SYLLABI BOOK

BACHELOR OF TECHNOLOGY
MECHANICAL ENGINEERING

Department of Mechanical Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.

TEACHING SCHEME FOR THE COURSE
B. TECH., MECHANICAL ENGINEERING

SEMESTER I

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
BS102	MATHEMATICS -I	3	1	0	60	40	0	0	100	4.0
BS103	MECHANICS	3	1	0	60	40	0	0	100	4.0
ES111	THERMODYNAMICS	3	0	2	60	40	50	0	150	4.0
ES112	BASIC ELECTRICAL ENGG.	3	0	2	60	40	50	0	150	4.0
ES113	COMPUTER PROGRAMMING	2	0	3	40	0	0	50	90	3.5
ES114	WORKSHOP PRACTICE - I	0	0	2	0	0	50	0	50	1.0
SM101	ENVIRONMENTAL STUDIES	2	0	0	40	0	0	0	40	0.0
									680	20.5

To check the detailed syllabus, click on subject code

SEMESTER II

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
BS203	MATHEMATICS-II	3	1	0	60	40	0	0	100	4.0
BS204	CHEMISTRY	3	0	0	60	0	0	0	60	3.0
ES203	ENGINEERING GRAPHICS	3	0	3	60	40	50	0	150	4.5
ES204	BASIC ELECTRONICS	3	0	2	60	40	50	0	150	4.0
ES205	MECHANICS OF SOLIDS	3	0	2	60	40	50	0	150	4.0
ES206	WORKSHOP PRACTICE - II	0	0	3	0	0	0	50	50	1.5
HS202	YOGA AND WELLNESS	2	0	2	40	0	0	50	90	3.0
									750	24

SEMESTER III

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
BS308	NUMERICAL TECHNIQUES	3	0	2	60	40	25	25	150	4.0
ES301	ELECTRICAL MACHINES AND DRIVES	3	0	2	60	40	25	25	150	4.0
MH309	FLUID MECHANICS	3	0	2	60	40	25	25	150	4.0
MH310	KINEMATICS OF MACHINES	3	1	2	60	40	25	25	150	5.0
MH311	MATERIAL SCIENCE AND METALLURGY	3	0	2	60	40	25	25	150	4.0
HS302	ENGLISH	2	0	2	40	0	0	50	90	3.0
									840	24.0

SEMESTER IV

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
MH413	DYNAMICS OF MACHINES	3	1	2	60	40	25	25	150	5.0
MH414	ADVANCE SOLID MECHANICS	3	0	2	60	40	25	25	150	4.0
MH415	MANUFACTURING TECHNOLOGY - I	3	0	4	60	40	25	25	150	5.0
MH416	APPLIED THERMODYNAMICS	3	0	2	60	40	25	25	150	4.0
MH417	MACHINE DRAWING & INDUSTRIAL DRAFTING	0	0	4	0	0	25	25	50	2.0
MH418	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	1	0	2	0	0	25	25	50	2.0
HS401	UNIVERSAL HUMAN VALUES	3	0	0	60	0	0	0	60	3.0
									760	25.0

SEMESTER V

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
MH515	MEASUREMENT AND METROLOGY	3	0	2	60	40	25	25	150	4.0
MH514	HEAT AND MASS TRANSFER	3	0	2	60	40	25	25	150	4.0
MH516	MANUFACTURING TECHNOLOGY - II	3	0	2	60	40	25	25	150	4.0
MH517	MACHINE DESIGN - I	3	1	2	60	40	25	25	150	5.0
MH519	OPEN ELECTIVE – I (RENEWABLE ENERGY)	3	0	0	60	0	0	0	60	3.0
MH518	INDUSTRIAL MANAGEMENT & ECONOMICS	2	0	0	40	0	0	0	40	2.0
MH520	MANDATORY COURSE - 2 (INNOVATION AND ENTREPRENEURSHIP)	2	0	0	40	0	0	0	40	0.0
									740	22.0

SEMESTER VI

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
MH618	MACHINE DESIGN - II	3	1	2	60	40	25	25	150	5.0
MH619	FLUID MACHINES	3	0	2	60	40	25	25	150	4.0
MH620	COMPUTER-AIDED DESIGN & MANUFACTURING	3	0	2	60	40	25	25	150	4.0
MH621	OPEN ELECTIVE – II (INDUSTRIAL ENGINEERING)	3	0	0	60	0	0	0	60	3.0
MH622 MH623 MH624 MH625	PROFESSIONAL ELECTIVE – I REFRIGERATION & AIR-CONDITIONING MECHANICAL VIBRATIONS & NOISE PRODUCTION TECHNOLOGY AUTOMOBILE SYSTEMS	3	0	2	60	40	25	25	150	4.0
MH626 MH627 MH628 MH629	PROFESSIONAL ELECTIVE – II QUALITY ENGINEERING & RELIABILITY PRESSURE VESSELS & PIPING ADDITIVE MANUF. & REVERSE ENGG. SUPPLY CHAIN MANAGEMENT	3	0	0	60	0	0	0	60	3.0
									720	23.0

SEMESTER VII

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
MH718	FINITE ELEMENT METHODS	3	0	2	60	40	25	25	150	4.0
MH719	OPERATION RESEARCH	3	1	0	60	40	0	0	100	4.0
MH720	OPEN ELECTIVE – III (CONTROL ENGINEERING)	3	0	0	60	0	0	0	60	3.0
MH721	EFFECTIVE TECHNICAL COMMUNICATION	3	0	0	60	0	0	0	60	3.0
MH722	SEMINAR	0	0	2	0	0	0	100	100	1.0
MH723	SUMMER INTERNSHIP (4-WEEKS)	0	0	4	0	0	0	50	50	2.0
MH724 MH725 MH726 MH727	PROFESSIONAL ELECTIVE – III THERMAL SYSTEM DESIGN TRIBOLOGY ADVANCED MANUFACTURING PROCESSES INTERNAL COMBUSTION ENGINES	3	0	2	60	40	25	25	150	4.0
MH728 MH729 MH730 MH731	PROFESSIONAL ELECTIVE – IV ROBOTICS DESIGN OF AUTOMOTIVE POWER TRANSMISSION SYSTEM ENERGY MANAGEMENT RECENT TRENDS IN QUALITY MANAGEMENT	3	0	0	60	0	0	0	60	3.0
									730	24.0

SEMESTER VIII

	Subject Title	Teaching Scheme & Credit			Examination Scheme					
		Lect	Tut	Prac	TH	Sess	Prac	TW	Total	Credit
MH811 MH812 MH813 MH814	PROFESSIONAL ELECTIVE – V COMPUTATIONAL FLUID DYNAMICS MECHATRONICS COMPUTER INTEGRATED MANUFACTURING OPTIMIZATION TECHNIQUES	2	0	2	40	0	25	25	**90**	**3.0**
MH821 MH822 MH823 MH824	PROFESSIONAL ELECTIVE – VI POWER PLANT ENGINEERING FAILURE ANALYSIS AND FRACTURE MECHANICS PRODUCT DESIGN AND DEVELOPMENT PRODUCTION PLANNING AND CONTROL	2	0	0	40	0	0	0	40	**2.0**
MH831 MH832 MH833 MH834	PROFESSIONAL ELECTIVE – VII ENERGY STORAGE TECHNOLOGY MECHANICS OF COMPOSITE MATERIALS ADVANCED METAL FORMING SAFETY AND MAINTENANCE	2	0	0	40	0	0	0	40	**2.0**
MH801	PROJECT	0	0	4	0	0	0	100	100	**2.0**
MH802	INDUSTRIAL TRAINING (8 WEEKS)	0	3	12	0	0	150	100	250	**9.0**
									520	18.0

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: MATHEMATICS - I (BS102)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	1	0	60	40	0	0	100	3	1	0	4

DETAILED SYLLABUS

1 CALCULUS: INTEGRAL CALCULUS

Evolutes and involutes, Applications of definite integrals to evaluate surface areas and volumes of revolutions.

2 LINEAR ALGEBRA: MATRICES, VECTORS, DETERMINANTS, LINEAR SYSTEMS:

Matrices, Vectors: Addition and Scalar Multiplication, Matrix Multiplication, Rank of a matrix, Solutions of Linear Systems: Existence, Uniqueness, Determinants, Cramer's Rule, Inverse of a matrix, Eigen values, Eigenvectors, Symmetric, Skew-symmetric, Linear Independence of vectors, Diagonalization.

3 SEQUENCES AND SERIES:

Convergence of sequence and series, Introduction to tests for convergence; Power series, Series for exponential, Trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

4 MULTIVARIABLE CALCULUS (DIFFERENTIATION)

Partial derivatives, Total derivative; Tangent plane and normal line; Taylor series expansion for function of two variables, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers, Introduction to Vector Differential Calculus; Directional derivatives, Gradient, Curl and divergence.

LEARNING OUTCOMES:

The students will learn:

- To apply differential and integral calculus to notions of curvature and applications of definite integrals.
- Convergence, divergence, and analysis of sequences and infinite series.
- To develop functions as a Fourier series.
- The essential tools of matrices and linear algebra including linear transformations, eigen values, diagonalization.

TEXT/REFERENCE BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.

2. G. B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
8. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

B. TECH. SEMESTER – I (CL/IC/MH)
SUBJECT: THERMODYNAMICS (ES111)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	2	60	40	0	50	150	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCTION

Macroscopic versus microscopic view point, thermodynamic systems and control volume, thermodynamic properties, processes and cycles, homogeneous and heterogeneous systems, thermodynamic equilibrium, quasi-static process, concept of continuum, temperature and zeroth law of thermodynamics, ideal gas and gas laws

2 ENERGY ANALYSIS OF A CLOSED SYSTEM

Regnault's law, specific heats of solids, liquids and ideal gases, analysis of isochoric, isobaric, isothermal, isentropic and polytropic processes

3 PROPERTIES OF PURE SUBSTANCES

Pure substance, phases and phase change process, types of steam, property diagrams, use of steam table, enthalpy, specific volume, internal energy and external work done and latent heat of steam, Van der Waals equation

4 ENERGY TRANSFER AND ANALYSIS OF AN OPEN SYSTEM

Forms of energy, energy transfer by heat and work, mechanical forms of work, first law of thermodynamics and Joule's experiment, energy conversion efficiencies, conservation of mass, flow work and energy of a flowing fluid, steady flow energy equation and its application for various thermal systems

5 SECOND LAW OF THERMODYNAMICS

Introduction to second law, thermal energy reservoir, heat engine, refrigerator and heat pump, Clausius and Kelvin-Plank statement, perpetual motion machines, reversible and irreversible processes, Carnot and reversed Carnot cycle, entropy principle and isentropic process, Tds and Maxwell relation

6 APPLICATIONS OF THERMODYNAMICS

Construction and working of boilers, fuel calorimeters, pumps, compressors, IC engines- petrol and diesel engines, refrigeration systems, valves

TEXT/REFERENCE BOOKS:

1. Yunus A. Cengel, Michael A. Boles., “Thermodynamics- An engineering approach”, Tata McGraw Hill publishing co. ltd.
2. Nag P.K., “Engineering Thermodynamics”, Tata McGraw Hill publishing co. ltd.
3. Smith J.M., Van Ness H.C., Abbott M.M, “Introduction to chemical engineering thermodynamics”, McGraw Hill publishing co. Ltd.
4. Sonntag. R.E., Borgnakke, C. and Van Wylen G.J.,”Fundamental of thermodynamics”, John Wiley and Sons.
5. Moran M.J. and Shapiro H.N., “Fundamentals of engineering thermodynamics”, John Wiley and Sons.

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: ELEMENTS OF ELECTRICAL ENGINEERING (ES112)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	2	60	40	0	50	150	3	0	1	4

DETAILED SYLLABUS

1 D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

2 A.C. CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

3 TRANSFORMERS

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

4 ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

5 ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthling. Elementary calculations for energy consumption, power factor improvement. DC-DC buck and boost converters. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

6 SEMICONDUCTORS, DIODES AND APPLICATIONS

Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) in brief.

