BACHELOR OF TECHNOLOGY

IN

MECHANICAL AND AUTOMATION OF ENGINEERING

SCHEME OF EXAMINATION

&

SYLLABUS (2^{nd}, 3^{rd} & 4^{th} Year)

BACHELOR OF TECHNOLOGY (IGDTUW)

(Mechanical & Automation Engineering)
(Teaching and Examination Scheme)

THIRD SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BAS-201	Numerical Methods	4	-	4	BS
2	BMA-203	Strength of Materials	4	-	4	DC
3	BMA-205	Material Science	4	-	4	DC
4	BMA-207	Fluid Mechanics and Hydraulic Machines	4	-	4	DC
5	BEC-211	Analog and Digital Electronics	4	-	4	ES
PRACTICAL/VIVA VOCE						
1	BMA-251	Machine Drawing Lab	0	2	1	DC
2	BMA-253	Strength of Materials Lab	0	2	1	DC
3	BMA-255	Material Science I- Lab	0	2	1	DC
4	BMA-257	Fluid Mechanics and Hydraulic Machines Lab	0	2	1	DC
5	BEC-261	Analog and Digital Electronics- Lab	0	2	1	ES
		TOTAL	**20**	**10**	**25**	

FOURTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BMA-202	Manufacturing Processes	4	-	4	DC
2	BMA-204	Theory of Machines	4	-	4	DC
3	BMA-206	Operations Research	4	-	4	DC
4	BMA-208	Thermal Engineering-I	4	-	4	DC
5	BMA-210	Engineering Measurement and Metrology	4	-	4	DC
PRACTICAL/VIVA VOCE						
1	BMA-252	Manufacturing Processes-Lab.	0	2	1	DC
2	BMA-254	Theory of Machines- Lab.	0	2	1	DC
3	BMA-256	Operations Research- Lab.	0	2	1	DC

4	BMA-258	Thermal Engineering-I Lab.	0	2	1	DC
5	BMA-260	Engineering Measurement and Metrology- Lab.	0	2	1	DC
		TOTAL	**20**	**10**	**25**	

BACHELOR OF TECHNOLOGY (IGDTUW)

(Mechanical & Automation Engineering)
(Teaching and Examination Scheme)

FIFTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BMA-301	Machine Design	4	-	4	DC
2	BMA-303	Manufacturing Technology	4	-	4	DC
3	BMA-305	Microcontrollers and Its Applications	4	-	4	ES
4	BMA-307	Thermal Engineering-II	4	-	4	DC
5	BMA-309	Automation in Manufacturing	4	-	4	DC
6	BMA-311	Human Values and Professional Ethics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BMA-351	Machine Design Lab	0	3	2	DC
2	BMA-353	Manufacturing Technology Lab	0	2	1	DC
3	BMA-355	Microcontrollers and Its Applications Lab	0	2	1	ES
4	BMA-357	Thermal Engineering-II Lab	0	2	1	DC
5	BMA-359	Automation in Manufacturing Lab	0	2	1	DC
		TOTAL	**23**	**11**	**29**	

SIXTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BMA-302	Production Management	4	-	4	DC
2	BMA-304	Computer Aided Design	4	-	4	DC
3	BMA-306	Heat Transfer	4	-	4	DC
4	BMA-308	Metal Cutting and Tool Design	4	-	4	DC
5	BMA-310	Automobile Engineering	4	-	4	DC
6	BAS-312	Engineering Economics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BMA-354	Computer Aided Design Lab	0	2	1	DC
2	BMA-356	Heat Transfer-Lab.	0	2	1	DC
3	BMA-358	Metal Cutting and Tool Design-Lab	0	2	1	DC
4	BMA-360	Automobile Engineering Lab	0	2	1	DC
5	BMA-362	Advance Machine Design Lab	0	3	2	DC
		TOTAL	**23**	**11**	**29**	

BACHELOR OF TECHNOLOGY (IGDTUW)

(Mechanical & Automation Engineering)

(Teaching and Examination Scheme)

SEVENTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BMA-401	Computer Aided Manufacturing	4	-	4	Departmental Core
2	BMA-403	Mechatronics	4	-	4	Departmental Core
ELECTIVES - I (Choose Any One)						
1	BMA-405	Refrigeration & Air-Conditioning	4	-	4	Departmental Elective
2	BMA-407	Non-Conventional Energy Resources				
3	BMA-409	Mechanical Vibration				
4	BMA-411	Modeling and Simulation				
5	BMA-413	Gas Dynamics				
6	BMA-415	Flexible Manufacturing Systems				
ELECTIVES - II (Choose Any One)						
1	BIT-415	Cyber Security Awareness	3	-	3	Humanities & Social Science/ Department of IT/MAE
2	BMA-417	Process Improvement Techniques				
3	BAS-419	Financial Accounting				
PRACTICAL/VIVA VOCE						
1	BMA-451	Computer Aided Manufacturing Lab	0	2	1	Departmental Core
2	BMA-453	Mechatronics Lab	0	2	1	Departmental Core
3	BMA-455	Practical based on Elective-I	0	2	1	Departmental Core
4	BMA-457	*Minor Project	0	8	4	Departmental Core
5	BMA-459	Practical Training	-	-	2	Departmental Core
6	BAS-461	Disaster Management	0	2	1	Humanities & Social Science
			15	**16**	**25**	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

EIGHTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BMA-402	Finite Element Analysis	4	-	4	Departmental Core
2	BMA-404	Robotics and Computer Integrated Manufacturing	4	-	4	Department Core
ELECTIVES - I (Choose any one)						
1	BMA-406	I.C. Engines	4	-	4	Departmental Elective
2	BMA-408	Industrial Tribology				
3	BMA-410	Maintenance and Reliability				
4	BMA-412	Power Plant Engineering				
5	BMA-414	Reverse Engineering and Rapid Prototyping				
6	BMA-416	Non-conventional Manufacturing Processes				
7	BMA-418	**E-Learning Based Course				
ELECTIVES - II (Choose any one)						
1	BAS-420	Business Entrepreneurship	3	-	3	Humanities & Social Science
2	BAS-422	Organizational Behaviour				
PRACTICAL/VIVA VOCE						
1	BMA-452	Finite Element Analysis Lab	0	2	1	Departmental Core
2	BMA-454	Robotics and Computer Integrated Manufacturing Lab	0	2	1	Departmental Core
3	BMA-456	*Major Project	0	12	8	Departmental Core
		TOTAL	**15**	**16**	**25**	
		GRAND TOTAL			**214**	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

** This course will be offered in e-learning mode.

NOTE: 1. The total number of the credits offered in B. Tech. Programme = 214

2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn the minimum of 204 credits.

Paper Code: BAS-201 **L** **C**

Paper Title: Numerical Methods **4** **4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT-I

Floating-Point Numbers: Floating-point representation, Rounding, Chopping, Error analysis,Condition and instability, rate and order of convergence of iterative schemes.

Non-Linear Equations: Direct iteration method, Bisection, Secant, Regula-Falsi method and Newton-Raphson method for single variable, convergence analysis of Newton's and Secant method, simultaneous nonlinear equations with two variables-Newton-Raphson method.

System of Linear equations: Gauss-elimination method (using Pivoting strategies), Gauss-Jacobi and Gauss-Seidel Iteration method. Power and Jacobi method for eigen-values and eigen-vectors. **(10 Hrs)**

UNIT-II

Interpolation: Difference operators, Finite differences, Newton's, Stirling's and Bessel's interpolation formula, Gauss interpolation method, Lagrange interpolation and Newton's divided difference interpolation formula with error analysis.

Numerical differentiation and integration, Newton-Cotes quadrature formulae (with error) and Gauss - Legendre quadrature formulae, Trapezoidal, Simpson's one-third and three-eighth rule. **(10 Hrs)**

UNIT –III

Differential Equations: Solution of initial value problems using Euler's, modified Euler's, Runge-Kutta method for first and second order differential equations. Milne's and Adam's Bashforth predictor-corrector methods. **(10 Hrs)**

Text Books:

1. Jain M.K., Iyengar, S.R.K., and Jain, R.K." Numerical Methods for Scientific and Engineering Computation", New Age International, 2003.
2. Gerald C.F and Wheatley P.O., "Applied Numerical Analysis", Pearson Education. 2011,Eighth Edition
3. Grewal B. S., "Numerical Methods in Engineering and Science", Khanna Publishers.

References Books :

1. Sastry S., "Introductory Methods of Numerical Analysis", PHI Pvt. Ltd., 2012, Fifth Edition

2. Conte, S.D and Carl D. Boor, “Elementry Numerical Analysis: An Algorithmic approach”, Tata McGraw Hill, New York, 2005.
3. Jain R.K., Iyengar S. R. K., “Advanced Engineering Mathematics”, Narosa Publishing House, 2011, Third Edition

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-203 **L C**

Paper Title: Strength of Materials **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - 1

Compound Stresses & Strains: two dimensional stress system, conjugate shear stress at a point on a plane, principal- planes, principal stresses, Mohr's circle for plane stresses, analysis of strain, principal strain in three dimensions, Mohr's circle graphical representation for strain.

Stresses in Beams: combined bending and direct stresses, bending stresses in beams, bending stresses in composite beams, shearing stress variation in typical cross-sections such as circular, hollow circular, rectangular, I & T sections.

Deflection of Beams: moment curvature relation, direct integration method, Macaulay's and moment-area method, theories of elastic failures, strain energy due to bending, Castigliano's theorem.

(10 Hrs)

UNIT –2

Fixed Beams: Macaulay's method for built-in beams, moment area method for fixed beams.

Continuous beams: Clapeyron's theorem, beams with overhang, continuous beams with fixed ends.

Torsion: torsion of circular shafts, strain energy due to torsion, shaft under action of varying torque, shaft in series and parallel, compound shafts, combined bending and torsion.

(10 Hrs)

UNIT-3

Springs: Closed and open coil helical spring subjected to axial load, spring in parallel & series.

C**olumns and Struts**: elastic stability of columns, buckling of columns, slenderness ratio and conditions, derivations of Euler's formula for elastic buckling load, Equivalent lengths and Ranking Gordon empirical Formulae. **(10 Hrs)**

UNIT-IV

Thin Pressure Vessel: Thin Pressure Vessels, Circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure.

Thick Pressure Vessel: Lame's theory, Stresses in thick and compound cylinders.

Bending of curved bars: stresses in curved bars, position of neutral axis, stresses in rectangular, trapezoidal, triangle and circular cross sections subjected to tension or compression. **(10 Hrs)**

Text Books:

1. R.K. Rajput, “Strength of Materials”, S. Chand Publication, New Delhi, 1998.
2. Ryder G.H., “Strength of Materials”, Macmillan, Delhi, 2003.
3. R.K. Bansal, “Strength of Materials”, Laxmi Publication, New Delhi, 2001.

Reference Books:

1. Timoshenko S.P., “Elements of Strength of Materials”, E-W. P, N. Delhi, 2000.
2. Hibbler R.C., “Mechanics of Materials”, Prentice Hall, New Delhi, 1994.
3. Popov Eger P., “Engg. Mechanics of solids”, Prentice Hall, New Delhi, 1998.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-205 **L C**
Paper: Material Science **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - I

Structure of metal: Crystal structure, crystal systems, crystallographic points, directions and planes, linear and planar density computations, Single crystal, polycrystalline materials,

Anisotropy, Polymorphism and anisotropy X-Ray diffraction technique.

Imperfection in solids: Point defects, vacancies, linear defects, interfacial defects, volume defects, effect of crystal defects on mechanical properties of the materials, grain size determination. **(10 Hrs)**

UNIT - II

Materials: Classifications of Cast Iron, steels and their alloys, effect of alloying elements, properties, IS standards codes for Cast iron and steels, composite materials and non-metals.

Phase and Equilibrium Diagrams: Unary and binary phase diagrams, phase equilibria, phase rule, types of equilibrium diagrams, solid solution types, Iron- Carbon diagrams.

Microstructural Exam: Grain size determination, Comparative study of microstructure of various metals such as mild steel, CI, brass. (**10 Hrs)**

UNIT - III

Heat Treatment: Principles and purpose of heat treatment of plain carbon steels, annealing, Normalizing, hardening, tempering, isothermal treatment, case hardening – carburizing, nitriding etc, precipitating hardening of aluminum alloys, cooling curves.

Corrosion: Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion. **(10 Hrs)**

UNIT - IV

Failure of the materials: Ductile fracture and brittle fracture; Fatigue failure, Design considerations for fatigue failure, Creep failure of the materials and creep resistant materials.

Dislocations and strengthening mechanisms in solids: Slip systems, slip in single crystal, twinning, Hall-Petch equation, solid-solution strengthening, strain hardening, recovery, recrystallization and grain growth. (**10 Hrs)**

Text Books:

1. V.Raghavan, “Material Science & Engineering”, Prentice Hall India Ltd., 2001.
2. William D. Callister, “Material Science & Engineering” Wiley India Ltd., 2010.
3. Sidney H. Avner, “Introduction to Physical Metallurgy”, Tata McGraw-Hill, 2007.

