inertia Force and Moments in Machines: Introduction, Balancing of Rotating Masses, Two-Plane Balancing, Determination of Balancing Masses, Balancing of Internal Combustion Engines.

UNIT IV

Gyroscopic action in Machines: Introduction, Motion of a Rigid Body in Three- Dimensions, Principal Axes, Angular Velocity and Momentum about Principal Axes, Euler s Equation of Motion, Euler's Modified Equation, Simple Precession of a Symmetrical Gyroscope in Angular Precession, Gyroscopic Effects in Machines, Gyroscopic Stabilization.

UNIT V

Dynamics of Rotating Shafts: Introduction, Critical Speed, Shaft with an Unbalanced Disc at Mid-Span, Generalized Forces, Lagrange s Equation of Motion, Gyroscopic Effect on Critical Speed.

Text Books

1. Theory of Mechanisms and Machines by Amitabh Ghosh and Ashok Kumar Malik, Affiliated East- West Press Pvt. Ltd, New Delhi.
2. Theory of Machines and Mechanisms by Joseph Ed ward Shigley and John Joseph Uicker, J.R. International Student Edition, Mc-Graw Hill International Company.

BME-E829
MECHANICAL SYSTEMS DESIGN

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Engineering Process and Systems Approach: Basic concepts of systems, attributes characterizing a system, system types. Application of systems concepts in Engineering, advantages of systems approach, basic problems concerning systems. Concurrent Engineering. A case study: e.g. viscous lubrication system in wire drawing.
Problem Formulation: Nature of engineering problems, Needs statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraints. A case Study: e.g. heating duct insulation system high- speed belt drive system.

UNIT II

System Theories: System analysis, Black Box approach, state theory approach, component integration approach, Decision process approach; A case study : e.g. automobile instrumentation panel system.
System Modeling: Need of modeling, Model types and purpose, linear systems, mathematical modeling, Concepts; A case study: e.g. A compound bar system.

UNIT III

Graph Modeling and Analysis: Graph Modeling and analysis process, path problem , Network flow problem, A case study: e.g. material handling system.
Optimization Concepts: Optimization process, selection of goals and objectives- Criteria, methods of optimization analytical, combinational, subjective. A case study: e.g. aluminium extrusion ion system.

UNIT IV

System Evaluation: Feasibility assessment, planning horizon, time value of money, financial analysis. A case study: e.g. manufacture of a Maize-Starch system.
Calculus Methods for optimization: Model with one decision variable, model with two decision variables, model with equality constraint, Model with inequality constraint. A case study: e.g. optimization of an insulation system.

UNIT V

Decision Analysis: Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict Probability density function, Expected monetary value, utility value, Bayes theorem: A case study: e.g . Installation of a Machinery.

System Simulation: Simulation concepts, simulation models, computer applications in simulation, spread sheet simulation. Simulation process, problem definition, input model construction and solution, limitations of simulation approach. A case study: e.g. An inventory control in a Production Plant.

References

1. Design And Planning of Engineering Systems by D.D.Reredith, K.V.Wong, R.W.Woodhead, and R.R.Worthman, Prentice Hall Inc., Englewood Cliffs, New Jersey.
2. Design Engin eering- by J.R.Dixon, Tata Mc Graw Hill Publishing Company, New Delhi.
3. An Introduction to Engineering Design Method by V.Gupta and P.N. Murthy, Tata Mc. Graw Hill.
4. Engineering Design Robert Matousck, Blackie and Son Ltd., Glasgow.
5. Optimisation Techniques S.S.Rao.
6. System Analysis and Project Management- Devid I. Cleland, William R.King, Mc Graw Hill.

BME-E830
PROJECT MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Project Management Concepts: Definition of Projects, Project Life Cycle / Phases, Stakeholders, Organization & Skills, Role of Project Manager, Conflicts in Projects and Resolution, Project Objectives / Processes

UNIT II

Project Organization and Contracts: project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

UNIT III

Project Appraisal and Cost Estimation: technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

UNIT IV

Project Planning and Scheduling: Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT mod el, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks.

UNIT V

Modification & Extensions of Network Models: complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution.

Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM software, software packages for CPM. Enterprise-wide PM, using spread sheets for financial projections.

Suggested Books

1 Chandra, P., “Projects: Planning, Analysis, Financing, Implementation and control”, 5/e, Tata McGraw Hill, 2002
2 Ghattas, R.G., Mc Kee, S.L., “Practical Project Management, Pearson Education Asia, 2001
3 Choudhury, S., “Project Scheduling and Monitoring in Practice”, South Asian Publishers, 1986

BME-E831
FOUNDRY ENGINEERING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Solidification: Effect of mould and mould variables on progressive and directional solidification. Heat Transfer through moulds and dies after pouring. Thermal gradients.