TEXT/REFERENCE BOOKS:

1. R. Muthu Subramanian, S. Salivahanan, and K. A. Muraleedharan, Basic Electrical, Electronics and Computer Engineering, 2nd Edition, Tata McGraw Hill
2. V. K. Mehta & Rohit Mehta, Principles of Electronics, 11thEdition, S. Chand & Company
3. B. L. Theraja , A. K. Theraja, Electrical Technology (Vol: II), 23rdEdition, S. Chand & Company
4. D.P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 3rd Edition, Tata McGraw Hill

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: MECHANICS (BS103)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	1	0	60	40	0	0	100	3	1	0	4

DETAILED SYLLABUS

1 STATICS

Resultant force for 2D and 3D force system, concept of free body diagrams, equilibrium equations for particles and rigid body subjected to 2D and 3D force system, centroid and center of gravity, moment of inertia, Friction

2 DYNAMICS AND VIBRATIONS

Rotational Transformation of scalers and vectors, Newton's Laws for particle motion, Potential Energy function F= - Grad V, conservative and non-conservative forces, Conservation of momentum, angular momentum, collision, energy equation, free harmonic motion, damped harmonic motion, forced oscillation and resonance, kinematics in a coordinate system rotating and translating in a plane.

TEXT/REFERENCE BOOKS:

1. Engineering Mechanics, M. K. Harbola, 2nd Edition, Cengage Learning, 2013.
2. Mechanics – J P Den Hartog, Dover Publications, 2003.
3. Mechanical Vibrations - J P Den Hartog, Dover Publications, 1985.
4. Theory of Vibrations with Applications – W. T. Thomson, 5th Edition, Pearson Education, 2008.
5. Engineering Mechanics: Statics (V.1), Dynamics (V.2), J. L. Meriam and L. G. Kraige, 5th edition, Wiley, 2017.
6. Engineering Mechanics: Statics & Dynamics, Irving H. Shames, 4th edition, Pearson Education, 2005.
7. Vector Mechanics for Engineers: Statics (V.1), Dynamics (V.2), F. P. Beer and E. R. Johnston, 10th SI edition, McGraw Hill Education, 2017

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: COMPUTER PROGRAMMING (ES113)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
2	0	3	40	0	0	50	90	2	--	1.5	3.5

DETAILED SYLLABUS

1 INTRODUCTION:

Introduction to components of computer system, Idea of algorithm, Introduction to C, Constants, Variables & Data types in C, Managing input and Output operators.

2 OPERATORS AND EXPRESSIONS:

C Operators: Arithmetic, relational, logical, increment &decrement, assignment a nd conditional, Arithmetic Expressions & Precedence Rule, Type conversion in C, Mathematical Functions.

3 DECISION MAKING AND BRANCHING:

Decision making with If & If...else statements, goto statements.

4 DECISION MAKING AND LOOPING:

The while statement, the break statement & the do... while loop, the for loop, Jum p within loops - Programs.

5 ARRAYS:

Array 1D, 2D, Character Array as String

6 USER DEFINED FUNCTIONS:

Categories of Functions (Including using built in library), Call by Value, Paramete r passing to function, Recursion.

7 STRUCTURE:

Defining structure, Assigning value to the structure members, Array of structure

8 POINTER:

Idea of pointer, declaration and Initialization of pointer, passing address as funct ion argument, passing array to function using pointer.

9 FILE HANDLING

(only if time is available, otherwise should be done as part of the lab)

TEXT/REFERENCE BOOKS:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
3. Yashvant Kanetkar, Let Us C, 12th Edition, BPB Publication.

4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: ENVIRONMENTAL STUDIES (SM101)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS:

1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance & Need for public awareness

2 NATURAL RESOURCES

Renewable and non-renewable resource: Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people, Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

3 ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

4 BIODIVERSITY AND ITS CONSERVATION

Introduction definition: Genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

5 ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards Solid waste management, causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

6 SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management**,** Resettlement and rehabilitation of people: its problems and concerns. Case studies**,** Environmental ethics: Issues and possible solutions**,** Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies: Wasteland reclamation, Consumerism and waste products, Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation**,** Public awareness

7 HUMAN POPULATION AND THE ENVIRONMENT

(Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health, Case studies.

8 FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain) Visit to a local polluted site - Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc.

TEXT BOOKS/ REFERENCE BOOKS

1. Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013.
2. Poonia, M. P.; Sharma, S. C. Environmental studies; Khanna Publishing House: New Delhi, 2017.
3. Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.
4. Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.
5. Basak, A. Environmental Studies; Dorling Kindersley: India, 2009.
6. Dhameja, S. K. Environmental studies; S. K. Kataria and Sons: New Delhi, 2007.
7. Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi, 2006.
8. Brunner, R. C. Hazardous Waste Incineration; McGraw Hill: Michigan, 1989.
9. Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.

10. Trivedy, R. K. Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards; B. S. publications: Hyderabad, 2005.
11. Jadhav, H.; Bhosale, V. M. Environmental Protection and Laws; Himalaya Pub. House: Delhi, 1995.
12. Agarwal, K. C. Environmental Biology; Nidi Publ.: Bikaner, 2001.
13. Bharucha, E. The Biodiversity of India; Mapin Publishing: Ahmedabad, India, 2002.
14. Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia; Jaico Publ. House: Mumbai, 2001.
15. De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.
16. Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.
17. Hawkins, R.E., Encyclopedia of Indian Natural History; Bombay Natural History Society: Bombay, 1987.
18. Heywood, V. H.; Waston, R. T. Global Biodiversity Assessment; Cambridge Univ. Press: Cambridge, 1995.
19. Mckinney, M.L.; School, R.M. Environmental Science systems & Solutions; Web enhanced edition: USA, 1996.
20. Miller, T.G. Jr.; Spoolman, S. E. Environmental Science; Cengage learning: Wadsworth, 2014.
21. Odum, E.P. Fundamentals of Ecology; W.B. Saunders: USA, 1971.
22. Rao, M. N.; Datta, A.K. Waste Water treatment; Oxford & IBH Publ.: New Delhi, 1987.
23. Sharma, B. K., Environmental Chemistry; Goel Publ. House: Meerut, 2001.
24. Townsend, C., Harper, J.; Michael, B. Essentials of Ecology; Blackwell: Oxford, 2008.
25. Trivedi, R. K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II; B. S. Publications, Hyderabad, 2010.
26. Trivedi, R. K.; Goel, P. K. Introduction to air pollution; ABD Publishers: Jaipur, 2003.
27. Wanger, K. D., Environmental Management; W.B. Saunders Co. Philadelphia, USA, 1998

B. TECH. SEMESTER – I (CH/CL/IC/MH)
SUBJECT: WORKSHOP PRACTISE - I (ES114)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
0	0	2	0	0	0	50	50	0	0	1	1

LABORTORY WORKS/SCHEDULE:

Lab	Workshop-I
1	Introduction to Workshop, Basic Workshop types
2	Safety requirement in workshop, Safety rules
3	To Understand “5S" Concept for Workplace
4	Demonstration of Tin smithy Tools and it's exercise
5	To make job for Tin smithy shop
6	Demonstration of Plumbing tools, It’s accessories.
7	To make job for Plumbing shop
8	Introduction to Fabrication shop, Welding Equipment
9	To make job for Fabrication shop
10	Introduction of Machine shop
11	Introduction and Demonstration of Lathe machine.
12	Introduction and Demonstration of Milling and Radial Drilling m/c

TEXT/ REFERENCE BOOKS

1. Work shop technology, A. K. Hajrachaudhari & S. K. Hajrachaudhari
2. ITB Hand book, Engineering industry training board
3. Work shop Technology Vol. I & II, Gupta & Kaushik

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: MATHEMATICS – II (BS203)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	1	0	60	40	0	50	50	3	1	0	4

DETAILED SYLLABUS

1 SERIES SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS BY POWER SERIES METHOD:

Introduction, Validity of series solution of the equation, General Method, Forms of series solution.

2 PARTIAL DIFFERENTIAL EQUATIONS:

Basic Concepts, Classification and Solutions of partial differential equations: Lagrange's linear equation of first order, Non-linear equations of first order-Charpit's method, Homogenous linear equations with constant coefficient to find the complementary functions and the particular integral, Introduction to non-homogenous linear equations with constant coefficients, Method of separation of variables.

3 MULTIVARIABLE CALCULUS (INTEGRATION

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Introduction to Triple integrals (Cartesian), Vector line integrals, Vector surface integrals, Theorems of Green, Gauss and Stoke's.

4 LAPLACE TRANSFORM:

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, finding inverse Laplace transform by different methods, Convolution theorem, Evaluation of integrals by Laplace transform, Solving ODE by Laplace Transform method.

TEXT/REFERENCE BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2. G. B. Thomas and R. L. Finney, Calculus and Analytic geometry,9thEdition, Pearson, Reprint,2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India,2009.

5. S. L. Ross, Differential Equations, 3rd Ed., Wiley India,1984.
6. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications,1958.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.
9. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2008.

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: ENGINEERING GRAPHICS (ES203)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	3	60	40	0	50	150	3	0	1.5	4.5

DETAILED SYLLABUS

1 INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, dimensioning, geometrical construction, layout of drawing sheet

2 CONIC SECTIONS AND PLANE AND SPACE CURVES

Conic Section curves, ellipse, parabola, hyperbola, cycloidal curves (cycloid, epicycloid, hypocycloid), involutes, Archimedean spiral

3 SOLID GEOMETRY

Projection of points, projection of lines and their applications, projection of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus, of right and regular solids inclined to both the planes (prisms, pyramids, cylinder, and cone).

4 ORTHOGRAPHIC AND SECTIONAL ORTHOGRAPHIC PROJECTIONS

Concept of orthographic projections, first-angle and third-angle projection methods, conversion of pictorial views into orthographic projections with dimensioning, and sectional views.

5 ISOMETRIC PROJECTIONS AND VIEWS

Principles of isometric projection, isometric scale, isometric projection and view, conversion of orthographic views to isometric projections and views.

6 DEVELOPMENT OF SURFACES

Introduction, engineering applications of development of surfaces, methods of development, development of surfaces of right regular solids- prism, pyramid, cylinder, and cone.

TEXT/REFERENCE BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah P. J., (2014) Engineering Graphics Vol.1 & 2, S. Chand Publishing

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: BASIC ELECTRONICS (ES204)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	2	60	40	0	50	150	3	0	1	4

DETAILED SYLLABUS

1 TRANSISTOR & CHARACTERISTICS

Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration

2 FIELD EFFECT TRANSISTOR (FET)

Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits

3 TRANSISTOR AMPLIFIERS AND OSCILLATORS

Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift

4 OPERATIONAL AMPLIFIERS AND APPLICATIONS

Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, and inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator, wein bride oscillator.

5 DIGITAL ELECTRONICS FUNDAMENTALS

Difference between analogy and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification, Logic ICs, Implementation of combinational logic - half and full adder/subtractor, multiplexers, de-multiplexers.

6 SENSORS & SIGNAL CONDITIONING CIRCUITS

Types of sensors – pneumatic, electromagnetic, electronic, smart sensors. Diaphragm, bellows and bourdon tube, Resistive, Capacitive, Inductive, ultrasonic, LVDT, piezoelectric, optoelectronic transducers, thermocouple, RTD and thermistors, Application of sensors for flow, level, temperature and stress measurement, Bridge Circuit, Differential Amplifier, Instrumentation Amplifier

TEXT/REFERENCE BOOKS:

1. Principles of Electronics, 11thEdition By: V. K. Mehta & Rohit Mehta Publisher: S. Chand & Company
2. Electrical & Electronic Measurement & Measuring Instruments, 17th Edition By: A.K. Sawhney Publisher: Dhanpat rai
3. M. M. Mano, "Digital logic and Computer design", Publisher : Pearson Education India.