Reference Books:

1. Porter and Esterling, “Phase transformation in metals and alloys”, Van Nostrand Reinhold Company Ltd, 1999.
2. Reed Hill, “Principles of Physical Metallurgy” Cengage Learning Ltd, 2009
3. Buduisky et al, “Engineering Materials & Properties”, Prentice Hall India, New Delhi, 2004.
4. Peter Haasten, “Physical Metallurgy”, Cambridge Univ. Press, 1996.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-207 **L C**
Paper Title: Fluid Mechanics & Hydraulic Machines **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT-1

Fluid properties and pressure measurement: Mass density, Specific Volume, Specific Weight & Relative density, Viscosity, Newton's law of viscosity, Newtonian and Non-Newtonian Fluids, Ideal and Real fluids, Compressibility, Bulk modulus, Pressure at a point, Pascal's law, Hydrostatic pressure law, Absolute and Gauge pressure, Measurement of pressure, Simple and Differential Manometers. (**10 Hrs)**

UNIT-2

Hydrostatic and kinematics of fluids: Definition of total pressure, Center of pressure, Equation for hydrostatic force and depth of center of pressure on plane surfaces (vertical and inclined), Hydrostatic force on submerged curved surfaces, Classification of flow, steady & unsteady, uniform and non-uniform, Definition of path line, streamline, streak line, stream tube, one, two, three dimensional flows, Rotational and irrotational flow, Definition of velocity potential, stream functions, stream line, equipotential line, Relation between velocity potential and stream function. (**10 Hrs)**

UNIT-3

Fluid dynamics: Derivation of Euler's equation and Bernoulli's equation, Application of Bernoulli's equation, Pitot tube, Venturimeter, problems, Momentum equation, Flow through pipes and dimensional analysis, Flow through pipes, Reynolds number, classification of flow, Definition of hydraulic gradient, energy gradient, Major and minor losses in pipe flow, Equation for head loss due to friction (Darcy-Weishbach equation), Friction factor for commercial pipes, Minor losses (types), equation for head loss due to sudden expansion, Pipes in series, pipes in parallel and equivalent pipe, laminar and turbulent flow, Buckingham's π theorem, Model analysis, Similitude. (**10 Hrs)**

UNIT-4

Introduction to hydrodynamic machines: Turbines classification, elementary analysis, specific and unit quantities, performance characteristics of Kaplan, Pelton , Francis, Centrifugal and reciprocating Pumps, elementary analysis, specific and unit quantities, performance characteristics. (**10 Hrs)**

Text Books

1. Dr. R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd.,2002.
2. Som & Biswas, Fluid Mechanics, Tata Mc Graw Hill publication, 2012.
3. Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria & Sons, 2001

Reference Books

1. Yunus A. Cengel, "Fluid Mechanics", TMH 2010.

2. J. F. Douglas, “Fluid Mechanics”, Pearson Education, 2011.

Internet Sources:

www.nptel.ac.in

http://ocw.mit.edu

Paper Code: BEC-211 **L C**
Paper Title: Analog and Digital Electronics **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT-I

Bipolar Junction Transistor: Transient Characteristics in CB, CE & CC Configuration, Definition of α and β, Saturation, Regions of operation of Transistor, Biasing methods.
Amplifiers: CE, CC, CE Amplifier circuits and their comparisons, RC Coupled Amplifier, Frequency Response, Gain-Bandwidth, Darlington pair, Class B Push Pull Amplifier.
Feedback: Concept of Negative & Positive feedback and their relative advantages and disadvantages, Sinusoidal Oscillators. **(10 Hrs)**

UNIT -II

Field Effect Transistor: Introduction, JFET Characteristics, Depletion & Enhancement MOSFET, CMOS. Operational Amplifier: Characteristics of Ideal Op-Amp, Inverting & Non-Inverting Amplifier, Differential Amplifier, Adder & Subtractor, Integrator, Differentiator, Instrumentation Amplifier, Schmitt Trigger, Astable Multivibrator.**(10 Hrs)**

UNIT-III

Digital Electronics: Analog & Digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra. Standard representation of Logical functions, K-map representation and simplification of logical functions, Don't care conditions, X-OR & X-NOR simplification of K-maps.
Combinational circuits: Multiplexers, demultiplexers, Decoders & Encoders, Adders & Subtractor, Code Converters, comparators, decoder/ drivers for display devices **(10 Hrs)**

UNIT – IV

Flip Flops: S-R, J-K, D & T Flip-flops, excitation table of a flip-flop, race around condition. **Sequential circuits**: Shift registers, Ripple counter, Design of Synchronous counters and sequence detectors, sequence generators. **(10 Hrs)**

TEXT BOOKS:

1. Millman and Halkias, "Electronic devices and circuits" TMH, 1999.
2. Salivahanan, Suresh Kumar, Vallavaraj, "Electronic devices and circuits"TMH, 1999.
3. Roy Choudhury and Jain, "Linear Integrated Circuits", New Age Publishers, 4th ed.
4. Morris Mano, "Digital Design", PHI, 2nd edition.

REFERENCE BOOKS:

1. Balbir Kumar and S. B. Jain, "Electronic Devices and Circuits" PHI, 2012.
2. R.P. Jain, "Modern Digital Electronics", TMH, 3rd edtion.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-202 **L C**

Paper Title: Manufacturing Process-I **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - I

General Introduction- Manufacturing; definition and broad classification

Casting – Review of Sand mould casting, Patterns, types, material and design including pattern allowances, Moulding sands composition, preparation, properties and testing, Cores, Gating systems, Advantages, limitations and applications of various Gates, Pouring time, Foundry equipment and furnaces, Principles, method, Mould Casting, centrifugal casting, investment casting, Injection Moulding, principle, types, methods, advantages and application. (**10 Hrs)**

UNIT - II

Welding- Review of Fusion welding, gas welding, electrical Arc welding, Manual arc welding, Submerged arc welding, TIG and MIG, Induction welding; Plasma arc welding, Resistance welding; Spot welding, Butt welding; Seam welding, Projection welding, Solid state welding Principles. Methods, requirements and application of the different types, Solid state welding in hot condition, forge welding, Friction welding, Welding defects, Types, causes, effects and remedy, Soldering & Brazing. (**10 Hrs)**

UNIT - III

Forming Processes – Introduction, General principles, major classification, Hot working and cold working; principle, advantages and applications, Forging Definition and classification, work materials different forging operations, tools and equipments, drop forging and press forging (pressing) methods and use, Forging dies types and design calculations.**Rolling**-Introduction, basic principles and general applications, Characteristics and applications of hot rolling and cold rolling; various rolling processes, Wire drawing and Extrusion, Basic principles and requirements, Classification, methods and applications, Press tool works, Press tool construction, Materials, design of parts, Various operations and applications, Nesting, Blank Development (**10 Hrs)**

UNIT – IV

Forming Process continued – Bending, Bending Die design, Mechanics of Bending, Spring Back and calculations, Forces and power required for shearing and Forming operations.Introduction to Spinning, flow turning, Bulging, Hydro forming, Explosive forming.

Powder Metallurgy

Introduction, Production of metal powders, Compaction and sintering processes, Secondary and finishing operations, Economics, advantages, and applications of powder metallurgy. (**10 Hrs)**

Text Books:

1. Rao.P.N. “Manufacturing technology: foundry, forming and welding”: McGraw-Hill, 2001.
2. Ghosh, A., & Mallik, A. K. “Manufacturing science”, Ellis Horwood, 1986.
3. Raghuwanshi B. S, “Workshop Technology”, Vol. 1, Dhanpat Rai and Sons, 2006.
4. Hazra Chaudhuri S. K., “Elements of workshop Technology”, Vol. 2, Media Promoters, 2003

Reference Book

1. Kalpakjian, S., & Schmid, S. R. “Manufacturing processes for engineering materials”: Pearson Education, 2008.
2. Campbell, J. S. “Principles of manufacturing materials and processes”, Tata McGraw-Hill, 2005.
3. Date. P.P.” Introduction to manufacturing processes”, Jaico Publishing House, 2002.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-204 **L C**
Paper Title: Theory of Machines **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - 1

General concepts, Velocity and Acceleration Analysis: Introduction of Simple mechanism, Different types of Kinematics pair, Grublers rule for degree of freedom, Grashof's Criterion for mobility determination Inversions of 3R-P, 2R-2P chains, Kinematic analysis of planar mechanism. (**10 Hrs)**

UNIT - 2

Cams: Classification, Cams with uniform acceleration and retardation, SHM, Cylcloidal motion, oscillating followers.

Vibrations: Vibration analysis of SDOF systems, natural, damped forced vibrations, based excited vibrations, transmissibility ratio. (**10 Hrs)**

UNIT -3

Gears: Geometry of tooth profiles, Law of gearing, involute profile, interference, helical, spiral and worm gears, simple, compound gear trains, Epicyclic gear trains–Analysis by tabular and relative velocity method, fixing torque.

Dynamic Analysis: Slider-crank mechanism, turning moment computations. (**10 Hrs)**

UNIT - 4

Balancing: Static and Dynamic balancing, balancing of revolving and reciprocating masses, single and multi-cylinder engines.

Gyroscopes: Gyroscopic law, effect of gyroscopic couple on automobiles, ships, aircrafts. (**10 Hrs)**

Text Books:

1. S.S. Rattan, "Theory of Machines", Tata McGraw Hill, 2000
2. Dr. V.P. Singh, "Theory of Machines", Dhanpat Rai & Co. (P) Ltd., 2001
3. Ghosh & A.K. Mallik, 'Theory of Mechanisms and Machines", East West, Press, 2012.

Reference Books:

1. Jagdish Lal, "Theory of Mechanism & Machines", Metropolitan Education, 2000
2. Thomas Beven, "The Theory of Machines", CBS Publishers, 2000
3. P.L. Ballaney, "Theory of Machines & Mechanism", Khanna Publishers, 23rd Edition, 2003.

4. Norton, 'Kinematics and Dynamics of Machinery', Tata McGraw Hill, 2011.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-206 **L C**

Paper Title: Operation Research **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - 1

Linear Programming: Formulation of LP Problem, Gra Prentice Hall Indicial and Simplex method for maximization and minimization LP Problems, Duality in Simplex Problems, Sensitivity Analysis. (**10 Hrs)**

UNIT - 2

Transportation Models: Stepping stone method & MODI method for optimality check, North, West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems, Problems of degeneracy and maximization.

Assignment Models: Assignment model for maximization & minimization problems, Travelling of Salesman Problems, Industrial Problems. (**10 Hrs)**

UNIT - 3

Queuing Theory: Basic structure, Terminology, Classification, Birth and Death Process, Queuing Models up to 2 service stations.

Sequencing Theory: Processing of n-jobs through m-machines with each job having same processing order, Processing of two jobs through m-machines with each job having different processing order. (**10 Hrs)**

UNIT - IV

Network Models: Introduction to PERT and CPM, Fundamental concept of Network models and construction of network diagrams, Activity time estimates, Critical path and project time duration, Probability of completing the project on or before specified time, Concept of Float and slack.

Games Theory: Two person zero-sum games, Minimax and Maximin principle, Arithmetic, Algebraic, Matrix Algebra method, Solution by Dominance, Sub game, Gra Prentice Hall Indicial and Linear programming method.

Dynamic Programming: Concepts, Characteristics, Forward and Backward Computation, Optimality, DP Approach and applications (**10 Hrs)**

Text Books:

1. N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
2. J.K. Sharma, "Operation Research", Macmillan India Ltd. 2005.
3. H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

Reference Books:

1. Richard Bronson, Govindasami Naadimuthu, “Operations Research”, TMH 2004
2. A.P. Verma, “Operations Research”, S.K. Kataria & Sons, 2004
3. Fedrick S. Hiller and Gerald J. Lieberman, “Introduction to operations research concepts and cases”, McGraw-Hill, 2007.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-208 **L C**

Paper Title: Thermal Engineering-1 **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT 1

Entropy: Definition, Clausius inequality, Entropy a point function, Principle of increase of entropy, Entropy change during constant volume, constant pressure, isothermal, reversible adiabatic and polytrophic processes, Numerical problems.

Availability and Irreversibility: High and low grade energy, Available and unavailable energy, Loss of available energy due to heat transfer through finite temperature difference, Availability, Availability of a non-flow or closed system, Availability of a steady flow system, Helmholtz and Gibbs functions, Irreversibility, Numerical problems.

Thermodynamic relations: Reciprocal and cyclic relations, Property relations, Maxwell relations, Tds equations, Heat capacity relations, Relations for internal energy and enthalpy. (**10 Hrs)**

UNIT- 2

Gas Power cycles: Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Stirling and Ericsson cycles, Brayton cycle, Numerical problems.

Steam and its properties: Phase transformation of water on p-v, T-v, T-s and h-s diagrams, Properties of saturated water, wet steam, dry saturated steam and superheated steam, Steam Tables and Mollier chart for thermodynamics properties, Measurement of dryness fraction, Numerical problems.

Vapor Power Cycles: Rankine cycle, Comparison of Rankine and Carnot vapor cycles, Methods of improving the performance of Rankine cycle, Superheating, Reheating, Regenerative cycle, Binary vapor cycle, Numerical problems.

(**10 Hrs)**

UNIT-3

Steam Generators: Classification of boilers, Boiler mounting and accessories, High pressure boilers, Lamont, Benson, Loeffler, Schmidt-Hartmann and Velox boilers.

Steam Nozzle: Introduction, Types of nozzles, Isentropic flow of steam through nozzles, Velocity of steam leaving the nozzle, Entropy change with friction, Effect of friction, Calculation of nozzle area, Mass flow, Critical pressure ratio, Super-saturated flow in nozzles, Numerical problems (**10 Hrs)**

UNIT- 4

Steam Turbines: Principles of operation of steam turbine, Types of steam turbines, Compounding of steam turbines, Impulse Turbine, Velocity diagram, Effect of blade friction, Forces on Blades, Work done, Diagram efficiency, Stage efficiency. Impulse

Reaction Turbine, Velocity diagram, Degree of reaction, Parson's turbine, Numerical problems.