UNIT II

Moulding and Core Materials
Comparative study of sands, clays and additives, cavitated clays. Selection of materials for moulds, cores and dies for various processes

UNIT III

Design and Location of Gates and Risers
Application of theory of gate and riser design to actual castings

UNIT IV

Mechanization in Foundry: Modern developments in mechanization of foundry. Modern developments in foundry processes. Application of industrial engineering principles in foundry.
Fluidity: Measurement of fluidity. Effects of various parameters on fluidity
Testing of Sand: Recent developments such as mulling index, mouldability index, compactability, mould wall movements etc.

UNIT V

Melting: selection and control of melting furnaces. Melting, refining and pouring. Recent trends in Cupola design
Inspection and Quality Control: Why and how to detect. Analysis of defects

References

1. Hane Loper and Rosenthal, Principles of Metal Casting
2. Flinn, Fundamentals of Metal Casting

BME-E832
FINITE ELEMENT METHODS

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

General Concepts and Mathematical Preliminaries
Review of theory of elasticity, stress, strain, stress- strain relations. Plane stress. Plain Strain. Matrices and Matrix operation methods of solution of simultaneous equations. Brief history and over view of finite element method. Shape functions and their derivation.

UNIT II

Direct Stiffness Method
Introduction of direct stiffness method and its application to springs, electrical networks, flow in pipes and bars. Truss analysis with direct approach. Determination of local element characteristics, Assemblage of Global element characteristics, application of the prescribed displacements and loads & solution.

UNIT III

Variational Formulation
Introduction to boundary value problems and variational calculus. Variational approach to boundry value problems. The weak formulation. The Euler-Lagrange equation. One dimensional axial deformation and heat conduction problems. Geometric and Natural boundary conditions

UNIT IV

Introduction to Weighted Residual Methods
Garlekin's approach to one dimensional problems. Completeness requirements, Isoparametric elements and concepts of numerical integration

UNIT V

Application to Solid Mechanics
Principle of virtual displacements, Plane stress and plane strain problems, axi- Symmetric and three dimensional stress analysis

References

1. Paul Allaire, Introduction to Finite Element Method
2. Frank L Stasa, Applied Finite Element Analysis for Engineers
3. Desal & Abel , Introduction to the Finite Element Method
4. William B Bickford, Finite Element Method

BME-E833
NANOTECHNOLOGY AND NANOCOMPUTING

MM : 100 **Sessional : 30**
Time : 3 Hr **ESE : 70**
L T P **Credit : 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Nanotechnology: Nanosystems, Molecular machinery and manufacturing, quantum mechanics, mechanosynthesis, Ideas of Richard Feynman

Nanocomputing: Introduction, Nanocomputing Technologies, Carbon nanotubes, Nano information processing, Silicon Nanoelectronics, prospects and Challenges.

UNIT II

Carbon Nanotubes: Properties, Molecular structure, Chiral Vector, carbon nanotube Electronics, Carbon Nanotube Field effect Transistors

UNIT III

Imperfection and Reliability

Nanocomputing with Imperfections: Nanocomputing in presence of defects and faults, redundancy, Error control coding, reconfiguration, Fault Simulation, Defect Tolerance, Reconfigurable Hardware, Overcoming Manufacturing defects

Reliability of Nanocomputing: Markov Random Fields, examples, reliability Evaluation strategies, Law of large Numbers, NANOPRISM

UNIT IV

Nanoscale Quantum Computing

Quantum Computers, Challenges to Physical Realization, Quantum-dot Cellular Automata (QCA), QCA Clocking, Design Rules, Placement, Basic QCA Circuits using QCA Designer Software and their implementation

UNIT V

Molecular and Optical Computing

Molecular Computing: Background of molecular electronics, Aldeman's Experiment, DNA Computation, Bacteriorhodopsin, challenges before molecular computing.

Optical Computing: Introduction, use of Optics for Computing, Optical Computing Paradigms, Ultrafast Pulse Shaping, Photonic Switches

References

1. S K Shukla and R I Bahar (Eds.), Nano, Quantum and Molecular Computing- Implications to High level design and Validation, Kluwer Academic Publishers
2. V Sahni and D Goswami, Nanocomputing – an Introduction, Tata McGraw Hill