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: MECHANICS OF SOLIDS (ES205)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	**Tut**	**Prac**	**Theory**	**Sess.**	**Prac**	**TW**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
3	0	2	60	40	0	50	150	3	0	1	4

DETAILED SYLLABUS

1 Concept of stress and strain, elasticity, generalized Hooke's law for 3D, concept of isotropy and homogeneity, plane stress and plane strain idealization, axial, volumetric and thermal stresses and strains

2 Transformation of stress and strain at a point, Principal stresses and strains, Mohr's Circle, strain rossete

3 Mechanical properties of metals – elasticity, plasticity, strain hardening, hardness, toughness, fatigue, strain energy

4 Force-strain-deformation analysis for axial load, flexure, shear and torsion

TEXT/REFERENCE BOOKS:

1. Strength of Materials: Part– I and II, Stephen Timoshenko, 3rd Edition, CBS Publisher, 2002.
2. Strength of Materials, Sadhu Singh, 1st Edition, Khanna Book Publishing Company, 2016.
3. Advanced Mechanics of Solid, L. S. Srinath, 3rd Edition, McGraw Hill Publication, 2017.
4. Engineering Mechanics of Solids, E P Popov, 2nd Edition, Prentice Hall India Learning Pvt. Ltd, 2002.

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: CHEMISTRY (BS204)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS:

1 ATOMIC AND MOLECULAR STRUCTURE

Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

2 SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

3 INTERMOLECULAR FORCES AND POTENTIAL ENERGY SURFACES

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

4 USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

5 PERIODIC PROPERTIES

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

6 STEREOCHEMISTRY

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

7 ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecules.

TEXT/REFERENCE BOOKS

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins (vi)Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: WORKSHOP PRACTISE – II (ES206)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
0	0	3	0	0	0	50	50	0	0	1.5	1.5

LABORTORY WORKS/SCHEDULE:

Lab	Workshop-II
1	Introduction to Carpentry Shop, application of various carpentry tools
2	Demonstration of Carpentry Job 1 & 2
3	To make Job 1 for Carpentry shop
4	To make Job 2 for Carpentry shop
5	Introduction to Black smithy shop and Demonstration of it's job
6	To make Job for Black smithy shop
7	Introduction to Fitting shop, to understand application of various tools of this shop
8	Demonstration of Fitting Job
9	To make job for Fitting shop
10	To make job for Fitting shop
11	Assignment for Carpentry shop
12	Assignment for Fitting shop

TEXT/ REFERENCE BOOKS

1. Work shop technology, A. K. Hajrachaudhari & S. K. Hajrachaudhari
2. ITB Hand book, Engineering industry training board
3. Work shop Technology Vol. I & II, Gupta & Kaushik

B. TECH. SEMESTER – II (CH/CL/IC/MH)
SUBJECT: YOGA AND WELLNESS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	**Tut**	**Prac**	**Theory**	**Sess.**	**Prac**	**TW**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
2	0	2	40	0	50	0	90	2	0	1	3

COURSE OVERVIEW

Yoga and wellness techniques such as meditation and pranayama can offer numerous benefits to individuals in various professions including engineers. Stress reduction, improved focus and concentration, enhanced creativity, better physical health, improved emotional well-being, enhanced problem-solving skills, increased energy levels, better work-life balance, cultivation of patience, etc. are some of the significant advantages of this ancient and globally popular Indian knowledge base. By incorporating this course on yoga and wellness techniques such as meditation and pranayama techniques, physical well-being, mental clarity, emotional resilience, and overall all-round performance enhancement are aimed. The course aims to help engineers manages stress, foster creativity, and maintain a healthy work-life balance.

DETAILED SYLLABUS

1 YOGA AND MEDITATION

Concept/Introduction of Yoga

Types of Yoga, Brief about different Yoga, Kundalini Yoga-Subtle System, Energy centers & Channels, Sahaja Yoga – Unique revolution of modern time in yoga. Concept/Introduction of Meditation: Definition, Thoughtless awareness, Levels of Consciousness, Practical session

2 YOGA AND INNER PERSONALITY

Stress Management, Holistic Healthcare, Addiction free life, General Health Concept.

TEXT/REFERENCE BOOKS

1. Maharshi Patanjali, Yog Darshan, Gita Press Gorakhpur Publication
2. Yogi Svatmarama, The Hatha Yoga Pradipika, Motilal Banarsidaas Publishers
3. Swami Ramdev, Yog: Its Philosophy and Practice, Divya Publication
4. Swami Ramdev, Pranayama Rahasya, Divya Publication

B. TECH. SEMESTER – III
SUBJECT: NUMERICAL TECHNIQUES (BS308)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

DETAILED SYLLABUS:

1 ERROR ANALYSIS

Significant figures, accuracy and precision, error definitions, round-off errors, truncation errors, Taylor series, total numerical error, blunders, formulation errors, and data uncertainty

2 ROOTS OF EQUATIONS

Introduction, bracketing methods: bisection method and false-position method, open methods: Newton-Raphson method, Secant and Modified Secant method, roots of polynomials

3 ALGEBRAIC EQUATIONS

Introduction, numerical solutions of linear algebraic equations: Cramer's rule, Gauss elimination method, numerical solution of nonlinear equations: Gauss-Jordan method, LU decomposition, special matrices: tridiagonal matrices analysis, Cholesky decomposition, Iterative methods: Gauss-Seidel method and Jacobi's method

4 CURVE FITTING AND INTERPOLATION

Introduction, least square regression: linear regression, polynomial regression
Introduction, Newton's forward and backward difference interpolation, Lagrange interpolation, inverse interpolation, spline interpolation

5 NUMERICAL DIFFERENTIATION AND INTEGRATION

Introduction, high accuracy differentiation formulas: forward, backward and central difference method, Richardson extrapolation, Newton-Cotes integration formulas: trapezoidal and Simpson's rule.

6 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS AND PARTIAL DIFFERENTIAL EQUATIONS

Introduction, initial value problems: Euler's method, Heun's method, fourth order Runge-Kutta method, multistep methods: Milne's method and Adam's method
Elliptic equations: Laplace difference equation, Liebmann's iterative method, boundary conditions, parabolic equations: implicit method, explicit method, the Crank Nicolson method

TEXT/REFERENCE BOOKS

1. Numerical Methods for Engineers, Steven C. Chapra, Raymond P. Canale, Tata McGraw Hill
2. Numerical Methods, E Balagurusamy, Tata McGraw Hill

3. Applied Numerical Analysis, Curtis F. Gerald, Patrick O. Wheatley, Addison Wesley, Pearson
4. Numerical Methods in Engineering and Science, Grewal. B.S. and Grewal. J.S., Khanna Publishers, New Delhi
5. Applied Numerical Methods Using MATLAB, W.Y. Yang, W. Cao, T.S. Chung and J. Morris, Wiley India Edition
6. Numerical Methods for Engineers, S. K. Gupta, New Age International Publishers

B. TECH. SEMESTER – III
SUBJECT: ELECTRICAL MACHINES AND DRIVES (ES301)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

DETAILED SYLLABUS:

1 TRANSFORMERS & ITS SWITCHGEARS

General aspects, basic definition, working principle of transformer, types of transformers, transformer construction: core/shell/spiral transformers, transformers on no load & on load, vector diagrams, equivalent circuit, losses and condition for maximum efficiency, all day efficiency, Sumpner's test, conditions for parallel operation, introduction to 3-phase transformer, construction, instrument transformers, Relay, circuit breaker and isolator, fuses

2 ALTERNATOR

Introduction, constructional details, types, armature winding, EMF equation, factor affecting size of alternator, alternator operation on load, voltage regulation, losses and efficiency, parallel operation of alternators, armature reaction, damper winding

3 DC GENERATOR

Classification, working principle of generator, construction of DC Machines, types of DC generator, open circuit characteristic, external characteristic and internal characteristic of DC generator, efficiency and power stages with example, condition for maximum efficiency

4 DC MOTORS

Construction, types, principle of operation, torque equation, losses and efficiency, speed torque characteristics of shunt, series and compound motor, D.C. shunt motor 3–point starter, speed control of D.C. shunt and series motors, Stepper motor, Single line diagrams of DC motors

5 SINGLE PHASE, THREE-PHASE INDUCTION MOTOR & ITS SWITCHGEARS

Construction, principle of operation, production of magnetic field, comparison between three phase and single-phase induction motors, speed and slip, rotor current, relation between rotor copper loss and rotor input, torque of an induction motor, torque slip curve, losses and efficiency, starters for three phase induction motor, speed control of three phase induction motor, single line diagram of induction motor

6 INTRODUCTION TO DRIVES

Introduction to Thyristor, Insulated Gate Bipolar transistors (IGBTs), Power MOSFET, general configuration of a motor drive, matching power electronic converter and motor, thyristor controlled single phase and three phase converter drive, modes of operation, block diagram and DC drive examples

TEXT/REFERENCE BOOKS

1. Power systems, V. K. Mehta, S. Chand publication
2. Principles of power systems, V.K. Mehta, S. Chand publication
3. Electrical Technology- Vol. II, B. L. Theraja, S. Chand publication
4. A course in power systems, J. B. Gupta, S. K. Kataria Publication
5. Electrical power systems, S. L. Upal, Khanna Publishers
6. A course in Electrical Power, P. V. Gupta, M. L. Soni, U. S. Bhatnagar, Dhanpat Rai & Co.
7. Theory & Performance of Electrical Machines, J. B. Gupta, Katson books
8. Power Electronics, P.S. Bimbhra, Khanna Publishers

B. TECH. SEMESTER – III
SUBJECT: FLUID MECHANICS (MH309)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

Reference Code ME203A

DETAILED SYLLABUS:

1 FLUID PROPERTIES AND PRESSURE MEASUREMENT

Properties of fluid: Mass Density, specific weight, specific gravity and specific volume, Types of fluid, Newton's law of viscosity, continuum concept of a fluid, viscosity, surface tension and capillarity, vapor pressure, cavitation, compressibility, Pressure, Pascal's law, hydrostatic law, hydrostatic paradox, absolute and gauge pressures, measurement of pressure, manometers: simple and differential manometers

2 FLUID STATICS

Total pressure force and center of pressure, hydrostatic force on submerged surfaces -horizontal, inclined, vertical and curved surfaces, buoyancy, stability of floating body and submerged body, metacenter, analytical method to determine meta-centric height

3 FLUID KINEMATICS

Langrangian approach and Eulerian approach, types of flow, streamline, stream tube, path line and streak line, continuity equation, continuity equation in differential form for cartesian coordinate system, local and convective acceleration, translation, rotation and deformation of fluid element, rotation and vorticity, stream function and velocity potential function, stream lines and equipotential lines, relation between stream function and velocity potential, flow nets

4 FLUID DYNAMICS

Newton's Laws of Motion, Euler's Equation, Bernoulli's Equation, venturimeter, orifice meter and pitot tube, impulse-momentum equation and its application, moment of momentum equation, vortex flow, forced and free vortex flow, equation of motion for vortex flow, equation of forced and free vortex flow, dimensionless parameters and their significance, Dimensional analysis.