Condensers and Cooling Towers: Function of a condenser, Jet condenser, Surface condenser. Types and performance of cooling towers.

(10 Hrs)

Text Books:

1. P. K. Nag, "Engineering Thermodynamics", Tata McGraw-Hill Publishing Company Limited, New Delhi, India, 2011
2. P. L. Ballaney, "Thermal Engineering", Khanna Publishers, Delhi, India.,2012
3. Van Wylen and Sonntag, "Fundamentals of Classical Thermodynamics", John Wiley & Sons Inc., 2002.
4. Cengel and Boles, "Thermodynamics: Engineering Approach", Tata McGraw-Hill Companies, 2011

Reference Books:

1. P. K. Nag, "Power Plant Engineering", Tata McGraw-Hill , New Delhi, India.2012
2. S. C. Arora and S. Domkundwar, "A course in Power Plant Engineering", Dhanpat Rai & Sons, Delhi, India., 2012.
3. M.M. El Wakil, "Power Plant Engineering", Tata McGraw-Hill Companies, 2002.

Internet Sources:

www.nptel.ac.in

http://ocw.mit.edu

Paper Code: BMA-210 **L C**

Paper Title: Engineering Measurement and Metrology **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - 1

Introduction: Introduction to measurement and measuring instruments eneralized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, Types and sources of error, statistical analysis of errors.

Sensors and Transducers: Types of sensors, types of transducers and their characteristics, Difference b/w Open loop and Closed loop measurement system, Signal conditioning unit, indicating unit, static characteristics i.e accuracy, precision, sensitivity, resolution, linearity.

Measurement of flow: Methods of flow measurement, hot wire anemometer, ultrasonic flow meter. (**10 Hrs)**

UNIT - 2

Measurement of pressure: Elastic and indirect type pressure transducers. Measurement of very low pressures.

Strain measurement: Types of strain gauges and their working,temperature Compensation.

Measurement of force and torque: Different types of load cells, elastic transducers, pneu--matic and hydraulic systems.

Temperature measurement: Thermocouples, pyrometers. (**10 Hrs)**

UNIT - 3

Metrology and Inspection : Sources of error, Standards of linear measurement, line and end standards, Limit fits and tolerances, Interchangeability and standardisation.

Length Standards: Line standards, end standards, transfer from line standards to end standards, Numerical based on line standards, Slip gauges – its use and care, methods of building different heights using different sets of slip gauges.

Linear and angular measurements devices and systems Comparators: Types of Gauges, Limit Gauge, Snap Gauge, Receiving Gauge ,Taylor's Principle of Gauge Design. (**10 Hrs)**

UNIT - 4

Measurement of geometric forms like straightness, flatness, roundness, Tool makers micro--scope, profile project autocollimator.

Interferometry: principle and use of interferometer, optical flat. Measurement of screw threads and gears.

Surface texture: quantitative evaluation of surface roughness and its measurement, Comparators, Feature inspection Form Tolerance Inspection. Tolerance Stack Analysis, CMM, working and features **(10 Hrs)**

Text Books:

1. A.K. Tayal, "Instrumentation and Mechanical Measurement", Galgotia Publications Pvt. Ltd., 2003..
2. T.G. Beckwith, R.D. Maragoni and J.H Lienhard, "Mechanical Measurements", Addison- Wesley, 1999.

Reference Books

1. R.K. Jain, "Engineering Metrology", Khanna Publishers, Delhi,2010
2. I.C. Gupta, "Engineering Metrology", Dhanpat Rai Publications, Delhi,2011
3. F.W. Galyer & C.R. Shotbolt, "Metrology for Engineers", ELBS edition, 2009

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-301 **L C**
Paper Title: Machine Design **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT I

Introduction to the design process for automation, Factor influencing machine design, Mechanical properties of materials, Direct stress, Bending stress, torsional stress and variable stress in machine parts, theory of failure, stress concentration factor, factor of safety.

Manufacturing & environment consideration in Design- Tolerance,type of fits,selection of fits, limits. [**10 Hrs]**

UNIT II

Analysis and design of fastener and joints - Key and keyed joints, Cotter and Knuckle joint, bolts and bolted joint with and without initial tightening loads, riveted joints, boiler joints, structural joints, welded joints, bolted, riveted and welded joints under eccentric loading, springs.

[10 Hrs]

UNIT III

Design of Shaft - Shaft subject to combined loading, subjected to fatigue loading, Design of Power screws, pulleys and flywheels, Belt and Chain drive.

Coupling - Rigid and Flexible types, Design of levers.

[**10 Hrs]**

UNIT IV

Design of spur and helical gears, bevel & worm gears.

Bearing and Lubrication - Type of sliding bearing, materials, type of lubrication, design of sliding bearing, selection and application of rolling bearing, seals and gaskets.

[**10 Hrs]**

Text Books:

1. Budynas R.G.. and Nisbett, J.K.,"Mechanical Engineering Design" McGraw Hill Education (India)Private Limited, 2013
   Bhandari, V. B., "Design of Machine Elements", Tata M.C.Graw – Hill, 2010.
2. Maleeve Hartman and O.P. Grover, "Machine Design", CBS Publication & Publishers,2012.
3. P.C. Sharma and D.K Aggarwal., "Machine Design", S.K. Kataria& Sons, 2012.

References Books:

1. Dieter G.E. and Schmidt L.C., “Engineering Design” McGraw Hill Education (India)Private Limited, 2013
2. Shigley, J. E. and Mischke, C. R.“Mechanical Engineering Design ” Tata McGraw Hill, 2006 Mahadevan, “Design Data Book”, CBS Publication & Publishers, 2011.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-302 **L C**

Paper Title: Production Management **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT-I

Introduction - Production and productivity, Multi Factor productivity, Classical view of Production management, Production structure.

Capacity Planning, Plant Location and Plant Layout – Introduction, Need for selecting a suitable location, Location Factors, Quantitative Method, Principles of Plant layout, Types of Layout **–** Product, Process, Fixes Position, Cellular Layout

[10 Hrs]

UNIT-II

Process and Product Life Cycle, Scheduling and control of Production processes.

Demand Forecasting-Need for demand forecasting, Techniques of forecasting, Time series analysis, Least Square Method, Moving Average, Exponential Method and Qualitative Techniques.

Method Study- Introduction, Objectives Steps, Micromotion Study, Cycle graph and chronocycle graph, Therblings and SIMO charts.

Work Study – Objectives, Different Techniques, Standard Time, Allowances, Time study Numerical, Performance Rating, Work sampling.

[10 Hrs]

UNIT –III

Inventory Control - Introduction, Reasons for Holding Inventories, Relevant Costs of Inventories, EOQ models, Quantity Discount Models, Safety Stock, Inventory control system, Selective Control of Inventory ABC analysis , VED analysis.

Production Cost Concepts – Introduction, Cost of Production, Classification and analysis of Cost, Break even analysis, Make and Buy.

Material Requirement Planning **–** Introduction, MRP objectives, Functions served by MRP

Production Planning and Control, Supply chain and Logistics Management.

[10 Hrs]

UNIT IV

Industrial Maintenance – Concepts of Maintainence, Organisation for Maintenance department, Types of Maintenance-Preventive, Breakdown and Corrective Maintenance, Failure Analysis, Maintenance Performance, Replacement policies of machines.

[10 Hrs]

Text Books:

1) Martinich, J.S., Production and Operations Management: An Applied Modern Approach", John Wiley and Sons, New Delhi, 2008.

2) Richard B. Chase, Nicholas J.A., Jacobs, F.R., "Production and Operation Management", Tata McGraw Hill, New Delhi, 1998.

References Books:

1) Paneerselvam, R., "Production and Operations Management", Prentice Hall India, 2012.
2) Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1985.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 303 **L C**

Paper Title: Manufacturing Technology **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - I

Introduction: Classification of machine tools based on application and production rate: General purpose, Single purpose and Special purpose machines, Classification based on- Types of machine tools and the processes, Generating and forming

Single Point cutting tool nomenclature Elements of tool geometry, cutting tool & its Materials and applications.

Lathe - Centre lathe, facing lathe, gap-bed lathe, capstan and turret lathe, CNC lathe, major difference between CNC lathe and conventional lathe. Major sub-Assemblies- Bed, headstock, tail stock, carriage consisting of saddle, cross-slide, compound Slide tool post and apron, Work holding devices: self centering three jaw chuck,Independent, four jaw chuck, collets, face plates, dog carriers, centers and mandrels.

[10 Hrs]

UNIT - II

Lathe contd... Driving mechanisms, apron mechanism, thread cutting mechanism and Calculations, features of half-nut engagement – disengagement, indexing dial mechanism.

Operations on lathe: taper turning, related calculations, thread cutting, facing, under-Cutting,Drilling, boring, parting-off, knurling, is chamfering.

Reciprocating Type Machine Tools- Shaper, Planer and Slotter, Constructional features, Basic Machines and kinematics and related calculations **[10 Hrs]**

UNIT - III

Drilling Machines: Classification and uses, Constructional features of bench drilling machine, radial drilling machine, multi-spindle drilling machine, feed mechanism, work Holding devices, Tool – holding devices. Different drilling operations: Drilling, reaming, Counter boring and countersinking etc., estimation of drilling time.

Milling Machines: Types of general purpose milling machines- horizontal, vertical and Universal. Types of milling cutters and their applications, different milling operations, work holding devices- vice, clamps, chucks, dividing head and its use, simple, compound and differential indexing. Indexing calculations and machining time calculations. Introduction to machining centers **[10 Hrs]**

UNIT – IV

Grinding Machines: Different types of grinding machines: cylindrical, surface and centre- Less grinding machines, basic constructional features and mechanisms, specifications,Wheel Dressing and Wheel Truing Specifications of grinding wheel,

Mechanics of grinding, effect of grinding conditions and type of grinding on wheel behavior, equivalent diameter of grinding wheel Introduction to honing, lapping and super-finishing processes.
Case Study on a relevant Manufacturing Technology

[10 Hrs]

Text Books:

1. P.N. Rao, "Manufacturing Technology: Metal Cutting & Machine Tools", Tata McGraw Hill, Delhi, 2004.
2. Serope Kalpakjian and Steven Schmid, "Manufacturing Engineering & Technology",(7th Edition) , Pearson Education 2013

Reference Book

1. P.C. Sharma, "A Text Book of Production. Engineering", S. Chand, New Delhi, 2004.
2. Bawa H.S., "Workshop Technology", Vol.2, Tata McGraw Hill, 2004.
3. Juneja & Shekhon, "Fundamental of Metal Cutting", New Age Publications
4. S.F. Krar Stevan F. and Check A.F., "Technology of M/C Tools", McGraw Hill Book Co.,1986.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-304 **L C**
Paper Title: Computer Aided Design (CAD) **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT-I

Introduction:

Introduction to CAD, Need and scope of CAD, Types of CAD systems, Benefits of CAD, Hardware and Software requirement of CAD, Integrated CAD/CAM systems, Engineering Applications, input and output devices used in CAD systems.

Computer Graphics

Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm.

[10 Hrs]

UNIT-II

Geometric Transformations:

World/device Coordinate Representation, Windowing and clipping, 2D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation

Curves:

Curves representation, Properties of curve design and representation, Interpolation vs approximation, parametric representation of analytic curves,

[10 Hrs]

UNIT-III

Parametric continuity conditions, parametric representation of synthetic curves-Hermite cubic splines, Bezier curves, curve manipulations, modelling of surfaces.

3D Graphics:

Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; half spaces, Boundary representation,

Constructive solid geometry, Sweep representation, Colour models, Application commands for AutoCAD, Pro-E, Solidworks and ANSYS softwares.

[10 Hrs]

UNIT-IV

Finite Element Method:

Introduction, Principles of Finite elements modeling, Finite Element Analysis, Solution of 1D and 2D structural and solid mechanics problems - linear static analysis. Introduction of Dynamic analysis, Case studies using FEM for design of simple geometries.

[10 Hrs]

Text Books:

1. Ibrahim Zeid and Sivasubramanian, R., CAD/CAM Theory and Practice, Tata McGraw Hill Publications, New Delhi, 2009
2. N.K. Chougule , CAD/ CAM/CAE, Scitech Publications (India) Pvt., New Delhi, 2009

Reference Books:

1. Sham Tikoo, Understanding AutoCAD 2010, Tata McGraw Hill Book Company, New Delhi,
2. J.N. Reddy, An Introduction to Finite Element Method, Tata McGraw Hill Book Company, New Delhi, 2009.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA 305 **L C**

Paper Title: Microcontroller & Its Application **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

Unit-I

Introduction to Microprocessor and Microcontroller:

Introduction to microprocessors, classification, basic architecture and its applications. Introduction to microcontrollers, classification, basic architecture and its applications. Difference between microprocessors and microcontrollers. **Programming:** Various programming languages to program Microprocessor and Microcontroller, High-level language, assembly language, machine language. **Tools:** Integrated development environment for application development, assemblers,compilers.

[10 Hrs]

Unit-II

8085 microprocessor:

Introduction to 8085 microprocessor: Architecture, pin diagram, instruction set, and classification of instruction set, instruction and data format, timing diagram of instructions, basic concept of programming, addressing modes of 8085 microprocessors, 8086 architecture, BIU and EU, registers, pin diagram and Instruction set of 8086. **[10 Hrs]**

Unit-III

8051 Microcontroller:

8051 architecture, pin diagram, instruction set and classification of instruction set, instruction and data format, timing diagram of instructions, basic concept of programming, addressing modes. I/O Ports, SFRs, Timer, Counters, UART, SPI, I2C, External interrupt handling, Watch dog timer.