5 VISCOUS FLOW

Concepts of laminar and turbulent flows, Reynolds number and Reynold's experiment, exact solution of Navier -Stokes equation for simple flows, relation between shear stress and pressure gradient, concept of developing and fully developed flow, Flow of viscous fluid in circular pipes - Hagen-Poiseuille law, laminar flow between parallel plates for moving and stationary plates

6 FLOW THROUGH PIPES

Loss of energy in pipes, friction factor, Moody's Chart, Darcy Weisbach Equation, major and minor losses in pipes, hydraulic gradient lines and total energy line, pipes connected in series and parallel, equivalent pipe, branched pipes, flow through orifices and mouthpieces

TEXT / REFERENCE BOOKS

1. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Prakashan
2. Fluid Mechanics and Fluid Power Engineering, D.S. Kumar, S. K. Kataria & Sons
3. Fluid Mechanics, Yunus A. Cengel, McGraw Hill Publication
4. Fluids Mechanics, F.M. White, McGraw-Hill Inc
5. Fluid Mechanics and Hydraulic Machines, Sukumar Pati, McGraw-Hill Inc
6. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som., G. Biswas, Tata McGraw Hill Co. Pvt. Ltd

B. TECH. SEMESTER – III
SUBJECT: MATERIAL SCIENCE AND METALLURGY (MH311)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

DETAILED SYLLABUS:

1 STRUCTURE OF MATERIALS

Crystalline structure of solids, crystalline materials vs amorphous materials, concept of unit cell and space lattice, lattice parameters, Miller indices, crystal structure of ferrous and non-ferrous metals, crystal imperfections, atomic packing factors for various cubic systems, Bragg's law

2 MECHANICAL PROPERTY AND MEASUREMENTS

Tensile, compression and torsion test, Young's modulus, relations between true and engineering stress-strain curves, generalized Hook's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery, Hardness: Rockwell, Brinell and Vickers and their relation to strength

3 PHASE DIAGRAM AND IRON-CARBON EQUILIBRIUM DIAGRAM

Alloys, substitutional and interstitial solid solutions, phase diagrams, interpretation of binary phase diagrams and microstructure development, eutectic, peritectic, peritectoid, and monotectic reactions. Iron- Iron carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrite and cementite, cast iron

4 STEELS AND HEAT TREATMENTS

Introduction and purpose of heat treatments, classification of heat treatment processes, annealing, tempering, normalising and spheroidising, isothermal transformation diagram for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructure and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening. Property variation with microstructure, classification and application of steels, transformation product of austenite, TTT and CCT curves, critical cooling rate. Introduction and applications of various case hardening and surface hardening treatments

5 FERROUS-NON-FERROUS ALLOYS, COMPOSITES & OTHER NON-METALS

Classification of steels, alloying of steels, properties of various stainless steels and tool steels, designation of steels. Cast irons; grey, white, malleable and spheroidal cast irons. Copper and copper alloys, brasses, equivalent zinc in brasses, season cracking of brasses, aluminium bronzes, tin bronzes, beryllium bronzes, silicon bronzes, copper nickel alloys, aluminium and aluminium alloys, nickel and nickel alloys, bearing materials, Ceramic materials, polymers, composites, particles-

reinforced composites, fiber reinforced composites, Material standards and its equivalency (ISO, ASTM, DIN, JIS).

6 NON-DESTRUCTIVE TESTING

Introduction to non-destructive testing, radiography testing, dye penetration testing, magnetic particle testing, ultrasonic testing, Jominy end quench test, macro-examination, spark test, macro-etching, microscopic examinations, electron microscopy, magnetic testing, chemical analysis of steel and iron, NDT certification and its applicability to industry.

TEXT / REFERENCE BOOKS

1. Material Science & Engineering, V. Raghvan, PHI Learning Pvt Ltd.
2. Introduction to Physical Metallurgy, Sidney H Avner, Tata Mcgraw-Hill
3. Material Science and Engineering, W. Callister, Willey Publication
4. The science and engineering of Materials, Donald Askland and Pradeep Phule, Wadsworth Publishing.
5. Material Science and Metallurgy for Engineers, V.D. Kodgire, Everest Publishing House
6. Elements of Material Science and Engineering, Lawrence Vlack, PEARSON
7. Physical Metallurgy for Engineers, Donald S Clark & Wilbur R Varney, East-west press pvt Ltd.

B. TECH. SEMESTER – III
SUBJECT: KINEMATICS OF MACHINES (MH310)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	1	2	7	5	60	40	25	25	150

DETAILED SYLLABUS:

1 MECHANISM AND MACHINES

Terminology and definitions, mechanism & machines. rigid and resistance body, link, kinematic pair types of motion, degrees of freedom, classification of Kinematic pairs, kinematic chain, linkage, kinematic inversions of single and double slider crank chain, four bar chain mechanism with lower pairs, straight line mechanism and approximate straight-line mechanism, quick return mechanisms, Steering gear mechanisms

2 VELOCITY ANALYSIS

Vectors, displacement of a rigid body, relative displacement, definition of velocity, angular velocity, rotation of a rigid body, translation and rotation of a rigid body, relative velocity method, instantaneous axes of motion, properties of instantaneous centers, the Aronhold Kennedy theorem of three centers, velocity analysis by instantaneous centers.

3 ACCELERATION ANALYSIS

Definition of acceleration, angular acceleration, a general case of acceleration, radial and transverse components of acceleration, the Coriolis component of acceleration, examples of Acceleration analysis, acceleration diagrams

4 BELTS, ROPES & CHAIN DRIVES

Introduction, belt and rope drives, open and crossed belt drives, velocity ratio, slip, materials for belt and ropes, law of belting, length of belt, ratio of friction tensions, power transmitted, centrifugal effect on belts, maximum power transmitted by a belt, initial tension, creep, chain drive-chain length, angular speed ratio, classification of chains

5 GEARS & GEAR TRAINS

Introduction, classification of gears, gear terminology, law of gearing, velocity of sliding, forms of teeth, cycloidal profile teeth, involute profile teeth, comparison of cycloidal and involute tooth forms, birth of contact, arc of contact, number of pairs of teeth in contact, interference in involute gears, minimum number of teeth, interference between rack and pinion, undercutting, introduction to helical, spiral, worm and bevel gears

6 CAMS

Introduction, types of cams, types of followers, cam terminology, displacement diagrams, motions of the follower, graphical construction of cam profile

TEXT / REFERENCE BOOKS

1. Theory of Machines, S. S. Rattan, Tata McGraw-Hill Publishing Co. Ltd New Delhi
2. Theory of Machines, P. L. Ballaney, Khanna Publishers, New Delhi
3. Theory of Machines and Mechanisms, Joseph Shigley and John Uicker, Jr., McGraw Hill
4. Theory of Mechanisms & Machines, Amitabha Ghosh & Ashok Mallik, Affiliated East-West Press Pvt. Ltd
5. Theory of Machines, Thomas Bevan, CBS publishers and distributors
6. Theory of Machines, Sadhu Singh, Pearson Education
7. Mechanism and Machine Theory, J.S. Rao and R.V. Dukkipati, New Age International Publisher
8. Kinematics & Dynamics of Machinery, Charles Wilson & J. Peter Sadler, Pearson Education

B. TECH. SEMESTER – III
SUBJECT: ENGLISH (HS302)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
2	0	2	4	3	40	0	50*	0	90

DETAILED SYLLABUS:

1 VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

2 BASIC WRITING SKILLS

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

3 IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

4 NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

5 WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

6 ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

TEXT / REFERENCE BOOKS

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

B. TECH. SEMESTER – IV
SUBJECT: APPLIED THERMODYNAMICS (MH416)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

DETAILED SYLLABUS:

1 EXERGY: WORK POTENTIAL OF ENERGY

Overview of laws of thermodynamics, exergy associated with kinetic and potential energy, reversible work and irreversibility, second law efficiency

THERMODYNAMIC RELATIONS

Maxwell relations, Clapeyron equation, Clausius-Clapeyron equation

2 GAS POWER CYCLE

Basic considerations in the analysis of power cycles, air-standard cycles: assumptions, Otto cycle, diesel cycle, dual cycle and their comparison, simple Brayton cycle and its modification-intercooling, reheating and regeneration

3 VAPOUR POWER CYCLES

The Carnot vapour power cycle, simple Rankine cycle and its energy analysis, modified Rankine cycle: superheating, reheating and regeneration

4 FUELS AND COMBUSTIONS

Calorific values of fuel, requirements of good fuel, proximate and ultimate analysis of fuel, theoretical determination of calorific value using Dulong's formula, air requirement for combustion, boiler performance

5 REFRIGERATION CYCLE

Reversed Carnot cycle, Joule-Thompson effect, analysis of ideal vapour compression refrigeration cycle, actual vapour Compression refrigeration cycle, refrigerants and its properties, selection, air refrigeration (Bell-Coleman) cycle

6 PSYCHROMETRY AND AIR-CONDITIONING

Psychrometric properties and processes, adiabatic saturation temperature, psychrometric chart, human comfort and industrial air-conditioning

TEXT / REFERENCE BOOKS

1. Thermodynamics- An engineering approach, Yunus A. Cengel, Michael A. Boles., Tata McGraw Hill publishing co. ltd.
2. Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill publishing co. ltd.
3. Fundamental of thermodynamics, Sonntag. R.E., Borgnakke C. and Van Wylen G.J, John Wiley and Sons.
4. Fundamentals of engineering thermodynamics, Moran M.J. and Shapiro H.N., John Wiley and Sons.

B. TECH. SEMESTER – IV
SUBJECT: ADVANCE SOLID MECHANICS (MH414)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	2	5	4	60	40	25	25	150

DETAILED SYLLABUS:

1 STRESSES AND STRAINS IN THREE DIMENSIONS

Solid mechanics approaches, concept of continuum, homogeneity and isotropy, types of forces on a body, state of stress at a point, rectangular stress components, stress sign convention, equality of cross shear, traction on an arbitrary surface, principal stresses and planes, stress invariants, hydrostatic and deviatoric stress tensor, Mohr's circle for general state of stress, octahedral planes and stresses, differential equation of equilibrium

Difference between displacement and deformation, strain at a point, strain displacement relationship, engineers and mathematician's strain tensors, rigid body rotation, cubical dilatation, principal axes of strain and principal strain, strain deviator, strain invariants, compatibility conditions, stress-strain relationship and elastic constants required for different types of materials, stress strain relationship for isotropic material, plane stress and plane strain

2 THEORIES OF ELASTIC FAILURE UNDER STATIC LOADING

Concept of factor of safety, factors affecting factor of safety, maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear strain energy theory, region of safety for all theories

3 THICK CYLINDERS AND BENDING OF CURVED BARS

Cylinder Classification, design of thick cylinders, Lame's theory, Design based on various failure theories, cylinders subjected to external pressure, Methods of prestressing of cylinders

Introduction, Stresses in curved bars (Winkler-Bach theory) (Rectangular section, Circular section, Triangular section, Trapezoidal section, T-Section)

4 COLUMNS AND STRUTS

Classification of columns, strength of columns, end conditions and equivalent length, Euler's formula, Rankine's hypothesis

5 SLOPE AND DEFLECTION OF BEAMS

Introduction, Beam deflection, relation between slope, deflection and radius of curvature, slope and deflection at a section by various methods

6 STRESSES DUE TO ROTATION

Stresses in rotating ring, stresses in rotating thin solid and hollow disc, stresses in thin disc with a pin hole, disc of uniform strength

TEXT / REFERENCE BOOKS

1. Advanced Mechanics of Solids, L. S. Srinath, Tata McGraw Hill
2. Strength of Materials, R. K. Rajput, S. Chand & Co. Ltd.
3. Solid Mechanics, S. M. A. Kazimi, Tata McGraw Hill
4. Strength of Materials, D. S. Bedi, Khanna book publishing co. Pvt ltd.
5. Elements of Strength of Materials, Timoshenko S. P. and Young D.H., East-West Press Pvt. Ltd.
6. Mechanics of Materials, Timoshenko and Gere, CBS Publishers
7. Mechanics of Structures, S. B. Junarkar, Charotar Publishers

B. TECH. SEMESTER – IV
SUBJECT: MANUFACTURING TECHNOLOGY-I (MH415)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	0	4	7	5	60	40	25	25	150

DETAILED SYLLABUS:

1 SAND CASTING PROCESS

Principal of casting process, different types of patterns, pattern materials, pattern allowances, pattern colours, types of sand, moulding materials and core, moulding processes, melting practice and metal pouring, gating system design, fettling process and casting defects

2 SPECIAL CASTING PROCESSES

Gravity die casting, pressure die casting, centrifugal casting, investment casting, continuous casting, vacuum casting, squeeze casting, comparison with conventional sand casting process