[10 Hrs]

Unit-IV

8051 Interfacing and Applications: Interfacing Keyboard and Display Devices: LED, 7-segment LED display, LCD, ADC, DAC, DC motor, Stepper motor. **Advanced Microcontrollers:** Case study of AVR, ATMEGA, PIC and ARM microcontrollers.

[10 Hrs]

TEXT BOOKS:

1. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", Prentice Hall, 5th Edition, 2002.
2. Douglas V. Hall, "Microprocessors and interfacing: programming and hardware", McGraw-Hill, 2nd Edition, 1990.
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems, Using assembly and C", Pearson, Second Edition, 2008.

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", TMH, 2006.
2. K Ayala, "The 8051 Microcontroller", Thomson Delmar Learning, 3RD Edition, 2007.
3. H.W Huang, "PIC Microcontroller", Delmar CENGAGE Learning, 2007.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-306 **L C**

Paper Title: Heat Transfer **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT-I

Introduction to Heat transfer: Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzman's Law, combined modes of heat transfer, thermal diffusivity, and overall heat transfer coefficient, thermal conductivity of solids, liquids and gases, factors influencing conductivity, measurement.

Conduction: General 3-D differential equation of conduction, one dimensional steady state conduction, linear heat flow through a plane and composite wall, tube and sphere, critical thickness of insulation, effect of variable thermal conductivity, conduction with heat generation.

[**10 Hrs]**

UNIT-II

Conduction (continued): Heat transfer from extended surfaces, fin performances, transient heat conduction-lumped system analysis.

Forced Convection: Introduction, laminar boundary layer equations for internal and external flows, laminar forced convention on a flat plate and in a tube, Reynolds-Colburn analogy, Dimensional analysis and physical significance of the dimensionless parameters.

[**10 Hrs]**

UNIT –III

Natural Convection: Dimensional analysis of natural convection, empirical relationship for natural convection.

Boiling and Condensation: Convection with phase change, description of condensing flow, theoretical model of condensing flow, regimes of boiling heat transfer, empirical relationships for convection with phase change.

Heat Exchangers: Different types of heat exchangers, design of heat exchangers, LMTD and NTU methods, fouling factor and correction factor, Introduction to compact and plate heat exchangers.

[**10 Hrs]**

UNIT IV

Thermal Radiation: Introduction, absorption and reflection of radiant energy, emission, radiosity and irradiation, black and non black bodies, Kirchhoff's law, intensity of radiation, radiation exchange between black surface, geometric configuration factor, grey body radiation exchange between surfaces of unit configuration factors, radiation shields, electrical analogy to simple problems.

[**10 Hrs]**

Text Books:

1. R. C. Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", New Age International Publishers,
2. Mahesh M. Rathore, "Engineering Heat and Mass Transfer", Laxmi Publications, 3 edition, 2015.
3. D. S. Kumar, "Heat and Mass Transfer" S. K. Kataria & Sons, 2009.

References Books :

1 P Frank, Incropera and David P. DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley &Sons, 2011.

2 J. P. Holman, "Heat and Mass Transfer", TMH, 2008.

3 Cengel & Yunus, "Heat transfer: A practical approach", TMH, 2007

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-307 **L C**

Paper Title: Thermal Engineering-II **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT 1

Combustion of Fuels – Combustion reactions, First law applied to a combustion reaction, Mass balance, Energy balance, Stoichiometric air-fuel ratio, Actual air-fuel ratio from the analysis of products, Enthalpy of formation, Heat of combustion, Heating values - Enthalpy of combustion, Adiabatic flame temperature.

Reciprocating Air Compressor - Single stage compressor: Equation for work, Isothermal, adiabatic and polytropic compression, Isothermal and adiabatic efficiency, Volumetric efficiency, Effect of clearance, Multi-stage compression with inter cooling.

[10 Hrs]

UNIT- 2

Centrifugal Air Compressor – Constructional details, Working principle, Static and total heads, Velocity diagrams and theory of operation, Work done by impeller, Losses and isentropic efficiency of compressor, Prewhirl, Surging and choking of compressors.

Review of Fundamentals of IC Engines - Classification, two stroke and four stroke engines, SI and CI engines, Theoretical and actual indicator diagrams, Valve and port timing diagram.

[10 Hrs]

UNIT- 3

IC Engine - Components of IC Engine and their functions, Battery ignition system for SI engines, Fuel Injection system for CI Engines, Cooling and lubrication systems for IC engines.

Combustion in IC Engines - Combustion phenomenon in S.I. Engine, Pre-ignition, Auto-ignition and detonation in SI Engines, Factors affecting detonation, Rating of SI Engine fuels, Combustion phenomenon in C.I. Engines, Delay period, Factors influencing delay period, Diesel knock, Rating of CI Engine fuels.

[10 Hrs]

UNIT- 4

Gas Turbines - Open and closed cycles for gas turbine, Analysis of basic closed cycle for gas turbine, Thermal efficiency and specific work output, Optimum pressure ratio for maximum cycle output and for maximum cycle efficiency, Effects of regeneration, Re-heating and inter-cooling on thermal efficiency and work output, Isentropic efficiencies of turbine and compressor, Advantages and disadvantages of gas turbines, Application of gas turbines.

Jet Propulsion - Different types– screw propeller, turbo-jet, turbo-prop, ram jet and pulse jet engines; Operation of rocket engine.

[10 Hrs]

Text Books:

1. P. K. Nag, “Engineering Thermodynamics”, Tata McGraw-Hill Publishing Company Limited, New Delhi, India, 2011
2. P. L. Ballaney, “Thermal Engineering”, Khanna Publishers, Delhi, India.,2012
3. Mathur and Sharma, “Internal Combustion Engines”, Dhanpat Rai Publications, 2003.

Reference Books:

1 Van Wylen and Sonntag, “Fundamentals of Classical Thermodynamics”, John Wiley & Sons Inc., 2002.

2 V. Ganesan, “Internal Combustion Engines”, Tata McGraw-Hill Publishing Company Limited, New Delhi, India, 2004.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 308 **L C**

Paper Title: Metal Cutting & Tool Design **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - 1

Introduction: Definition of feed, depth of cut and cutting speed, Concept of specific cutting energy in metal cutting ,Numerical based on calculation of machining time on lathe, drilling machine, shaper, milling machine and grinding machines considering specific cutting energy of materials.

Theory of Metal Cutting: Orthogonal and oblique cutting, types of chips, Factors affecting The chip formation, Cutting forces in orthogonal cutting and their measurement, Merchant circle and derivation of relationships between the cutting forces, chip thickness ratio, shear angle, stress and strain in the chip, work done and power required in metal cutting, plowing forces and the size effect', apparent mean shear strength of work material

[**10 Hrs]**

UNIT - 2

Ernst Merchant Theory: - its assumptions and modifications. Relationship between Cutting Velocity, shear velocity and chip flow velocity. Mechanism of friction at chip-tool interface.Numerical based on metal-cutting.

Machinability: Machinability and its criteria, forms of tool-wear in metal cutting, tool-life and its criteria, effect of different cutting parameters on tool-life. Economics of machining and numerical. Cutting fluids, their physical action and applications.

[**10 Hrs]**

UNIT -3

Press Tools – Types and Classification of Press Tools, Press Tool Construction, Design of Blanking and Piercing Die

Jigs & Fixtures: Important considerations in jigs and fixture design, Main principles of Designing Of jigs & fixtures, elements of Jigs and fixtures. Different devices and methods of Locations. Different types of clamps used in jigs & fixtures.

[**10 Hrs]**

UNIT – 4

Cutting Tool Design: General considerations, single point tool geometry. Principles of Differen cutting tool materials and their important characteristics. Geometry of a drill. Basic principles of design of a single point and multiple point tools i.e. broaches and twist drill.

Heat generation in Metal cutting: Heat generation and temperature distribution in metal Cutting. Measuring methods of Temperature in metal cutting

Case Study [**10 Hrs]**

Text Books:

1. Dr. P.C. Pandey & C.K. Singh, “Production Engg. Sciences”, Standard Publisher,2009. Distributors.
2. Dr. B.J. Ranganath, “Metal Cutting & Tool Design” Vikas Publishing House Pvt. Ltd.,2008
3.Ghosh and Mallick “Manufacturing Science’’2nd Edition, East West Press Pvt Ltd,2010

Reference Books:

1. Geoffrey Boothroyd, “Fundamentals of Metal Machining & Machine Tools”, Tata McGraw Hill Kogakusha Ltd.
2. P.N. Rao, “Manufacturing Technology”, Tata McGraw Hill Publication Lt.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 309 **L C**

PaperTitle: Automation in Industrial Manufacturing **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT 1

Production systems, concepts and history of Industrial Automation , building blocks, Types of Industrial Automation systems, Advantages and Limitations of Automation, Automation and Product development strategy, Implications of automation on Employee and Employer.

[10 Hrs]

UNIT 2

Automation Production Economics - Introduction, Productivity and society, Manufacturing Costs and Automated systems, Break even analysis, Automation production system elements, Advanced Automation functions, Levels of Industrial Automation

[10 Hrs]

UNIT 3

Automated Material Movement, Types of material movement systems through conveyors, robots and AGV, Automated storage and retrieval system, Artificial Intelligence and expert system in automation, Applications of Artificial Intelligence in Manufacturing Automation

[10 Hrs]

UNIT 4

Automated Assembly Systems – Classification of Transfer lines, Automated flow lines, Transfer mechanisms ,Layout design and assembly lines, Line Balancing concepts and few problems , limitations on the work stations in a line, Industry based Case Study

[10 Hrs]

Text Books:

1. Mikell P.Grover, “Automation, Production Systems and Computer Integrated Manufacturing”, Pearson Education Asia, New Delhi, 2007
2. Asfahl,C.R., “Robots and manufacturing Automation”, John Wiley and Sons New York, 1992.

References Books:

1. Jain, K.C. and Jain, S., “Principles of Automation and Advanced Manufacturing Systems”
2. Viswanadham, N. and Narahari, Y., “Performance Modeling of Automated Manufacturing Syetms”, Prentice Hall India, New Delhi, 1992.

Paper Code: BMA-310 **L** **C**
Paper Title: Automobile Engineering **4** **4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT - I

Introduction to I.C. engine: Introduction to automotive vehicle, classification of internal combustion engine, constructional details of C.I. and S.I. engines, working of 2-stroke and 4-stroke engines, crank shafts, connecting rods, pistons, piston pins, piston rings, valves mechanisms, manifolds, air cleaners, mufflers, radiators and oil filters, performance characteristics of internal combustion engines.

[10 Hrs]

UNIT II

Transmission systems: Transmission requirements, general arrangement of clutch, gear box and rear axle transmission, general arrangement of rear engines and vehicles with live axles. General arrangement of Dead axle and axle-less transmission, De-Dion drive, arrangement of front engine and front wheel drives, four wheel drive transmission, principle of friction clutch, single and multiplate clutches, centrifugal clutch, friction materials.

[10 Hrs]

UNIT III

Transmission: Description and working of manually operated gearboxes like sliding mesh, constant mesh, synchromesh, semi-automatic transmission, Wilson Gear Box, analysis of differentials, live axles, construction and working, requirement of overdrive, steering geometry, Ackermann steering, center point steering, power steering.

[10 Hrs]

UNIT IV

Suspension: Independent suspension, perpendicular arm type, parallel arm type, dead axle suspension, live axle suspension, air suspension, shock absorbers, wheel and tyre requirements, tyre dynamics, mechanical and hydraulic brakes, shoe arrangements and analysis, disc brakes.

[10 Hrs]

Text Books:

1. D. Crolla, D. E. Foster, T. Kobayashi, N. Vaughan, “Automobile Engineering”, Wiley (2014).
2. Srinivasan, “Automotive Engines”, Tata McGraw Hill (2013).

Reference Books:

1. K.K. Jain & R.B. Asthana, “Automobile Engineering”, Tata McGraw Hill (2013).
2. R.K.Rajput, “Automobile Engineering”, Kataria Publication (2014).

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BAS 311 **L C**

Paper Title: Human Values and Professional Ethics **3 3**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT – I
Human Values

Morals, Values and Ethics, Integrity, Work Ethic, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Valuing Time, Co-operation, Commitment, Empathy, Self-Confidence, Character, Spirituality. Indian values (on the conceptual framework of Vedas): Purusharth, Niskama karma, Religion and Human Values, Towards a World Religion, Ethical Living and Harmony in Life. **[8 Hrs]**

UNIT – II

Ethics and Engineering Profession

Profession and Professionalism, Ethical Theories: Kohlberg's Theory, Gilligan's Theory, Feminist Consequentialism, Moral Dilemmas, Types of Enquiry, Uses of Ethical Theories, Engineering Profession, Engineering Professionals- Training, Skill Set, Life Skills, Engineering Ethics: Making Senses and Issues, Ethical Obligations of Engineers, Ethical Codes for Engineers.

[7 Hrs]

UNIT - III

Engineering as a Social Experimentation, Safety Responsibility and Rights:

Engineering as experimentation, Engineers as responsible Experimenters, Concept of Safety and Risk, Engineer's Responsibility for Safety, Risk – Benefit Analysis, Case Studies: The challenger case study, The Three Mile Island, Fukushima Nuclear Disaster, Bhopal Gas Tragedy. Disaster Management, Professional Rights, Employee Rights, Intellectual Property Rights (IPRs), Human Rights and Human Responsibilities. Major Ethical Issues. **[8 Hrs]**

UNIT – IV

Ethics and Global Issues

Ethics in Global Scenario, Multinational corporations, Environmental ethics, computer ethics, Business Ethics. Corporate Social responsibility, Weapons Development, Research Ethics.