3 LATHE MACHINE

Function, working principle, classification, specifications, main parts, feed mechanism, lathe accessories, lathe operations, cutting tool materials, tool geometry of single point cutting tool, cutting Parameters: speed, feed and depth of cut, machining time, material removal rate, specification of lathe machine, capstan and turret lathe, working principle, parts

4 MILLING, SHAPER AND PLANNER MACHINE

Working principle, main parts, classification of milling machines, specification, milling machine mechanism, work holding devices, cutter holding devices, different milling cutters, tool geometry of plain milling cutter, milling operations, cutting parameters, machining time, milling attachments, principle of indexing, types of indexing

Function of shaper, working principle, classification, main parts, driving mechanism of shaper, feed mechanism of shaper, different operations on shaper machine, cutting parameters: speed, feed and depth of cut, machining time, specification of shaper machine

Working principle of planer, classification, difference between shaper and planer, planner operations, specification of planner machine

5 DRILLING, BORING AND GRINDING MACHINE

Working principle of drilling, classification, main parts, specification, different operations on drilling, machining time

Working principle & types of boring machines, boring tools

Working principle, main parts, classification of grinding machines, specification, Grinding operations, types of grinding wheels, wheel marking, truing, glazing, loading

6 INTRODUCTION TO ADDITIVE MANUFACTURING

Additive manufacturing – basics, processes and applications

TEXT / REFERENCE BOOKS

1. Element of Workshop Technology, S. K. Hajra Choudhury,Vol. 1, Media Promoters and publishers Pvt.
2. Element of Workshop Technology, S. K. Hajra Choudhury,Vol. 2, Media Promoters and publishers Pvt.
3. Foundary Technology, O. P. Khanna, Dhanpat Rai Publication
4. A course in Workshop Technology, B.S.Raghuwanshi, Dhanpat Rai & Sons, Delhi
5. Elements of Lathe work, B.Brushtein and V.Dementyev, Peace Publishers, Moscow
6. Manufacturing Engg. And Technology, S. Kalpakajain, PHI/Pearson
7. H.M.T, "Production Technology", Tata McGraw Hill
8. Manufacturing Processes for Engineering Materials, Kalpakjain S. and Schmid Steven R., Pearson Publication
9. Workshop Technology Vol. I, II & III, Chapman
10. Manufacturing Technology – 1 Foundary, Forming and Welding, P. N. Rao

B. TECH. SEMESTER – IV
SUBJECT: DYNAMICS OF MACHINE (MH413)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
3	1	2	5	5	60	40	25	25	150

DETAILED SYLLABUS:

[1] STATIC FORCE ANALYSIS

Introduction, conditions of static equilibrium, equilibrium of different members, free body diagrams, principle of super position, static force analysis of various mechanism, principle of virtual work, static force analysis with friction

[2] DYNAMIC FORCE ANALYSIS

Introduction, D–Alembert's principle, equivalent offset inertia force, dynamic analysis of simple mechanisms, combined static and inertia force analysis of different mechanisms, dynamic force analysis of reciprocating engine: inertia of reciprocating mass and connecting rod, dynamically equivalent system

[3] FLYWHEEL

Introduction, function, turning-moment diagrams, fluctuation of energy, dimensions of flywheel rims

[4] BALANCING

Introduction, static balancing, dynamic balancing of several masses in different planes, balancing of reciprocating and rotary masses

[5] GOVERNORS

Introduction, different types of governors, various terminologies, effort and power of a governor, controlling force

[6] GYROSCOPE

Concept of gyroscope, angular velocity, angular acceleration, gyroscopic couple, gyroscopic effect on aviation, marine and automobiles

TEXT / REFERENCE BOOK

1. Theory of Machines, S S Rattan, Tata McGraw Hill.
2. Theory of Machines, R. S. Khurmi and J. K. Gupta, S. Chand and Company Ltd.
3. Theory of Machines and Mechanisms, Joseph Shigley and John Uicker, Jr., McGraw Hill.
4. Theory of Mechanisms & Machines, Amitabha Ghosh & Ashok Mallik, Affiliated East-West Press Pvt. Ltd.
5. Kinematics & Dynamics of Machinery, Charles Wilson & J. Peter Sadler, Pearson Education.

6. Dynamics of Machinery, Farazdak Haideri, Nirali Publication.
7. Mechanism and Machine Theory, J.S. Rao and R.V. Dukkipati, New Age International Publisher

B. TECH. SEMESTER – IV

SUBJECT: MACHINE DRAWING AND INDUSTRIAL DRAFTING (MH417)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	Tut	Prac	Total	Credits	Ext	Sess.	TW	Prac	Total
0	0	4	4	2	0	0	25	25	50

DETAILED SYLLABUS:

PART A: MACHINE DRAWING

1 FUNDAMENTALS OF MACHINE DRAWING

Introduction to Machine drawing, conventional representations of various machine elements such as threaded parts, bearing, gears, spring, etc. conventional representation of part materials, standard abbreviations.

2 DETACHABLE FASTNERS

Introduction, screw thread nomenclature, forms of thread, thread designation, drawing representations of threads: normal, schematic and conventional. part drawing exercises of threaded fasteners such as bolts, nuts, screws, studs, nut locking arrangements

3 PERMANENT FASTNERS

Rivets and riveted joints, BIS symbols for riveted joints. types of welded joints, BIS symbols for welded joints. drawing exercises for representation of riveted joints and welded joints

4 ASSEMBLY DRAWING

Detail drawing of machine components. assembly drawings of various machines, mechanisms and equipment such as cotter joint, knuckle joint, flange coupling, universal coupling, screw jack etc. from detail drawings, sketches and actual machine components

5 PRODUCTION DRAWING

Introduction to limits, fits, dimensional tolerance, surface roughness and their drawing representation. Geometric dimensioning and tolerancing: basic terminology, indication of geometric tolerance in drawing

PART B: COMPUTER AIDED DRAFTING

1 DRAWING OBJECTS

Starting with AutoCAD, AutoCAD dialog boxes, co-ordinate Systems, drawing line, circle, arc, rectangle, ellipse, polygons

2 EDITING SKETCHED OBJECTS

Editing sketches, moving, copying, pasting, offsetting, scaling, chamfering, trimming, mirroring. filleting, sketched objects

3 DIMENSIONING

Giving dimensions and annotations to drawings, creating linear, rotated, angular, aligned, base line dimensions, modifying dimensions, showing surface roughness symbols, weld symbols, dimensional tolerances, geometric tolerances

4 PLOTTING

Plotting the drawings in AutoCAD, plotting drawing using the plot dialog box, adding plotters and using plot styles, plotting sheets

5 DRAWING EXERCISES WITH AUTOCAD

Orthographic drawing and Isometric drawing of objects, drawing of machine parts, detail and assembly drawing of machines

6 3D MODELING

Creating a 3D model of any object using AutoCAD, generating drawings from the 3D model.

TEXT / REFERENCE BOOK

1. Machine Drawing, K. L. Narayana, P. Kannaiah, K. Venkata Reddy, 3rd edition, New age international (P) Ltd.
2. Machine Drawing, Basudeb Bhattacharyya, Oxford University Press
3. Machine Drawing, N. D. Junnarkar, Pearson Education Pvt. Ltd
4. Machine Drawing - P.S. Gill, S.K. Kataria & Sons New Delhi.
5. Machine Drawing - N. Sidheshwar, P. Kannaiah. McGraw-Hill India.
6. Engineering Drawing Practice for Schools and Colleges SP 46: 2003- BIS (Bureau of Indian Standards).
7. AutoCAD 2017 for Engineers & Designers- Prof. Sham Tickoo. Dreamtech Press.
8. Design of Machine Elements - V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd.
9. A text book of Machine Design - P. C. Sharma, D. K. Aggarwal, S. K. Kataria & Sons.
10. PSG Design data book.

B. TECH. SEMESTER – IV
SUBJECT: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (MH418)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	**Tut**	**Prac**	**Total**	**Credits**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**
1	0	2	3	2	0	0	100*	0	100

DETAILED SYLLABUS:

1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Meaning and definition of artificial intelligence, Physical Symbol System Hypothesis, production systems, Characteristics of production systems; Breadth first search and depth first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search.

2 KNOWLEDGE REPRESENTATION

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, logical consequences, syntax and semantics of an expression. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction.

3 NATURAL LANGUAGE PROCESSING & VISUAL PERCEPTION

Language & its comprehension, reading, understanding conversation and essays. Language context, language in a social context, Introduction to problem solving, decision making and reasoning, Visual perception from sensation to representation, approaches to perception, perception of object sand forms, role of environment in seeing, deficits in perception, and perception in practice. Automatic and controlled processes in attention.

4 INTRODUCTION TO MACHINE LEARNING

Preliminaries, what is machine learning; varieties of machine learning, learning input/output functions, sample application. Boolean functions and their classes, CNF, DNF, decision lists. Version spaces for learning, version graphs, learning search of a version space, candidate elimination methods

TEXT / REFERENCE BOOK

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill
2. Introduction to AI & Expert System: Dan W.Patterson, PHI
3. Introduction to Machine learning, Nils J.Nilsson
4. Introduction to Machine Learning with Python A guide for data scientists, Andreas, C. Muller & Sarah Guido, O'Reilly

5. Artificial Intelligence by Luger (Pearson Education)
6. Machine learning for dummies, IBM Limited ed, by Judith Hurwitz and Daniel Kirsch
7. Russel & Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.

B. TECH. SEMESTER – IV
SUBJECT: UNIVERSAL HUMAN VALUES (HS401)

Teaching Scheme (Hours/week)					Examination Scheme				
Lect	Tut	Prac	Total	Credits	Ext	Sess.	TW	Prac	Total
3	0	0	3	3	60	0	0	0	60

DETAILED SYLLABUS:

1 COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

Purpose and motivation for the course, recapitulation from Universal Human Values-I, self-Exploration–what is it?-Its content and process; 'Natural Acceptance' and experiential validation-as the process for self-exploration, continuous happiness and prosperity-A look at basic human aspirations, right understanding, relationship and physical facility-the basic requirements for fulfillment of aspirations of every human being with their correct priority, understanding happiness and prosperity correctly-a critical appraisal of the current scenario, method to fulfill the above human aspirations: understanding and living in harmony at various levels

2 UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', understanding the needs of Self ('I') and 'Body'- happiness and physical facility, understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer), understanding the characteristics and activities of 'I' and harmony in 'I' , understanding the harmony of I with the body: sanyam and health; correct appraisal of physical needs, meaning of prosperity in detail, programs to ensure sanyam and health

3 UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP

Understanding values in human-human relationship; meaning of justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; trust and respect as the foundational values of relationship, understanding the meaning of trust; difference between intention and competence, understanding the meaning of respect, difference between respect and differentiation; the other salient values in relationship, understanding the harmony in the society (society being an extension of family): resolution, prosperity, fearlessness (trust) and co-existence as comprehensive human goals, visualizing a universal harmonious order in society- undivided society, universal order- from family to world family

4 UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE

Understanding the harmony in the nature, interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in

nature, understanding existence as co-existence of mutually interacting units in all pervasive space, holistic perception of harmony at all levels of existence, include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

5 IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, definitiveness of ethical human conduct, basis for humanistic education, humanistic constitution and humanistic universal order, competence in professional ethics: a. ability to utilize the professional competence for augmenting universal human order b. ability to identify the scope and characteristics of people friendly and eco-friendly production systems c. ability to identify and develop appropriate technologies and management patterns for above production systems, case studies of typical holistic technologies, management models and production systems, strategy for transition from the present state to universal human order: a. at the level of individual: as socially and ecologically responsible engineers, technologists and managers b. at the level of society: as mutually enriching institutions and organizations

TEXT / REFERENCE BOOK

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan
3. Human Values, A.N. Tripathi, New Age Intl. Publishers

B. TECH. SEMESTER – V
SUBJECT: MEASUREMENT AND METROLOGY (MH515)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 BASIC CONCEPT OF MEASUREMENT

Introduction, Methods of measurement, Standards, Calibration, General measurement system, Operational description of a measurement system, Accuracy and Precision, Types of errors, Sources of errors, Statistical analysis of data, Static performance characteristics, Dynamic performance characteristics, transducers

2 MEASUREMENT OF PRESSURE AND TEMPERATURE

Measurement of Pressure: Introduction, Methods of measuring pressure, Dead weight gauge tester, McLeod gauge, Pressure measurement with elastic transducers, Manometers, Measurement of Vacuum.

Measurement of Temperature: Introduction, Thermometer, Resistance temperature detector, thermocouple, thermistor, Optical pyrometer

3 FLOW MEASURMENT TECHNIQUES AND MISCELLANEOUS MEASUREMENT

Flow measurement: Introduction, Types of flow measuring instruments, Quantity meter, Ultrasonic flow meter, Flow measurement by drag effect (Rotameter), Hot wire anemometers.

Miscellaneous measurements: Basic methods of force measurements, Torque measurement on rotating shaft, Prony brake and eddy current dynamometers, Strain measurements, Types of strain gauges, Electrical resistant strain gauges, Gauge factor of strain gauge, Rosettes.

4 LINEAR AND ANGULAR MEASUREMENT

Introduction, Need of inspection, Standards of Measurements, Steel Rule, Calipers, Surface plate, V block, Radius gauges, Feeler gauges, Screw pitch gauges, Angle gauges, Vernier Caliper, Vernier height gauge, Vernier depth gauge, Outside micrometer, Inside micrometer, Micrometer with interchangeable anvils, Vernier micrometer, Slip gauges, Universal Bevel Protector, Sine Principle and Sine Bars, Dial gauges, Comparators.

5 LIMITS, FITS, GAUGE DESIGN AND MEASUREMENT OF GEOMETRIC SHAPES

Introduction, Tolerances, Types of fits, Types of gauges, Taylor's principle of gauge design, Gauge tolerance, Allocation of gauge tolerance, Wear allowance, Straightness, Test for straightness by using Spirit level and Auto- collimator, Flatness Testing, Parallelism, Squareness, Measurement of circularity, Surface roughness measurement.

6 METROLOGY OF GEAR AND SCREW THREAD AND MODERN MEASUREMENT TECHNIQUES

Introduction, Screw thread terminology, Measurement of various elements of screw thread, Basic elements of gear, Measurement of various elements of spur gear.

Modern Measurement Techniques: Coordinate measuring machine, Machine vision, Universal measuring machine.

TEXTBOOKS/ REFERENCE BOOKS

1. Mechanical Measurement and Control by D. S. Kumar, Metropolitan, New Delhi
2. Metrology by M. Mahajan, Dhanpat Rai & Co.
3. Mechanical Measurements and Instrumentation and Control by A. K. Sawhney & Puneet
4. Sawhney, Dhanpat Rai & Co.
5. Engineering Metrology by R. K. Jain, Khanna publisher
6. Mechanical Measurement by R. S. Sirohi & H. C. Raha Krishna, Wiley Eastern Limited
7. Engineering Metrology by D. M. Anthony, Pergamon Press
8. The Metrology Hand Book by J. L. Bucher, American Society for Quality, 2004
9. Measurement Systems: Application and Design by E.O. Doebelin, McGraw Hill

B. TECH. SEMESTER – V
SUBJECT: HEAT AND MASS TRANSFER (MH514)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 BASIC CONCEPTS

Thermodynamics vs. Heat transfer, Modes of Heat transfer, Basic laws of heat transfer: Fourier's law, Newton's law, Stephen Boltzmann law, Steady and unsteady state of heat transfer, Thermal resistance, Thermal conductivity of material, General heat conduction equation in Cartesian, cylindrical and spherical coordinate system

2 CONDUCTION

Steady state one-dimension heat conduction- Heat conduction through plane and composite wall, heat flow between surface and surroundings, overall heat transfer coefficient, heat conduction through hollow and composite cylinders, heat conduction through hollow and composite spheres, Shape Factor, effect of variable conductivity, critical thickness of insulation.

Heat transfer from extended surfaces- Introduction, heat flow through rectangular fin, heat dissipation from, an infinitely long fin, a fin insulated at the tip and fin losing heat at the tip, Fin performance.

Unsteady state heat conduction- Transient conduction in solid with infinite thermal conductivity, Time constant and response of thermocouple, Transient conduction in solid with finite conduction and convection resistance

3 CONVECTION

Introduction- Basic law of heat convection, Free and Force convection.

Dimensional analysis- Dimensional homogeneity, Methods of dimensional analysis, Dimensional analysis applied to force and free convection, Dimensional numbers and their physical significance.

Empirical relation for free convection and forced convection- Bulk temperature and mean film temperature, Local and average convection coefficient, Correlations for force convection, Correlations for free convection.

Force convection- Hydrodynamic Boundary layer, thicknesses of boundary layer, and Thermal boundary layer, continuity, momentum and energy equations for force convection. Blasius solution for laminar boundary layer, General solution of Von- Karman integral momentum equation.

Free convection- Introduction, characteristic parameters in free convection, momentum and energy equations for laminar free convection heat transfer.

4 RADIATION

Thermal Radiation Basic relations- Introduction, Surface emission properties, absorptivity, reflectivity and transitivity, black, white and grey body, emissive power and emissivity, laws of radiation: Planck, Stefan-Boltzmann, Wein's displacement, Kirchhoff's law, intensity of radiation and solid angle, Lambert's cosine law

Radiation heat exchange between surfaces- black bodies, shape factor, heat exchange between non-black bodies- infinite parallel planes and infinite long concentric cylinder, small grey surfaces, small body in large enclosure, Electrical network approach for radiation heat exchange. Radiation shield, error in temperature measurement due to radiation.

5 HEAT EXCHANGER

Introduction, Classification of heat exchanger, performance analysis, overall heat transfer coefficient, LMTD, Correction factor for multi-pass arrangement, effectiveness and NTU, Limiting value of capacity ratio, TEMA standards for heat exchanger design

6 CONDENSATION, BOILING AND CONCEPT OF MASS TRANSFER

Condensation- Laminar film condensation on vertical plate, turbulence film condensation, convective coefficient for film condensation on tube.

Boiling- Boiling regimes, Bubble growth and nucleate boiling, Boiling correlation**.**

Mass Transfer- Classification, Concentration, velocity and fluxes. Fick's law, General equation of mass diffusion, Steady state diffusion, Mass transfer coefficient.

TEXTBOOKS/ REFERENCE BOOKS

1. Heat and Mass Transfer, R.K. Rajput, S. Chand Publication
2. Heat and Mass Transfer, D. S. Kumar, S.K. Kataria and sons
3. Cengel Y A, Heat Transfer – A Practical Approach, McGraw Hill
4. Fundamentals of Heat and Mass Transfer, D. P. Incropera, P.P. and Dewitt, Wiley Eastern
5. Convective Heat Transfer, Adrian Bejan, Wiley India.
6. Heat Transfer, J. P. Holman, McGraw Hill
7. Heat and Mass Transfer, Domkundawar Arora, Dhanapat rai & CO.
8. Heat and Mass Transfer, P. K. Nag, McGraw Hill

B. TECH. SEMESTER – V
SUBJECT: MANUFACTURING TECHNOLOGY – II (MH516)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 FUNDAMENTALS OF WELDING AND ARC WELDING PROCESSES

Fundamentals of welding system, Advantages & Disadvantages of welding, Classification of welding processes.

Fundamentals of arc welding, Arc welding processes: Carbon arc welding, Manual metal arc welding, Tungsten inert gas welding, Metal inert gas welding, Metal active gas welding and Submerged arc welding, arc welding power sources, welding consumables: types of electrodes, inert gases, fluxes.

2 RESISTANCE WELDING PROCESSES AND GAS WELDING PROCESS

Fundamentals of electric resistance welding, Spot welding, Projection welding, Seam welding.

Oxy fuel gas welding process, Oxyacetylene welding: Principle, Methods, Applications, Equipment used in gas welding, Gas cutting, Principles of gas cutting.

3 ALLIED METAL JOINING PROCESSES AND WELDING DEFECTS

Soldering, Brazing, Adhesive Bonding and its application.

Various types of welding defects, Causes and remedies, Introduction to inspection and testing of welds.

4 ADVANCED WELDING PROCESSES

Introduction to Electron beam welding, Electroslag welding, Underwater welding, Ultrasonic welding, special welding processes: Thermit welding, Friction welding.

5 HOT WORKING AND COLD WORKING OF METALS

Plastic Deformation, Rolling, Extrusion, Pipe & tube manufacture, Merits and demerits of the hot working and cold working process, Wire drawing, Metal spinning.

6 PRESS WORKING

Presses and drive mechanism for presses, Feed mechanism, Clearance and its importance, Press tool operations: Shearing, cutting off, parting, blanking, piercing, notching, slitting, slitting, nibbling trimming, lancing, Different types of dies, die materials, stock layout, construction details of die set.

TEXTBOOKS/ REFERENCE BOOKS

1. Welding technology, O.P. Khanna, Dhanpatrai & Co. (p) ltd, New Delhi
2. Production Technology, O.P. Khanna ,Dhanpatrai & Co.(p) ltd, New Delhi
3. Production Technology, P.C.Sharma, S. Chand
4. Welding processes and technology, R. S. Parmar, Khanna publishers

5. Manufacturing Technology- Foundry, Forming and Welding, P. N. Rao, Tata McGraw Hill
6. Introduction to Manufacturing Processes, Schey J., Tata McGraw Hill
7. Manufacturing Engineering and Technology, S. Kalpakajain, PHI/Pearson
8. Welding Technology, Richard Little, Tata McGraw Hill

B. TECH. SEMESTER – V
SUBJECT: MACHINE DESIGN – I (MH517)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	1	2	60	40	25	25	150	3	1	1	5

DETAILED SYLLABUS

1 INTRODUCTION AND DESIGN CONSIDERATIONS

Design engineering, design engineering phases, basic requirements and procedure of design, design synthesis, use of standards in design, selection of preferred sizes,aesthetic and ergonomic considerations in design, concurrent engineering, design considerations for manufacture and assembly of casting, forging, machining and welding

2 DESIGN AGAINST STATIC LOAD

Design parts subjected to tension, compression, shear, bending, torsion, combinedand eccentric axial static loads such as cotter joint, knuckle joint, levers

3 THREADED FASTENERS, POWER SCREW AND RIVETED JOINTS

Basic design concepts of threaded fasteners, eccentrically loaded threaded joint in shear, eccentric load perpendicular and parallel to axis of threaded fastener, designof power screw and simple screw jack

Riveted joints, Strength Equations, Basic design concepts of riveted joints, Efficiency of joint.

4 SHAFTS, KEYS, COUPLINGS

Types of shafts, material for shaft, shaft design based on strength and rigidity, A.S.M.E. code for shaft design, types of keys, design of sunk, saddle and Kennedykey, design of splines, types of couplings, design of flanged coupling

5 MECHANICAL SPRINGS

Types, applications and materials for springs, stress and deflection equations for closely coiled helical compression springs, Wahl's factor and its use in spring design, end conditions, concentric springs, design of helical torsion, spiral and leafsprings

6 DESIGN OF CLUTCHES AND BRAKES

Clutch: Function, classification and material selection, design of single plate, multiple plate,cone and centrifugal clutches

Brake: Function, classification of brakes, design of band brake, block brake with short shoe,block brake with long shoe, pivoted block brake with long shoe, internal expandingshoe brakes

TEXTBOOKS/ REFERENCE BOOKS

1. Design of Machine Elements, V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd
2. Machine Design – I & II, Farazdak Haideri, Nirali Prakashan
3. Mechanical System Design, Farazdak Haideri, Nirali Prakashan
4. Machine Design, An integral approach - Robert L. Norton, Pearson Education Inc
5. Mechanical Engineering Design - J. E. Shigley, C. R. Mischke, McGraw-Hill Publishing Co. Ltd
6. A text book of Machine Design - P. C. Sharma, D. K. Aggarwal, S. K. Kataria & Sons
7. Engineering Design, George E. Dieter, McGraw-Hill Publishing Co. Ltd
8. Design Data (PSG College of Engg. & Tech.), DVP Printers

B. TECH. SEMESTER – V
SUBJECT: RENEWABLE ENERGY (MH519)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION

Present energy scenario in India, need of the non- conventional energy sources, various conventional & non-conventional energy sources and their comparison, energy and environment.