[7 Hrs]

Text Books

1. Govindarajan M., Natarajan S., Senthil Kumar V. S., "Engineering Ethics", Prentice Hall, New Delhi, 2004.
2. Subramaniam R., "Professional Ethics", Oxford University Press, New Delhi, 2013.
3. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw-Hill, New York 1996.
4. RR Gaur, R Sangal, GP Bagaria, "A Foundation Course in Human values and Professional Ethics", Excel Books Pvt. Ltd, New Delhi 2009.
5. A.N.Tripathi, "Human Values", New Age International Publishers, New Delhi, 2nd Edition, 2004.

Reference Books

1. B.P. Banerjee, "Foundation of Ethics and Management", Excel Books, 2005.
2. Fleddermann, Charles D., "Engineering Ethics", Pearson Education. 2004.
3. Harris, Charles E., Protchard, Michael S. And Rabins, Michael, J., Wadsworth, "Engineering Ethics- Concepts and Cases", Thompson Learning, 2000
4. Boatright, John R., "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
5. Swami Ranganathananda, "Universal Message of the Bhagavad Gita: An exposition of the Gita in the light of modern thought and modern needs", Vol. I – III, Advaita Ashrama (Publication Department), Kolkata. 2000.
6. Peter Singer, "Practical Ethics", Oxford University Press, 1993.

Paper Code: BAS 312 **L C**

Paper Title: Engineering Economics **3 3**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT–I

Introduction: Meaning Nature and Significance of Economics, Economic Process, Micro Economics and Macro Economics. **Economy:** Definition, Types, Central Problems, Economic Development Indicators, Sustainable Development, a Glimpse of Indian Economy, Meaning of Science, Engineering and Technology and their relation with Economics, Role of Engineers in Economic Development. **[7 Hrs]**

UNIT–II

Demand Analysis: Meaning and Law of Demand, Demand Elasticity, Types and Uses, Demand Forecasting: Meaning and Uses, Supply Analysis, Production Function, Cost and Revenue Concepts, Producer's Equilibrium, Law of variable Proportion, Law of Returns to Scale.

Market: Meaning of Market, **Basic Features of Different markets:** Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition, and Price Determination under different Market Conditions. **[8 Hrs]**

UNIT–III

Money and Banking: Money, Meaning, Types and Functions, Bank Definition, Types and Functions, Credit Creation, Role of Central Bank- RBI, Introduction to Indian Financial system. **Inflation:** Meaning, Types, Causes and Measures to Control Inflation, Monetary Policy, Fiscal Policy, Business Cycle, **National Income Concepts:** NNP_{FC} and GDP_{MP}.

[7 Hrs]

UNIT–IV

Financial Economics: Concepts of Time Value of Money, Interest, Cost, Annuity. **Project Evaluation Methods:** NPV, IRR, PI. **Introduction to Financial Management:** Role and Functions, Financial Accounting. **Uses of Important Financial Statements:** Statement of Profit and Loss, Balance Sheet, Cash flow Statement. **Decision making Models (No numerical Applications):** Linear Programming, Input Output Model, Econometric Models. **Introduction to Process Improvement Techniques:** TQM, Six Sigma, Benchmarking. **[8 Hrs]**

TEXT BOOKS:

1. Riggs, Bedworth and Randhawa, "Engineering Economics", McGraw Hill Education India. 1997.
2. K.K. Dewett, "Modern Economic Theory" S.Chand, New Delhi. 2005.
3. Seema Singh, "Economics for Engineering Students", I.K. International Publishing House, New Delhi. 2009.
4. D.N. Kakkar, "Managerial Economics for Engineering", New Age International Publication. 2014.
5. D.N. Dwivedi, "Managerial Economics" Vikas Publishing House. New Delhi. 2008.

REFERENCE BOOKS:

1. C. T. Horngreen, "Cost Accounting ", Pearson Education India. 2012.
2. R. R. Paul, "Money banking and International Trade", Kalyani Publisher, New-Delhi. 2008.
3. S.C. Sharma and T.R. Banga, "Industrial Organization and Engineering Economics". Khanna Pub. 1999.
4. S.N. Maheswari, "Financial and Management Accounting" Sultan Chand & Sons. 2010.
5. Mishra & Puri, "Indian Economy", Himalaya Publishing House, New Delhi. 2000.

Paper Code: BMA- 401 **L C**
Paper Title: Computer Aided Manufacturing **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT -I

Introduction: Overview of automation in industry, type of production: continuous, mass, batch and job shop and automation achievements therein, product cycle and CAD/CAM influence, CAD/CAM on product cycle, automation strategies, mathematical model for employing and justifying CAD/CAM in different areas of operation.

Programmed Automation and Numerical Control: Program controlled machine tools, punched card and punched tape machine tools, numerical control and its basics, axis designation, NC motion control systems: point-to-point, straight-cut and continuous path control systems, applications of NC in metal-cutting and non-metal cutting areas. **(10 Hrs)**

UNIT - II

Computer Numerical Control: Block diagrams of CNC operations, nomenclature, types and features of CNC machine tools, elements of CNC machines and systems, machine control unit, position control and its significance, engineering analysis of NC positioning systems, open loop and closed loop systems, precision in NC positioning systems: control resolution, accuracy and repeatability, Actuators: DC servomotor, AC servomotor, stepper motor. Transducers and feedback elements: resolvers, encoders. **(10 Hrs)**

UNIT - III

Part Programming: Process planning and flow chart for part programming, tooling systems, tool nomenclature and tool geometries of modern indexable carbide tools, tool pre-setting & modular tooling, selection of tools based on machining capacity, accuracy and surface finish, elements of programming for turning and milling, composition of a part program. Preparatory codes G, Miscellaneous functions M. Interpolation, tool compensations, cycles for simplifying programming, part programming for typical components on turning machines and machining centres, computer aided programming. **(10 Hrs)**

UNIT - IV

Modern CNC Machines: CNC lathes, turning centres, machining centres, automatic pallet changers, automatic tool changers, direct numerical control and applications, CNC machine design features, supporting structures, guide ways, ball screw-and-nut mechanisms, machine spindles, concept of rigidity and relation with accuracy.

Computer Aided Inspection: Coordinate measuring machines and their applications, Introduction to machine vision and applications. **(10 Hrs)**

Text Books:

1. Ibrahim Zeid, CAD/CAM Theory and Practice, McGraw-Hill Publications, 1991.
2. S.K. Sinha, CNC Programming, Galgotia Publications, 2003.
3. P.N Rao, Computer Aided Manufacturing, Mc-Graw Hill Publications, 1998.

Reference Books:

1. Mikell P. Groover, Emory W. Zimmers, CAD/CAM, Pearson Education, 2001.
2. P.N. Rao.; CAD/CAM Principles and Applications, Tata McGraw Hill, 2003.
3. Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, Pearson Education, 2010.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-403 **L C**
Paper Title: Mechatronics **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Pneumatic & Hydraulic Actuation Systems: Fluid power systems, hydraulic systems, Pneumatic systems, hydraulic pumps and Pressure Control Valves and regulation, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems.

Electrical Actuation Systems: Switching Devices, Mechanical Switches – SPST, SPDT, DPDT, keypads; Relays, Diodes, Thyristors, Transistors, Solenoid Operated Hydraulic and Pneumatic Valves, Electro-Pneumatic Sequencing Problems. Control of DC & AC Motors, Stepper Motors and Servo Motors. **(10 Hrs)**

UNIT – II

Digital Electronics and Systems: Gates and Integrated Circuits Like 7408, 7402, Karnaugh Maps, Application of Logic Gates as: Parity Generators, Digital Comparators, BCD to Decimal Decoders, Flip Flops and applications, sequential logic, Introduction to Microprocessor and microcontrollers, introduction to assembly language programming for Intel 8051 micro-controller.

Sensors, Transducers and Application: Performance Terminology, Static and Dynamic Characteristics, Displacement, Position and Proximity Sensors, Potentiometer Sensors, Strain Gauge Element, LVDT, Optical Encoders, Pneumatic Sensors, Hall Effect Sensors, Tachogenerators, Strain Gauge Load Cell, Thermostats, Photo Darlington. Interfacing Sensors in Mechatronic System. **(10Hrs)**

UNIT - III

System Interfacing and Data Acquisition:

Interfacing requirements, Buffers, Darlington Pair, Handshaking, Serial and Parallel Port Interfacing, Peripheral Interface Adapters, Analog to Digital Conversion, Digital to Analog Conversion, Sample and Hold Amplifiers, Multiplexers, Time Division Multiplexing, Digital Signal Processing, Pulse Modulation.

Introduction to Signal Conditioning: Signal Conditioning Processes, Inverting Amplifiers, Non Inverting Amplifiers, Summing, Integrating, Differential, Logarithmic Amplifiers, Comparators, Amplifiers Error, Filtering, wheatstone Bridge, Temperature Compensation, Thermocouple Compensation. **(10 Hrs)**

UNIT - IV

Programmable Logic Controllers:

Programmable logic controllers (PLC) Structure, Input / Output Processing, principles of operation, PLC versus computer, Programming Languages, programming using Ladder Diagrams, Logic Functions, Latching, Sequencing, Timers, Internal Relays And Counters, Shift Registers, Master and Jump Controls, Jumps, Data Movement, Code Conversion, Data handling and manipulation, selecting a PLC, ladder programming and cases - Auto-Focus Camera, Printer, Domestic Washing Machine, Optical Mark Reader, Bar Code Reader and Pick and Place robot Arm.

System Modelling: Mathematical Models; Mechanical, Electrical, Hydraulic and Thermal Systems; Modeling of dynamic systems.

(10Hrs)

Text Books:

1. W. Bolton, Mechatronics – Electronic Control Systems in Mechanical & Electrical Engineering, Pearson Education Ltd., 2003.
2. Nitaigour Premch and Mahalik, Mechatronics Principles, Concepts & Application, Tata McGraw Hill Publishing Co. Ltd., 2003.
3. K. P. Ramachandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics - Integrated Mechanical Electronic Systems, Wiley, 2008.

Reference Books:

1. 1 David g Alciatore, Michael B Histand, Introduction to Mechatronics an Measurement Systems, Mc Graw Hill Education.
2. A Smaili, F Mrad, "Mechatronics – Integrated Technologies for Intelligent Machines, Oxford Higher Education.
3. Clarence W. de Silva, Mechatronics: A Foundation Course, CRC Press, June 4, 2010.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-405 **L C**
Paper Title: Refrigeration & Air-Conditioning **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Introduction to Refrigeration: Definition, Refrigerator, Heat Pump, COP, Unit of Refrigeration. Reversed Carnot Cycle, Classification of refrigeration systems, Numerical problems.

Air-Refrigeration cycles and Systems: Bell Coleman Cycle, Necessity of cooling the aeroplane, Refrigeration systems for aeroplane – Simple cooling and simple evaporative type, Bootstrap cooling and boot strap evaporative type, Regenerative type, reduced ambient type, Numerical problems.

(10 Hrs)

UNIT- II

Simple Vapour Compression Refrigeration System: Simple Saturated Cycle, its working, representation on p-h, T-s and p-v diagrams and analysis, Wet and Dry Compression, Effect of foreign materials on the performance of the cycle, Methods of undercooling and Effect, sources of superheating and effects, Preddure losses and their effects on the performance of the cycle, Advantages and disadvantages of Vapour Compression Refrigeration System over air refrigeration system, Numerical problems.

Vapour Absorption Refrigeration System: Simple vapour absorption Refrigeration system, Practical vapour absorption system, Electrolux Refrigerator, COP of an ideal vapour absorption system, Advantages and disadvantages over vapour compression refrigeration system, Properties of ideal refrigerant, absorbant and refrigerant-absorbant combinations used in absorption system.

Refrigerants: Classification of refrigerants, Required properties of an ideal refrigerant, Designation of refrigerants, Commonly used refrigerants.

(10 Hrs)

UNIT- III

Steam Jet Refrigeration System: Working and analysis, nozzle efficiency, entrainment efficiency, diffuser efficiency, mass of motive steam required, COP, advantages and disadvantages. Numerical problems.

Psychometric: Definitions of psychometric terms and properties, Dalton's Law of Partial Pressures, Psychometric relations, psychometric chart, psychometric processes and their representation on psychometric chart for calculations, Numerical problems.

(10 Hrs)

UNIT- IV

Comfort Air Conditioning: Requirements of comfort air conditioning, Concept of Effective Temperature, Comfort chart and comfort zone, Factors governing optimum effective temperature.

Air conditioning systems: Summer air conditioning system, winter air conditioning system, year-round air conditioning system.

Load Estimation: Heating/cooling load components, infiltration, air changes, load calculation.

(10 Hrs)

Text Books:

1. P.L. Ballaney, Refrigeration and Air Conditioning, Khanna publishers, 2009.
2. C P Arora, Refrigeration and Air Conditioning, Mc-Graw Hill, 2008.
3. Arora and Domkundwar, A Course in Refrigeration and Air Conditioning, Dhanpat Rai Publications, 7th edition, 2003.
4. Manohar Prasad, Refrigeration and Air conditioning, New Age Publication, 2nd edition, 2015.

Reference Books:

1. J. Roy Dossat, Principles of Refrigeration, Pearson Education Asia Publication, 4th edition 2002.
2. Ananthanarayan, Basic Refrigeration & Air Conditioning, Mc-Graw Hill, 2000.
3. Pita Edward G, Air Conditioning Principles and Systems, Prentice Hall, 4th edition, 2001.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 407 **L C**
Paper Title: Non-Conventional Energy Resources **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Introduction to various sources of energy; Solar thermal, Photovoltaic, hydro power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy.