2 SOLAR ENERGY AND ITS APPLICATIONS

Sun-Earth geometry, characteristics & estimation of solar radiation, instruments for solar radiation measurements. Types of solar collector – flat plate & concentrating. Energy calculations for flat plate type, parabolic concentrator type collector, collector efficiency calculation, Selective paints & surfaces for collectors

Active & passive systems, solar pumps, solar refrigeration & air conditioning solar cookers, solar furnaces, photovoltaic systems for power generation, solar cell modules and arrays, solar cell types, material, applications, advantages and limitations, thermal storages and solar ponds – principle & its uses.

3 WIND ENERGY

power in wind, power coefficient, different types of wind turbines, design criteria and material selection and economics, site selection, advantages and disadvantages, applications, wind energy development in India

4 TIDAL ENERGY AND OCEAN THERMAL ENERGY

Site selection, different methods of using tidal power, single basin, double basin, advantages and limitations.

Ocean Thermal Energy Conversion-Principle of utilization, open cycle OTEC system, closed cycle, hybrid cycle

5 BIOMASS CONVERSION

Photosynthesis & generation of bio-gas, digesters and their design, selection of material, feed of digester, gasification, types and applications of gasifiers, advantages and limitations of biomass conversion.

6 ENERGY STORAGE

Various energy storage systems: battery storage, types of batteries and their applications, sensible and latent heat storage materials, hydrogen storage, ultra-capacitors, ultra-flywheel.

TEXTBOOKS/ REFERENCE BOOKS

1. Non-conventional Energy Sources – G.D. Rai, Publisher: Khanna publisher
2. Solar Energy - Principles of thermal collection and storage, S. P. Sukhatme, Publisher: Tata McGraw-Hill
3. Solar Energy: Fundamentals, Design, Modelling and Applications - G.N. Tiwari, Narosa publisher.
4. Renewable Energy Sources and Emerging Technologies by: Kothari D. P., Singal K. C., Ranjan Rakesh, Publisher: PHI ISBN
5. Solar Energy, Garg and Prakash
6. Solar Energy Utilization, G.D. Rai

B. TECH. SEMESTER – V
SUBJECT: Industrial Management and Economics (MH518)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION
Concept of production and service, types of industries, objectives and functions of industrial management

2 FUNCTIONS OF MANAGEMENT
Introduction to term organization, types of ownership, types of organization structure: line, functional, line and staff and matrix. Management: classification and importance, functions of management: planning, organizing, staffing, directing and controlling

3 ELEMENTS OF ECONOMICS
Laws of demand and supply, factors of production, concept of economies of scale, time value of money, inflation, depreciation, gross domestic product, gross national product, productivity.

4 ENGINEERING ECONOMICS
Production cost concept: direct costs, indirect costs and overheads, break even analysis, make or buy decision, value analysis, product life cycle

5 WORK SYSTEM DESIGN
Work study: method study objectives and procedure, time study procedure, performance rating, allowances, principles of motion economy, ergonomics.

6 RECENT TRENDS IN INDUSTRIAL MANAGEMENT
Principles and concepts of quality, continuous improvement techniques, introduction to optimization, supply chain management.

TEXTBOOKS/ REFERENCE BOOKS

1. Industrial Engineering and Production Management, M. Mahajan, Dhanpat Rai Publication
2. Industrial Engineering and Production Management, Martand Telsang, S. Chand Publication
3. Industrial Organization and Engineering Economics, T. R. Banga and S. C. Sharma, Khanna Publisher
4. Production and Operation Management, R. Paneerselvam, PHI Publication
5. Elementary Economic Theory, K. K. Dewitt and J. D. Varma, S. Chand Publication
6. Management, S. Robbins, M. Coulter and A. Randel, Pearson Introduction to Work Study, G. Kanawaty, ILO Geneva

B. TECH. SEMESTER – V
SUBJECT: INNOVATION AND ENTREPRENEURSHIP (MH520)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 ENTREPRENEURSHIP

Role of entrepreneurship in economic development; entrepreneurial mindset, motivation and competencies; market pull and technology push factors; new product development lifecycle; technology readiness levels; Product-market fit validation; commercialization pathways; business vision and leadership; team composition and management

2 PRODUCT INNOVATION

Opportunity scanning, market survey, need identification and problem definition; creative design thinking for concept generation; detailed design and prototyping; functionality and manufacturability; bill of materials and components supply chain; manufacturing and assembly plan; product testing and quality assurance; intellectual property rights management

3 VENTURE CREATION

Sustainable business options and pathways; business model and business canvas; startup team and business partners; startup ecosystem and stakeholders; technology business incubators and parks; proposal pitching and agreements; startup company incorporation; social impact and responsibility

TEXTBOOKS/ REFERENCE BOOKS

1. Bill Aulet, Technology Entrepreneurship, 4th ed., Tata McGraw Hill
2. Peter F. Drucker, “Innovation and Entrepreneurship”, 1st ed., Harper Business
3. Chelat Bhuvanachandran, Innovision, Khanna Book Publishing
4. Byers, Dorf, and Nelson, Technology Ventures: From Ideas to Enterprise, McGraw Hill
5. Steve Blank, The Startup Owner's Manual”T.V. Rao, Entrepreneurship - A South Asian Perspective

B. TECH. SEMESTER – VI
SUBJECT MACHINE DESIGN-II (MH618)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	1	2	60	40	25	25	150	3	1	1	5

DETAILED SYLLABUS

1 DESIGN AGAINST VARYING LOAD

Stress concentration – causes and remedies, Stress concentration factors, Fluctuating stresses, Fatigue failure, S-N curve, Endurance limit, Notch sensitivity, Design for finite and infinite life, Soderberg and Goodman lines, Modified Goodman diagrams, Gerber equation, Fatigue design under combine stresses, Impact stresses.

2 SURFACE FAILURE

Introduction, Surface geometry, Mating surfaces, Friction, Effect of roughness on friction, Effect of velocity on friction, Rolling friction, Effect of lubrication on friction, Adhesive wear, Abrasive wear, Corrosive wear, Surface fatigue, Spherical contact, Cylindrical contact, General contact, Surface fatigue failure models, Surface fatigue strength.

3 BEARINGS

Introduction, Types of rolling contact bearings, Comparison of rolling and sliding contact bearings, Selection of rolling bearing type, Static and dynamic load carrying capacity, Equivalent bearing load, Bearing life, Load factor, Design for cyclic loads and speeds, Probability of survival, Bearing mounting, Failure of rolling contact bearing, Causes and remedies, Lubricants, Viscosity, Basic modes of lubrication, Material combination in sliding bearings, Hydrodynamic lubrication theory, Design of hydrodynamic journal bearings, Journal bearing Failure causes and remedies, Viscous flow through rectangular slot, Design of hydrostatic bearing.

4 SPUR GEAR DESIGN

Overview of gear drive terminology, Standard systems of gear tooth, Gear material selection, Force analysis of spur gear, Minimum no. of teeth, Estimation of module based on beam and wear strength for gears, Design of spur gears, Friction and wear of spur gears, Contact stresses, Lubrication of gears, Surface failures, Offline monitoring of gears, Online monitoring of gears.

5 HELICAL, BEVEL AND WORM & WORM GEAR DESIGN

Virtual number of teeth, Force analysis of helical gears, Design of helical gears, Bevel gear geometry, Force analysis of bevel gears, Design of bevel gears, Worm & worm gear geometry, Force analysis of worm & worm gear, Design of worm & worm gear.

6 DESIGN OF GEAR BOXES

Basic considerations in design of drives, Determination of variable speed range, Preliminary steps in the design of multi speed gear box, Structure diagram, Graphical representation of ray and speed diagram, Rules and guidelines for layout.

TEXTBOOKS/ REFERENCE BOOKS

1. Design of Machine Elements, V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd.
2. Machine Design- An Integrated Approach, Robert L. Norton, Pearson Education, Inc.
3. Machine Tool Design and Numerical Control, N. K. Mehta, Tata McGraw-Hill Education Pvt. Ltd.
4. Mechanical Engineering Design, Shigley J.E. and Mischke C.R., McGraw Hill Publ. Co. Ltd.
5. Fundamental of Engineering Tribology with Application, Harish Hirani, Cambridge University Press.
6. Design of Machine Elements, M. F. Spott, T. E. Shoup, L. E. Hornberger, S. R. Jayram & C. V. Venkatesh, Pearson Education Inc.
7. Machine Design, Black P.H. and O. Eugene Adams, McGraw Hill Book Co.Ltd.
8. Design Data (PSG College of Engg. & Tech.), DPV Printers.
9. Mechanical Design Data Book, V. S. Konnur & A. A. Memon, New Popular Prakashan, Surat.

B. TECH. SEMESTER – VI
SUBJECT: FLUID MACHINES (MH619)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCTION

Major applications of hydropower plant, classification of hydropower plant, mini-micro hydro power plant, elements of hydropower plant, advantages and disadvantages of hydropower plant, selection of site for a hydropower plant

2 IMPACT OF JET

Introduction, force exerted by jet on stationary flat, Inclined and curved vanes, force exerted by jet on moving flat, inclined and curved vanes, jet of water striking tangentially to symmetrical and unsymmetrical blades, jet Propulsion

3 HYUDRAULIC TURBINES

Introduction, classification of hydraulic turbines, head and efficiencies of hydraulic turbine, Pelton Wheel turbine-construction and working velocity triangle and work done for Pelton Wheel turbine, design parameters, radial flow reaction turbine-inward radial flow and outward radial flow turbine, Francis Turbine - construction and working, velocity triangle and work done, axial flow reaction turbine-construction and working of Kaplan Turbine, design parameters, draft tube-types, theory and efficiency of draft tube, specific speed of hydraulic turbines, unit quantities and characteristics curves of hydraulic turbines. governing of hydraulic turbines

4 HYDRAULIC PUMPS

Introduction, classification of pumps, centrifugal pump-introduction, main parts of centrifugal pump work done by centrifugal pump, definition of heads and efficiencies of centrifugal pump, minimum starting speed of centrifugal pump, multistage centrifugal pumps, specific speed of centrifugal pump, model testing of centrifugal pump, priming, characteristics curves of centrifugal pump, cavitation, maximum suction lift of centrifugal pump, NPSH, reciprocating pump-introduction, construction and working, indicator diagram, air vessels, comparison of centrifugal pump and reciprocating pump

5 COMPRESSORS

Centrifugal compressor-introduction, principle of operation, components of centrifugal compressor static and stagnation properties, work done by the impeller, pressure rise and temperature rise, degree of reaction, power input factor, slip factor, Stodola formula, enthalpy-entropy diagram, isentropic efficiency

Reciprocating compressor-terminology, classification, single stage reciprocating air compressor without clearance-work done, power required to compress air, condition for minimum work, single stage reciprocating air compressor with clearance-work done, volumetric efficiency, FAD, multistage compression-work done, two stage compressor with intercooler without clearance, condition for minimum work, work done in two stage compressor with intercooler with clearance, optimum intermediate pressure in two stage compressor with incomplete intercooling, actual p-v diagram for reciprocating compressor, mean effective pressure and indicated power, compressor efficiency, heat rejected in compressor and intercooler

6 MISCELLANEOUS HYDRAULIC MACHINES

Hydraulic accumulator, hydraulic intensifier, hydraulic ram, hydraulic lift, hydraulic crane, hydraulic coupling, hydraulic torque converter, airlift pump, gear pump