Solar Radiations:

Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

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, thermal analysis of solar collectors. Solar thermal energy storage, different systems and their applications, water heating, space heating & cooling, solar distillation, solar pumping, solar cooking, greenhouses, solar power plants. **(10 Hrs)**

UNIT-II

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.

Biogas:

Photosynthesis, bio gas production aerobic and anaerobic bio-conversion process, properties of biogas (composition and calorific value), storage and enrichment, community biogas plants, problems involved in bio gas production, bio gas applications, Biomass: generation, characterization, use as energy source, biomass conversion techniques, biomass cogeneration, fuel properties, biomass resource development in India. **(10 Hrs)**

UNIT-III

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, selection of a wind mill, wind energy farms, economic issues, and recent development.

Tidal and Wave Power:
Tides and waves as sources of energy, fundamentals of tidal power, use of tidal energy, limitations of tidal energy conversion systems. **(10 Hrs)**

UNIT-IV
Geothermal Energy:
Structure of earth's interior, geothermal sites, geothermal resources, hot springs, steam system, types of geothermal station with schematic representation, site selection for geothermal power plants, 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. **(10 Hrs)**

Text Books:

1. G.D Rai, Non-Conventional Energy Sources, Khanna Publishers, 2011.
2. G.N. Tiwari and M.K. Ghosal, Renewable Energy Resources: Basic Principles and Applications, Alpha Science International, 2005.
3. John Twideu and Tony Weir, "Renewal Energy Resources" Routledge Publishers, 3rd edition, 2015.

Reference Books:

1. D.P. Kothari, K.C. Singal and Rakesh Ranjan, Renewable Energy Resources and Emerging Technologies, Prentice Hall India Pvt. Ltd, 2011.
2. Ashok V. Desai, Nonconventional Energy, New Age International Publishers Ltd, 1990.
3. Manfred Kleemann, Michael Meliss, Ranjan Kaul and Kaushik Ghosh, Renewable Energy Sources and Conversion Technology, Tata Mc Graw Hill, 1990.

Internet Sources:
www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 409 **L C**
Paper Title: Mechanical Vibration **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Overview of the course, practical applications and research trends, Harmonic and periodic motions, vibration terminology, Vibration model, Equation of motion-Natural Frequency, Energy method, Rayleigh method, **(10 Hrs)**

UNIT-II

Principle of virtual work, Damping models, Viscously damped free vibration, oscillatory, non-oscillatory and critically damped motions, Logarithmic decrement, Experimental determination of damping coefficient, Forced harmonic vibration, Magnification factor, Rotor unbalance. **(10 Hrs)**

UNIT-III

Transmissibility, Vibration Isolation, Equivalent viscous damping, Sharpness of resonance, Generalized and Principal coordinates, derivation of equations of motion, Lagrange's equation, Coordinate coupling, Forced Harmonic vibration, Tuned absorber, determination of mass ratio. **(10 Hrs)**

UNIT-IV

Derivation of equations of motion, influence coefficient method, Modal analysis: undamped, Modal analysis: damped, Properties of vibrating systems: flexibility and stiffness matrices, reciprocity theorem. **(10 Hrs)**

Text Books:

1. G.K. Groover, Mechanical Vibration, Nem Chand and Brothers, 8th edition, 2009.
2. William J. Palm, Mechanical Vibration, John Wiley & Sons, 2006.
3. DK Adhwarjee, Mechanical Vibration, Laxmi Publication, 2008.

Reference Books:

1. Thammaiah Gowda, D.V. Girish and T Jagadeesha, Mechanical Vibration, Mc-Graw Hill, 2012.
2. C. Sujatha, Vibration and Acoustic, Tata Mc-Graw Hill, 2009.
3. J.P Denhartong, Mechanical Vibration, Dover Publication, 1985.

Paper Code: BMA- 411 **L C**
Paper Title: Modeling and Simulation **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Introduction: A review of basic probability and statistics, random variables and their properties, Estimation of means variances and correlation. **(10 Hrs)**

UNIT -II

System Modeling: Concept of System and environment, Continuous and discrete systems, Linear and non-linear systems, Stochastic activities, Static and Dynamic models, Principles of modeling, Basic Simulation modeling, system modeling, Role of simulation in model evaluation and studies, advantages of simulation. **(10 Hrs)**

UNIT-III

Probability Concepts in Simulation: Stochastic variables, discrete and continuous probability functions, Random numbers, Generation of Random numbers, Variance reduction techniques, Determination of length of simulation runs.

System Simulation: Techniques of simulation, Monte Carlo method, Experimental nature of simulation, Numerical computation techniques, Continuous system models, Analog and Hybrid simulation, Feedback systems, Computers in simulation studies, Simulation software packages. **(10 Hrs)**

UNIT -IV

Simulation of Mechanical Systems: Building of Simulation models, Simulation of translational and rotational mechanical systems, Simulation of hydraulic systems.

Simulation of Manufacturing Systems: Simulation of waiting line systems, Job shop with material handling and Flexible manufacturing systems, Simulation software for manufacturing and Case studies. **(10 Hrs)**

Text Books:

1. Geoffrey Gordon, System Simulation, PHI Publication, 1977.
2. Aaverill M Law, Simulation Modeling & Analysis, Mc-Graw Hill, 2008.
3. W. Bolton, Mechatronics, Pearson Education (Singapore) Ltd., 2003.

Reference Books:

1. Robert E. Shannon, System Simulation: The Art and Science, Prentice Hall, 1975.

2. J. Schwarzenbach and K.F. Gill, System Modeling and Control, Butterworth-Heinemann, 1992.
3. John A. Sokolowski and Catherine M. Banks, Principles of Modeling and Simulation: A Multidisciplinary Approach, Wiley Publication, 2009.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-413 **L C**
Paper Title: Gas Dynamics **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT – I

Fundamentals of Compressible Flow: Continuity, momentum and energy equation, control volume, sonic velocity, Mach number and its significance, Mach waves, Mach cone and Mach angle, Von Karman rules of supersonic flow, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility. (**10 Hrs)**

UNIT- II

Isentropic Flow of an Ideal Gas with Variable Area: One dimensional isentropic flow in ducts of varying cross-section- nozzles and diffusers, mass flow rate in nozzles, critical properties and choking, area ratio as function of Mach number, Impulse function, effect of back pressure variation of convergent and convergent divergent nozzles, nondimensional mass flow rate in terms of pressure ratio, area ratio and Mach number, flow through diffusers, use of gas tables.

(10 Hrs)

UNIT-III

Flow in Constant Area Duct with Friction (Fanno Flow): Fanno curve and Fanno flow equations, solution of Fanno flow equations, variation of flow properties, variation of Mach no. with duct length, isothermal flow in constant area duct with friction, tables and charts for Fanno flow.

Flow in Constant Area Duct with Heat Transfer (Rayleigh Flow): Rayleigh curve and Rayleigh flow equations, variations of flow properties, maximum heat transfer, tables and charts for Rayleigh flow.

(**10 Hrs)**

UNIT- IV

Normal Shocks in One-Dimensional Flow: Occurrence of shocks, Analysis of normal shocks, Prandtl's equation, Rankine - Hugoniot equation and other normal shock relations, moving shocks. Oblique shocks and expansion waves: oblique shock relations, θ-β-M relations, shock polar, supersonic flow over a wedge, expansion waves, Prandtl-Meyer function, intersection of shocks, detached shocks, Mach deflection, shock expansion theory.

Wind Tunnel: Types of wind tunnels. Wind Tunnel Applications (**10 Hrs)**

Text Books:

1. S.M. Yahya, Dynamics of Compressible Flow, New Age Publishers, Delhi, 2009.
2. Anderson, Computational Fluid Dynamics, Mc-Graw Hill, 2012.
3. P. Balachandran, Fundamentals of Compressible Fluid Dynamics, PHI Learning, New Delhi, 2006.
4. Shapiro A.H., Dynamics and Thermodynamics of Compressible Fluid Flow, Ronald Press, 1954.

Reference Books:

1 Liepman and Roshk, Elements of Gas Dynamics, Dover Publications, 2002.

2 Zuckrow M.J. and Hoffman D.H., Gas Dynamics, Mc-Graw Hill, New York.

3 Rathakrishnan E., Gas dynamics, Prentice Hall India, New Delhi, 1995.

Internet Sources:

www.nptel.ac.in

http://ocw.mit.edu

Paper Code: BMA-415 **L C**

Paper Title: Flexible Manufacturing Systems **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Introduction to FMS - concepts, advantages, components of FMS and their integration in the data processing systems - examples of FMS installations. Distributed data processing in FMS – DBMS and their applications in CAD/CAM.

FMS Introduction and Description: Basic Components of FMS, Different Types of FMS, Types of FMS Layouts, Seeking Benefits on Flexibility, Advantages and Disadvantages of FMS Implementation, Area of Application of a FMS in Industry, Various Equipments and their Functions Required for an FMS, CIM Technology, Manufacturing Cell, JIT and KANBAN System, Objectives of JIT, Quality and Quantity Principles of JIT, Benefits of JIT,, Push vs. Pull System. **(10 Hrs)**

UNIT - II

Group Technology: Introduction, Definition, Visual Inspection, Part Classification and Coding, Production Flow Analysis, Benefits of Group Technology Affecting Many Areas of a Company, Machining Centers, Deburring and Wash Stations, Coordinate Measuring Machines, Types of CMM, Functions of CMM Computer, Operational Cycle Description, CMM Applications, CMM Advantages. **(10 Hrs)**

UNIT - III

Automated Material Movement and Storage System: Types of AGVS, Unit Load Carries: Low Built Vechile, Types A and C, Side Loading and High Lifting Types, Tugger Systems, Automated Guided Transport Carts, Analysis of AGV Systems, Automated Storage and Retrieval Systems (AS/RS), Unit Load AS/RS, Mini Load AS/RS, Carousel AS/RS, Advanced Automated Storage and Retrieval System, Analysis of AS/RS, Quantitative Analysis, Industrial Robots. **(10 Hrs)**

UNIT - IV

FMS Software Structure, Functions and Description: General Structure and Requirements, Activities and Functions, Requirements of FMS Software, Work—Order Processing, Data Distribution and Collection, System Diagnostics and Maintenance, Traffic Management and Control, Planning Scheduling and Simulation, Cutting Tools and Tool Management, Tool Delivery, Tool Allocation and Data Flow, Programmable Logic Controllers, Cell Controllers, Communication Networks, FMS Installation and Implementation, Case Studies.

(10 Hrs)

Text Books:

1. Mikell P.Groover, Automation Production Systems, Computer Integrated Manufacturing, Pearson Education, 2010.
2. Nand K. Jha, Handbook of Flexible Manufacturing Systems, Academic Press, 2012.
3. S.K. Sinha, CNC Programming, Galgotia Publications, 2003.

Reference Books:

1. Heinrich Kuhn, John Wiley & Sons, Flexible Manufacturing Systems, Horst Tempelmeier, 1993.
2. S. Joshi, Jeffrey Smith, Computer Control of Flexible Manufacturing System, Springer Science & Business Media, 2012.
3. Nand K. Jha, Handbook of Flexible Manufacturing Systems, Academic Press, 2012.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BIT-415 **L C**
Paper: Cyber Security Awareness **3 3**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Concept of Information, Information as an asset, Information Security Concepts, Computer and Internet Security, Security Services, Security goals, Security attacks, Threats, Vulnerabilities, Malicious Software, Virus, Trojan, Worms, spywares.

(7 Hrs)

UNIT-II

Device Security : Securing PC, Securing Smart Phone, Securing Laptops/Tabs, Securing Pen drives, Physical Security, Wi-fi security, Email Security: Browser security, Email Architecture, Email Tracing, Secure download, Secure Apps, Spam mails, Identity theft.

(7 Hrs)

UNIT-III

New and emerging IT Technologies, Cloud Technologies and cloud security, Security issues of Smart Phones, digital tablets and & smart Devices, Social Networking Safety and Privacy issues on Social Network sites. Identity Theft, Password Hacking, Spamming, Social network Account Attack, Hacking of social network account using password cracking

(8 Hrs)

UNIT-IV

Cyber crime, Types of Cyber crime, Cyber Attacks methodology, Hacking, Phishing , credit card fraud, Malware, Threats to critical infrastructure, software piracy and legal issues, M-commerce e.g. mobile wallet, mobile payment, m-banking and security items. Indian IT ACT, 2000 and its amendments 2008 & 2011, Mobile law in India, Legal issues pertaining to Device, Mobile Apps and Social Media.

(8 Hrs)

Text Books:

1. William Stallings, Network security essentials: Applications and Standards, Pearson Education, 5th Edition, 2013.
2. Pavan Duggal, Law Relating to iPads, Tablets, Smartphones &Smart Devices, Universal Law Publishing &co, 2013.

Reference Books and web link:

1. Mark Rhodes-Ousley, Information Security: The Complete Reference, 2nd Edition, McGraw-Hill, 2013.
2. Mark Ciampa, Security Awareness: Applying Practical Security in Your World, 4th Edition, Cengage Learning, 2014.
3. http://www.sans.org/security-resources/

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 417 **L C**
Paper Title: Process Improvement Techniques **3 3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Principles of Management: approaches to management thoughts, scientific management, functions of management. Organization, Organization structure and organization design, The Process View of Organizations - Service and manufacturing processes – Nature of service processes, process structure in services, Process structure in Manufacturing, Value Chain – Core and support processes, adding value with processes. **(8Hrs)**

UNIT – II

Productivity, Value analysis and Value Engineering Concept, Procedure, Application and role in Productivity. Process Improvement Techniques**,** Total Quality Management(TQM), Basic Concept of Total Quality (TQ), Statistical Process Control, Programmes; Quality Improvement Teams; Marketing Aspect of T.Q.; Total Quality of Services; Total Quality and Safety; Six Sigma. **(7Hrs)**

UNIT – III

Benchmarking: Process and Benefits, Enterprise Resource Planning (ERP), Business Reengineering, Simulating business process – Application, simulation process, discrete event simulation, computer simulation . **(8Hrs)**

UNIT – IV

Constraint Management – theory of constraints, process layout – designing flexible flow layouts; Lean Systems – Toyota production system, characteristics of lean systems, continuous improvement, Kanban system Value stream mapping, JIT, Process Synchronization and Improvement. **(7Hrs)**

Text Books:

1. Manuel Laguna, Johan Marklund, “Business Process Modelling, Simulation and Design”, Pearson Education, 2011.
2. Poornima M.Charantimath, “Total Quality Management”, Pearson Education, First Indian Reprint 2003.

3. Shankar R., “Industrial Engineering and Management”, Galgotia Publication, 2002.
4. Mathur, K and Solow D., “Management Science”, Englewood Cliffs New Jersey, Prentice Hall Inc. 1994. Publications, Allahabad.

Reference Books:

1. Raví Anupindi, Sunil Chopra, Sudhakar Deshmukh, Jan A. Van Mieghem, and Eitan Zemel, “Managing Business Process Flows: Principles of Operations Management” PearsonEducation, 2006.
2. Douglas C. Montgomory, “Introduction to Statistical Quality Control”, Wiley Student Edition, Wiley India Pvt Limited, 2008.
3. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, sixth Edition, Thomson, 2005.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BAS -419 **L C**
Paper Title: Financial Accounting **3 3**

INSTRUCTIONS TO PAPER SETTERS: MAXIMUM MARKS: 60

1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

UNIT – I

Introduction to Accounting, concept and objectives of accounting and bookkeeping, conventions and principles, Accounting Equation, International Accounting principles and standards, Matching of Indian Accounting Standards with International Accounting Standards, debit and credit entries, double entry principle, journal and journal entries; accounting of sole proprietorship. (**8Hrs)**

UNIT – II

Ledger posting and trial balance ,preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill. **(7Hrs)**

UNIT - III

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis. . **(8Hrs)**

UNIT – IV

Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its **(7Hrs)**

Text Books:

1. Maheshwari & Maheshwari, “An Introduction to Accountancy”, Vikas Publishing House, 2009.
2. Maheshwari S.N., “Principles of Management Accounting”, 11th Edition, Sultan Chand & Sons, 2001.
3. V.K. Gupta & R.L. Gupta, “Financial Accounting”, Sultan Chand & Sons, 2014.
4. Ghosh T.P. “Financial Accounting for Managers”, Taxman, 2009.

Reference Books:

1. Narayanswami, “Financial Accounting: A Managerial Perspective”,PHI, 2014
3. Ramchandran & Kakani, “Financial Accounting for Management”, TMH, 2011.
4. Ashish K. Bhattacharya, “Financial Accounting for Managers”, PHI, New Delhi, 2006.

Paper Code: BMA- 402 **L C**

Paper Title: Finite Element Analysis **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT -I

Matrix algebra, the basic concept of FEM, spring and Bar elements, Element stiffness and Assembly stiffness equations by direct and inspection approach, Treatment of boundary conditions, Variational method of approximation (Rayleigh Ritz method, method of weighted residuals), potential energy formulation. **(10 Hrs)**

UNIT -II

Basic equation in elasticity, Stresses and strains, Compatibility equations, Strain-displacement relations, One dimensional problems, Linear, Quadratic and cubic elements, Shape functions, compatibility and convergence requirements, Co-ordinate system, Numerical Integration, Gauss Legendre quadrature, Application problems. **(10 Hrs)**

UNIT -III

Finite element analysis for plane stress and plane strain problem, Strain displacement matrix for 2-D elements, soparametric formulation, Co-ordinate transformation, global, local and natural co-ordinates, Two dimensional integrals, higher order elements, Application problems.
Scalar field problems including heat conduction and flow problems.

(10 Hrs)

UNIT -IV

Stiffness matrix formulation for beam and frame element.
Introduction of Dynamic analysis, Basic equations, Lagrange's equation, lumped and consistent mass matrices, Eigen-value problems and Eigen-modes, case studies using FEA software – ANSYS, NASTRAN, HYPERMESH etc. **(10 Hrs)**

Text Books:

1. T.R. Chandrupatla and Belegundu, Finite Element in Engineering, Prentice-Hall, 3rd edition, 2002.
2. J.N Reddy, An Introduction to Finite Element, Mc-Graw Hill, 2005.
3. David Hutton, Fundamentals of Finite Element Analysis, McGraw-Hill Science, 2003.

Reference Books:

1. Cook, Malkus, Plesha and Witt, Concepts and Applications of Finite Element Analysis, Wiley India, 2007.
2. Liu and Quek, The Finite Element Method, A Practical Course, Oxford, UK, 2013.
3. S.S. Rao, The Finite Element Method in Engineering, Butterworth-Heinemann, 2010.
4. C.S. Krishnamurthy, Finite Element Analysis, Mc-Graw Hill, 2001.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 404 **L C**
Paper Title: Robotics & Computer Integrated Manufacturing **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Fundamentals of Robotics:

Robot definition, automation for robotics, classification of robots, Robot anatomy, Work space volume, Drive systems. Control systems. Accuracy and repeatability. Robot design configuration, Components and robotic systems, Sensors in robotics. Robot configurations, Path control. Introduction to robot programming. **(10 Hrs)**

UNIT - II

Robot Kinematics: Mapping, Homogeneous transformations, Rotation matrix, Forward Kinematics Denavit - Hartenberg (DH) representation, inverse kinematics: solution of inverse problems.

Robot Differential Motion: Linear and Angular velocity of rigid link, Velocity and angular velocity and acceleration along link, Maipulator jacobian, Static force analysis with jacobian. End effectors: Types of grippers. Tools as end effectors. Robot and effectors interface. Gripper selection and design, current and emerging issues in Robotics. **(10 Hrs)**

UNIT - III

Introduction of NC, CNC & DNC, CAM as per computer aided manufacturing international, need, benefits & limitations, classification, machine tools, elements machines. G codes, M codes, APT – geometry preparatory, part programming related to turning on CNC lathe machine. **(10 Hrs)**

UNIT- IV

Codes and Part programming related to CNC milling machine. Functions and Components of CIM System: Concept of CAD/CAM integration and CIMS; Feasibility study for CIM implementation, Product development cycle in CIM, evolution of CIM, enabling technologies in CIM, programming in CIM, CAPP, Advantages and limitations of CAPP, applications.. **(10 Hrs)**

Text Books:

1 Mikell P Grover, Mitchell Weiss, Industrial Robotics: Technology, Programming and Application, Tata Mc-Graw & Hills, 2009.

2 Saeed B. Niku, Introduction to Robotics Analysis, Systems & Applications, Pearson Education Singapore P. Ltd., 2002.

3 S. K. Saha, Introduction to Robotics, Mc-Graw Hill- 2004.
4 S.K. Sinha, CNC Programming, Galgotia Publications, 2003.

Reference Books:

1 T. K. Kundra, P. N. Rao and N. K. Tiwari, Numerical Control and Computer Aided Manufacturing, Mc-Graw-Hill Publishing Company, New Delhi, 1998.
2 Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, 2nd edition, Prentice Hall, 2001.
3 R.K. Mittal, I. J. Nagrath, Robotics & Control, Tata Mc-Graw & Hills, 2005.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-406 **L C**
Paper Title: I.C. Engines **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT – I

Introduction to I.C Engines: Classification, Engine components and basic terminology, Two stroke and four stroke engines and their comparison, SI and CI engines and their comparison, Theoretical and actual indicator diagrams, Valve timing diagrams, Applications of SI and CI Engines.

Combustion in SI Engines: Phenomenon of homogeneous combustion, Stages of Combustion, Flame speed, Delay period, Rate of pressure rise, Abnormal combustion, Auto ignition, Detonation, Factors affecting detonation, Control of detonation, Combustion chamber design for SI engines.

(**10 Hrs)**

UNIT- II

Combustion in CI Engines: Combustion Phenomenon, Air fuel ratio, Ignition delay, Diesel knock, Factors affecting knocking, Knock control, Combustion chamber design of CI engines, Cold starting of CI Engines.

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

Air-Fuel Mixing in SI Engines: Properties of air-petrol mixtures, Mixture requirements under different operating conditions, Different types of carburetors, Fuel injection system in SI Engine, Electronic fuel injection, Advantages and disadvantages of petrol injection.

(**10 Hrs)**

UNIT- III

Fuel Injection Systems for CI Engines: Requirements of injection system, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

Ignition Systems for SI Engine: Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, ignition advance mechanism, Electronic ignition.

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication systems, Lubrication oils, Crankcase ventilation.

(**10 Hrs)**

UNIT- IV

Exhaust Emissions from SI and CI Engines And It's Control: pollutants from gasoline engine, effect of engine maintenance on exhaust emission, Gasoline engine emission control, Diesel emission, Diesel smoke and control, Diesel odour and control, Euro norms.

Scavenging and Supercharging: Scavenging in 2 Stroke engines, Uniflow, loop and cross flow scavenging, Objects of supercharging, Effects of supercharging on engine performance, Methods of supercharging, Turbo charging.

Testing and Performance: Performance parameters, Indicated power, brake power, friction power, Various efficiencies, Indicated and brake mean effective pressures, Methods for the measurement of friction power and brake power, Numerical problems.

(10 Hrs)

Text Books:

1. Paul W Gill, Fundamentals of Internal Combustion Engine, Oxford & IBH Publishing Company, 2007.
2. V. Ganeshan, I.C Engine, Tata Mc-Graw Hill Publishers, 2002.
3. R. Yadav, I.C Engine, Central Publishing House, Allahabad.

Reference Books:

1. E.F Obert., I.C Engine Analysis & Practice, Intext Educational Publishers, 1973.
2. H.N. Gupta, Fundamentals of Internal Combustion Engines, Prentice Hall of India, 2013.
3. John Heywood, Internal Combustion Engine- Fundamentals, Mc-Graw Hill, 2012.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-408 **L C**
Paper: Industrial Tribology **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Defining Tribology, Tribology in Design - Mechanical design of oil seals and gasket - Tribological design of oil seals and gasket, Tribology in Industry, Defining Lubrication, Basic Modes of Lubrication, Properties of Lubricants, Lubricant Additives, Defining Bearing Terminology - Sliding contact bearings - Rolling contact bearings, Comparison between Sliding and Rolling Contact Bearings.

(10 Hrs)

UNIT-II

Friction - Laws of friction - Friction classification - Causes of friction, Theories of Dry Friction, Friction Measurement, Stick-Slip Motion and Friction Instabilities, Wear - Wear classification - Wear between solids - Wear between solid and liquid - Factors affecting wear - Measurement of wear, Theories of Wear, Approaches to Friction Control and Wear Prevention, Boundary Lubrication, Bearing Materials and Bearing Construction.

(10 Hrs)

UNIT-III

Mechanics of Fluid Flow - Theory of hydrodynamic lubrication - Mechanism of pressure development in oil film,Two Dimensional Reynolds's Equation and its Limitations, Idealized Bearings, Infinitely Long Plane Fixed Sliders, Infinitely Long Plane Pivoted Sliders, Infinitely Long Journal Bearings, Infinitely Short Journal Bearings, Designing Journal Bearing - Sommerfeld number - Raimondi and Boyd method - Petroff's Solution - Parameters of bearing design - Unit pressure - Temperature rise - Length to diameter ratio - Radial clearance - Minimum oil-film thickness.

(10 Hrs)

UNIT-IV

Introduction - Flat plate thrust bearing - Tilting pad thrust bearing, Pressure Equation - Flat plate thrust bearing - Tilting pad thrust bearing, Load - Flat plate thrust bearing - Tilting pad thrust bearing, Center of Pressure - Flat plate thrust bearing - Tilting pad thrust bearing, Friction - Flat plate thrust bearing - Tilting pad thrust bearing.

(10 Hrs)

Text Books:

1. P. Sahoo, Engineering Tribology, PHI Learning, 2011.
2. K. C.Ludemna, Friction, Wear and Lubrication, CRC Press, 1996.
3. Cameron: the Principles of Lubrication (Ellis Horwood Series in Engineering Science), John Wiley & Sons Inc., 3rd edition, 1981.

Reference Books:

1. M.H. Jones, D. Scott, Industrial Tribology: The Practical Aspects of Friction, Lubrication and Wear, North-Holland, 1983.
2. J.H. Dumbleton, Tribology of Natural and Artificial Joints, North-Holland, 1981.
3. T. Mang, K. Robzin and T. Bartels, Industrial Tribology, Wiley VCH, 2010

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

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Paper Code: BMA- 410 **L C**
Paper Title: Maintenance and Reliability **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT-I

Definition. Causes and types of failures. Reliability expressions for constant, increasing and decreasing hazard rates. Data Analysis, Probability plots for various distributions (exponential, Weibull, Normal and Gamma). Series, parallel, series-parallel, standby and k-out-of-m modeling.

(10 Hrs)

UNIT-II

System reliability evaluation techniques, including methods of bounds, decomposition and transformation techniques. Recent trends in reliability evaluation techniques. Life/durability tests of sample devices/components, environmental testing of components/circuits/equipments.

(10 Hrs)

UNIT-III

Vibration and endurance tests, study of degradation characteristics, failure rates of components/devices under environmental factors. Maintained systems and various definitions associated with them. Type of Maintenance. Maintainability analysis, Markov Models for reliability, availability and MTTF computations.

(10 Hrs)

UNIT-IV

Renewal Theory Approach. Maintainability design considerations. Life Cycle Costs. Optimum Inventory Assessment. Optimal inspection, overhaul, replacement or repair strategies. Maintainability test and demonstration and warranties.

(10 Hrs)

Text Books:

1. K.K. Aggarwal, Reliability Engineering, Springer Science & Business Media, 1993.
2. A. K. Govil, Reliability Engineering, Tata Mc-Graw-Hill Publishing Company, 1983.
3. Ebelling, An Introduction to Reliability & Maintenance Engineering, Mc-Graw Hill, 2000.

Reference Books:

1. Matthew P. Stephens, Productivity and Reliability-Based Maintenance Management, Purdue University Press, 2010.
2. Emery Roe and Paul R. Schulman, High Reliability Management: Operating on the Edge, Stanford University Press, 2008.
3. Ramesh Gulati and Ricky Smith, Maintenance and Reliability Best Practices, Industrial Press Inc., 2009.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA-412 **L C**
Paper Title: Power Plant Engineering **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Steam Power Plant: General layout of modern thermal power plant, Site selection, Presents status of power generation in India.

High Pressure Boilers & Accessories: Unique features and advantages of high pressure boilers, LaMont, Benson, Loeffler, Schmidt- Hartmann, Velox, supercritical, Supercharged and fluidized bed combustion boiler. Different types of super-heaters, Re-heaters, economizers, Air pre-heaters, Methods of superheat control.

(10 Hrs)

UNIT -II

Coal & Ash Handling Systems: Coal handling storage of coal, Burning systems, Types of stokers their working, Pulverized fuel handling systems, Unit and central systems, Pulverized mills- ball mill, Bowl mill, Ball &race mill, Impact or hammer mill, Pulverized coal burners, Oil burners. Necessity of ash disposal, Mechanical, Hydraulic, pneumatic and steam jet ash handling system, Dust collection and its disposal, Mechanical dust collector, Electrostatic precipitator.

Draught System: Natural draught- estimation of height of chimney, Maximum discharge, Condition, Forced, Induced and balanced draught.

(10 Hrs)

UNIT- III

Condensers and Cooling Towers: Types of condensers, sources of air in condenser, Effects of air leakage, Methods of obtaining maximum vacuum in condenser, Necessity of cooling ponds and cooling towers, Condenser water cooling systems, Types of cooling towers, cooling ponds.

Feed Water Treatment: Necessity of feed water treatment, Different impurities found in feed water, Effect of impurities, pH & its role in corrosion and scale formation, Internal & external water treatment systems- hot lime soda process, Zeolite ion exchange process, Demineralization plants, Reverse osmosis process, Sea water treatment using reverse osmosis, De-aeration.

Gas Turbine Power Plant: Site selection of gas turbine power plant, Components of a gas turbine power plant, Different layouts of plant, Combined cycle power plants, Gas Turbine Fuels, Advantages and disadvantages over diesel and steam power plants.

(10 Hrs)

UNIT- IV

Diesel Power Plant: Essential components of diesel power plant, Different systems like fuel supply system, Engine cooling system, Engine lubrication system, Exhaust system, Engine starting and stopping system.

Nuclear Power Plant: Nuclear fusion and fission, Chain reaction, Nuclear fuels, Components of nuclear reactor, Classification of reactors, Pressurized water reactor, Boiling water reactor, Gas cooled reactor, CANDU reactor, Fast breeder reactor, Nuclear waste and its disposal, Nuclear power plants i n India.

Fluctuations of Load in Power Plant and Economics of Power Generation: Load curves, Load duration curves, Connected load, Maximum load, Peak load, base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, Cost of power plant, Performance and operating characteristics of power plant, Tariff for electric energy. **(10 Hrs)**

Text Books:

1. R.K. Rajput, Power Plant Engineering, Laxmi Publication, Delhi, 2015
2. P.K. Nag, Power Plant Engineering, Tata, Mc-Graw Hill, Delhi, 2014
3. P.C.Sharma & Nagpal, Power Plant Engineering, Khanna Publishers, 2013.

Reference Books:

1. Arora & Domkundwar, Power Plant Engineering, - Dhanpat Rai & Co. Delhi, 2014.
2. C. Elanchezhian, L. Saravanakumar, B. Vijaya Ramnath, Power Plant Engineering, I.K. International, Delhi, 2007.
3. Thomas Elliott, Kao Chen and Robert Swanekamp, Standard Handbook of Power plant Engineering, McGraw Hill Professional, 2012.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 414 **L C**
Paper Title: Reverse Engineering and Rapid Prototyping **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Review of solid modeling techniques with comparison advantages and disadvantages. Basic principle of RP processes, classification of RP processes, various Industrial RP systems like Sterolithography, Fused Deposition Modeling, Selective Laser Sintering, Laminated object Manufacturing, 3 D Printing.

(10 Hrs)

UNIT - II

Role of Rapid Prototyping and Rapid Tooling in product development and simultaneous engineering. Process planning for rapid prototyping, STL file generation, defects in STL files, slicing procedure, Accuracy issues in Rapid Prototyping, Strength of RP parts, Surface roughness problem in RP.

(10 Hrs)

UNIT - III

Part deposition orientation and issue like accuracy, surface finish, build time, support structure, cost etc. Rapid tooling technique such as laminated metallic tooling, direct metal laser sintering, vacuum casting

(10 Hrs)

UNIT - IV

Introduction to reverse engineering. Selecting and optimally employing 3-D digitization strategies and systems. Efficiently using 3-D scanning , CAD model development for complex components and tools. Various CAD commands in modelling. Tools and equipment's available for scanning and their comparison, 3D White light scanning.

(10 Hrs)

Text Books:

1. Rafiq Noorani, Rapid Prototyping: Principles and Application, John Wiley, Hoboken, 2006.
2. Kevin Otto and Kristin Wood, Product Design: Technology in Reverse Engineering and New Product Development, Pearson, New Delhi, 2004.
3. Kai, Chua Chee, Fai Leong, Rapid Prototyping: Principle & Application in Manufacturing, John Willey, London, 2003.

Reference Books:

1. Ian Gibson, Advanced Manufacturing Technology for Medical Applications: Reverse Engineering, Software Conversion and Rapid Prototyping, Willey, London, 2006.
2. Ali K. Kamrani, Emad Abouel Nasr, Rapid Prototyping: Theory and Practice, Volume 6 of Manufacturing Systems Engineering Series, Springer Science & Business Media, 2006.
3. G Bennett, Rapid Prototyping Casebook, Mechanical Engineering Publications, London, 1997.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BMA- 416 **L C**
Paper Title: Non- Conventional Manufacturing Processes **4 4**

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

UNIT - I

Introduction, Classification, their comparative study, Need. Process Selection: Physical Parameters, Shape applications, Material applications, Process capability, Effects on equipments and Tooling, Process economy.

(10 Hrs)

UNIT-II

Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining and Abrasive Flow Machining considering their construction, working Principle, equipment used, process parameter, analysis, advantages, disadvantages and applications. **(10 Hrs)**

UNIT-III

Electro Chemical Machining (ECM), Electro Chemical Grinding (ECG), and Chemical Honing (ECH) considering their construction, working Principle, equipment used, process parameter, analysis, Advantages, Disadvantages and Applications **(10 Hrs)**

UNIT-IV

Laser Beam Machining, Electron Beam Machining, Electric Discharge Machining, Wire Cut EDM, Ion Beam Machining (IBM) and Plasma Arc Machining considering Working principle, equipments, Process parameters, Analysis, Advantages, Disadvantages and Application.

. **(10 Hrs)**

Text Books:

1. P.C. Panday and H.S. Shan, Modern Machining Process, Tata McGraw-Hill Education, 1980.
2. Amitabh Gosh and A.K. Mallik, “Manufacturing Science”, Affiliated East-West Press Pvt. Ltd., 1985.
3. E. J. Weller, Nontraditional Machining Process, Society of Manufacturing Engineers, Publications/Marketing Division, 1984.

Reference Books:

1. G. F. Benedict, Nontraditional Manufacturing Processes, Marshal Dekkar, New York, 1987.
2. P. K. Mishra, Nonconventional Machining, Narosa Publications, 2007.
3. Vijay K Jain, Advance Machining Processes, Allied Publishers Pvt. Ltd., New Delhi, 2002.

Internet Sources:

www.nptel.ac.in
http://ocw.mit.edu

Paper Code: BAS- 420 **L C**
Paper Title: Business Entrepreneurship **3 3**

INSTRUCTIONS TO PAPER SETTERS: MAXIMUM MARKS: 60

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Introduction: The entrepreneur, definition, **characteristics;** leadership, risk taking, decision making and business planning,role of entrepreneur, entrepreneurship and an entrepreneurial perspective,significance of entrepreneurship, Innovation and entrepreneur, entrepreneurial behaviourand psycho-theories, social responsibility. **(8Hrs)**

UNIT – II

Promotion of a Venture: Opportunities analysis; external environmental analysis, economic, social and technological, competitive factors, fundamentals of feasibility plan, forms of business enterprises, Sole proprietorship, partnership and corporations, legal requirements ofestablishment of a new unit .

(7Hrs)

UNIT – III

Financial resources, rising of funds and documentation required. Project financing: fixed and working capital requirements, equity financing, securities market, venture capital, debt financing, banks and financial institutions and other non-bank financial sources, Government programmes, direct loan assistance and subsidies. **(8Hrs)**

UNIT – IV

Managing growth and transition: the organization life cycle; The entrepreneur-s perspective, changing roles.Entrepreneurial Development Programmes (EDP): EDP, their role, relevance andachievements; role of government in organizing EDP's critical evaluation. **(7Hrs)**

Text Books:

1. Vasant, DCSAI, "Entrepreneurship", Himalaya Publishing House, 2003.
2. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi, 2008
3. Pandey I.M.; "Venture Capital –The Indian Experience", Prentice Hall of India,2003.
4. Tandon B.C, "Environment and Entrepreneur",Chug Publications,Allahabad.

Reference Books:

1. Srivastava S.B. "A practical guide to industrial entrepreneurs", Sultan Chand &Sons, NewDelhi.
2. Chandra, Prasana, "Project Preparation, Appraisal, Implementation", TMH, NewDelhi, 2002.
3. Holt, David H., "Entrepreneurship: New Venture Creation", Prentice-Hall of India, NewDelhi, 1992
4. Panda, ShibaCharan," Entrepreneurship

Paper Code: BAS -422 **L C**
Paper Title: Organizational Behaviour **3 3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 60**

1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Introduction to Management and Organizational Behaviour: Introduction- Meaning and Nature of Management, Management Functions and Processes. Scientific Management Theories; Taylor and Scientific Management; Evolution of Organizational Behaviour- Classical, Neo Classical and Modern Approaches, Contemporary School of Management Thoughts, Theories of Organization **(8Hrs)**

UNIT – II

The Individual Behaviour- Factors affecting Individual Behaviour, Personality, Learning Process, Motivational Process, Perceptual Process, Attitudes and Values. **Group Behaviour:** Groups- Definition, Types, Theories of Group formation, Group Roles and Norms, Interpersonal relations, Group Dynamics, Leadership Styles & Leadership Development. **(7Hrs)**

UNIT – III

Behaviour in the Organization: Introduction, Issues between organizations and individuals. Interpersonal behaviour: Conflict in Organizations: nature of conflict, levels of conflict, conflict management styles. Management of Organizational Conflicts. Employee stress: forms, causes, implications, approaches to stress management. **(8Hrs)**

UNIT – IV

Organizational Structure & Design, Organizational Designs; Emerging Design Options Different Organizational Structures; Communication Process, Organizational Culture (creation and sustenance of cultures) , Organizational Ethos, Dimensions of Culture, Model for Managing Change, Forces for Change, resistance to change, Management of resistance. **(7Hrs)**

Text books:

1. Stephen P. Robinson: Organisational Behaviour, 11th edition, New Delhi – 110001 Prentice – Hill of India Pvt.Ltd., 2007.
2. L.M.Prasad: OrganizationalBehaviour, New Delhi, Sultan Chand &Sons, 2001.
3. Udai Pareek, "Understanding Organizational Behavior", Oxford University Press 1st Ed., 2004.
4. Robbins, S. P., Judge, T. A. and Sanghi. S, "Organizational Behavior", Pearson, 2009.

Reference Books:

1. Stoner, et. al., "Management", PHI, 6th Ed., 2002.
2. J. S. Chandan, "Organizational Behaviour", Vikas Publishing House, 2004.

3. Joseph W. Weiss, “Organizational Behaviour & Change, Managing Diversity, Cross-Cultural Dynamics& Ethics”, Vikas Publishing House, 2nd Ed. 2001.
4. Jit S Chandan: Organisational Behaviour, 3rd edition, 576, Masjid Road, Jangpura, N.D., New Delhi-1100014, Vikas Publishing House Pvt. Ltd., 2006.
5. Fred Luthans, “Organizational Behaviour,” McGraw Hill International Edition, 9th Ed., 2002.
6. Kavita Singh, “Organization Behaviour Text and Cases”, Pearson, 2010.
7. Luthans F.: Organizational Behaviour, 7th edition, New York, MC Graw Hill, 1995.