TEXTBOOKS/ REFERENCE BOOKS

1. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Prakashan
2. Fluid Mechanics and Fluid Power Engineering, D.S. Kumar, S. K. Kataria & Sons
3. Fluid Mechanics, Yunus A. Cengel, McGraw Hill Publication
4. Fluids Mechanics, F.M. White, McGraw-Hill Inc
5. Fluid Mechanics and Hydraulic Machines, Sukumar Pati, McGraw-Hill Inc
6. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som., G. Biswas, Tata McGraw Hill Co. Pvt. Ltd

B. TECH. SEMESTER – VI
SUBJECT: COMPUTER AIDED DESIGN & MANUFACTURING (MH620)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 FUNDAMENTALS OF CAD

Introduction to Computer-Aided Design (CAD), Conventional design vs CAD. Advantages of CAD, CAD hardware and software, Architecture of CAD workstation with technical specifications, Interactive Computer Graphics system. Scan conversion, Graphics algorithms (for line, circle etc.), CAD standards

2 GEOMETRIC TRANSFORMATIONS

Geometric transformations: Scaling, Translation, Rotation, Reflection, Shear, Homogeneous coordinate system, Composite transformation

3 GEOMETRIC MODELING

Introduction, Types of geometric modeling: Wire-frame, Surface and Solid modeling. analytical and synthetic curves, non-parametric and parametric representation of curves. analytical and synthetic surfaces. solid modeling representation schemes such as pure primitive instancing, generalized sweeps, hierarchical, octree and cellular decomposition, B-rep, CSG etc. Feature based modelling, Parametric modeling

4 FUNDAMENTALS OF CAM

Introduction to Computer Aided Manufacturing (CAM), role of computers in manufacturing, Numerical Control (NC) and Computerized Numerical Control (CNC), Components of NC/CNC system, specification of CNC system, axis designation, classification of NC/CNC machines, constructional details of CNC machines, NC/CNC tooling

5 PART PROGRAMMING FOR CNC MACHINES

Fundamentals of manual part programming, Manual part Programming for various machining operations on Turning centre and Machining centre, canned cycles

6 ADVANCES IN CAM

Introduction to Group Technology and Flexible Manufacturing System (FMS). Computer aided process planning (CAPP), Computer aided quality control (CAQC)

TEXTBOOKS/ REFERENCE BOOKS

1. CAD-CAM and Automation, Farazdak Haideri, Nirali Prakashan
2. Computer Aided Manufacturing, Rao, Tewari, Kundra, McGraw Hill

3. CNC Machines, Pabla B.S. & Adinathan, New Age publishers
4. Mastering CAD/CAM, Ibrahim Zeid, Mc Graw Hill international
5. Mathematical Elements of Computer Graphics, Roger and Adams, McGraw Hill
6. Computer Aided Design and Manufacturing, Sadhu Singh, Khanna Pub.
7. CAD/CAM, Zimmer & Groover P., Prentice Hall of India
8. CNC Programming, Sinha S. K., Galgotia Publications

B. TECH. SEMESTER – VI
SUBJECT: REFRIGERATION & AIR CONDITIONING (MH622)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	2	4

DETAILED SYLLABUS

1 FUNDAMENTALS OF REFRIGERATION

Reversed Carnot cycle, maximum coefficient of performance, methods of producing cooling effect

2 REFRIGERATION SYSTEMS

VAPOUR COMPRESSION REFRIGERATION SYSTEM

Factors affecting the performance of the system, actual cycle considering different losses, methods of improving COP.

SINGLE LOAD SYSTEM

Single evaporator with multi expansion valves & flash chambers, compound compression system with flash intercooler with single expansion valve concept of Variable Refrigerant Flow/Volume (VRF or VRV) technology.

VAPOR ABSORPTION REFRIGERATION SYSTEM

Aqua-ammonia system and its analysis, (Li-Br)-Water system, advantages of absorption system over compression refrigeration system, electrolux refrigerator.

AIR-REFRIGERATION SYSTEM

Bell-Coleman refrigeration cycle and its analysis, aircraft refrigeration system and its classification, advantages of air cycle for aircraft refrigeration, DART

3 PSYCHROMETRY & AIR-CONDITIONING

Psychrometric properties, Adiabatic saturation and Thermodynamics wet bulb temperature, psychrometric chart, psychrometer, application of first law to psychrometric process, mixing process, working substance in air-conditioning, basic process in conditioning of air, psychrometric process in air conditioning equipment, sensible heat factor (SHF) and its use, Grand sensible heat factor (GSHF) and apparatus dew point (ADP), Effective sensible heat factor (ESHF), Cooling towers, Indoor air quality

4 TRANSMISSION AND DISTRIBUTION OF AIR

Introduction, pressure drop in ducts, pressure drop by graphical method, Economic duct dimensions, methods of duct design.

5 **AIR-CONDITIONING SYSTEMS**

Classification, All year air-conditioning system, Winter air-conditioning, residential, commercial and industrial applications.

6 **THERMAL INSULATION & REFRIGERANTS**

Insulations: Desired properties and classification, thickness of insulation,

Refrigerants: thermodynamic, chemical & physical requirements, different types of refrigerants, including eco-friendly refrigerants, Refrigerant mixtures

TEXT BOOKS/ REFERENCE BOOKS

1. Refrigeration and Air Conditioning, C. P. Arora, Tata McGraw-Hill New Delhi
2. A course in Refrigeration and Air-Conditioning, S. C. Arora & S. Domkundwar, Dhanpat Rai & Co.
3. Refrigeration and Air Conditioning, Manohar Prasad, Wiley Eastern Ltd.
4. Refrigeration and Air Conditioning, W. F. Stocker and J.W.Jones, McGraw-Hill
5. Principles of Refrigeration, Roy. J Dossat, Pearson Education
6. Refrigeration & air conditioning technology, Whitman, W. C., Johnson, W. M., & Tomczyk, J. Delmar

B. TECH. SEMESTER – VI
SUBJECT: MECHANICAL VIBRATIONS & NOISE (MH623)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 UNDAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS

Introduction, Basic terminologies, Simple harmonic motion, Degrees of freedom, Derivations of differential equations, Solution of a differential equation, Rayleigh's energy method, Torsional vibrations, Equivalent stiffness of spring combinations: spring in series, spring in parallel, inclined springs.

2 DAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS

Introduction, Different types of damping, over-damped system, critically-damped system, under-damped system, logarithmic decrement, Viscous dampers: Fluid Dashpot, Eddy current damping, Dry friction damping, Solid damping, Slip damping.

3 FORCED VIBRATIONS OF SINGLE-DEGREE OF FREEDOM SYSTEMS

Introduction, forced vibration with constant harmonic excitation, Force vibration with rotating and reciprocating unbalance, forced vibrations due to excitation of support, Absolute amplitude, Relative amplitude, Energy dissipated by damping, Vibration isolation and transmissibility, Force transmissibility, Motion transmissibility. Vibration measuring instruments: Vibrometer, velocity pick-ups, accelerometer, and frequency measuring instruments, Introduction to proximeter, condition monitoring using vibration meters.

4 TWO DEGREE OF FREEDOM SYSTEMS

Introduction, Principal modes of vibration, Cases of two degrees of freedom undamped free systems, Undamped forced vibration with harmonic excitation, Vibration absorbers, Vibration isolation.

5 CRITICAL SPEED OF SHAFTS

Introduction, Critical speed of a single disc with and without damping, Secondary critical speed.

6 NOISE AND ITS MEASUREMENT

Introduction to noise and its causes, Basic terminologies, Decibel scale, Frequency and sound-dependent human response, Sound pressure level, Sound power level, Sound intensity scale, Addition, subtraction, and averaging decibel levels, Loudness, Standard of noise level and exposure limits, Measurement and analysis of noise, Measurement environment, Noise measuring equipment: Sound level meter, Integrating sound level meter, and Noise dosimeter

TEXTBOOKS/ REFERENCE BOOKS

1. Mechanical Vibrations by Grover, G.K., 8th Ed., Nem Chand and Brothers, 2003
2. Mechanical Vibrations and Noise Engineering by A. G. Ambekar, PHI Publication.
3. Mechanical Vibration by Singiresu S. Rao, 5th Ed., Pearson Publication.
4. Mechanical Vibrations by Singh, V.P., Dhanpat Rai & Co.
5. Mechanical Vibrations by Shrikant Bhave, Pearson Publication.
6. Theory of Vibration with Applications by Thomson W.T., 5th Ed., Pearson Publication.
7. Principles of Vibration by Benson H. Tongue, Oxford University Press.
8. Theory of Machines & Mechanisms by P.L.Ballaney, Khanna Publishers, Delhi.
9. Vibrations and noise for engineers by K. Pujara, Dhanpat Rai & Co.

B. TECH. SEMESTER – VI
SUBJECT: PRODUCTION TECHNOLOGY (MH624)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 THEORY OF METAL CUTTING
Principles of metal machining, cutting tools and tool materials, tool signature, mechanics of chip removal, cutting forces and parameters effecting it, cutting fluids, tool wear, tool life, economics of machining. Multi point cutting tools, temperature measurement at tool-work interface and its effects

2 GEAR AND THREAD MANUFACTURING
Different types of Threads manufacturing methods, and tools involved, Different gear forming and generating methods with their special features, Gears finishing processes

3 JIGS & FIXTURES
Definition, its usefulness in mass production, design principles, locating systems and types of locators & clamps, jig bushes, design of jigs and fixtures for various machining operations

4 UNCONVENTIONAL MACHININIG
Process principle, process equipment for various unconventional machining processes like - EDM, wire cut EDM, ECM, ECG, CM, AJM, USM, PAM, LBM, WJM

5 DRIVE AND CONTROLS IN MACHINE TOOLS
Introduction to drives in machine tools, classification of machine tool drives, selection of maximum and minimum speeds and feeds, stepped regulators and stepless regulators for spindle drive

6 SEMI AUTOMATS AND AUTOMATS:
Classification of automats, specifications, Capstan and turret lathes, tooling equipment, bar stock feeding methods, tool layout for turret, capstan and automats, single spindle and multi spindle automats

TEXT BOOKS/REFERENCE BOOKS

1. A Textbook of Production Engineering, P. C. Sharma, S. Chand & Company Limited
2. Modern Machining Processes, P. C. Pandey and H. S. Shan, Tata McGraw Hill
3. Production Technology, HMT, Tata McGraw-Hill Education Pvt Limited
4. Production engineering and science, P. C. Pandey and C. K. Singh, Standard Publishers Distributors
5. Jigs and Fixtures, P. H. Joshi, Tata McGraw Hill Education Private Limited
6. A Textbook of Production Technology, P. C. Sharma, S. Chand & Company Limited
7. Manufacturing Science, A. Ghosh and A. K Mallik, East West Press Pvt Ltd
8. Metal Cutting principles, M C Shaw, Oxford University press

B. TECH. SEMESTER – VI
SUBJECT: AUTOMOBILE SYSTEMS (MH625)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 VEHICLE PERFORMANCE AND STRUCTURE

Vehicle motion, Resistances during motion, Power required for acceleration and constant velocity motions, Tractive efforts and draw bar pull, Power required and engine characteristics, Gear ratio requirement. Study various vehicle layouts as front engine and front wheel drive, front engine & rear wheel drive, rear engine & rear wheel drive, Components of transmission system, Four-wheel drives. Types of Chassis frames & body, Material, Frameless construction.

2 AUTOMATIC TRANSMISSION AND DRIVE LINES

Requirements, types, Torque converter, Epicyclic gearbox, Continuously variable transmission, Overdrive. Propellers shaft, Types of drive, Final drive types, Type of drive axles & differential.

3 CLUTCH AND MANUAL TRANSMISSION

Functions, Type of clutches, Lining material, Release mechanism, Fluid flywheel. Types of gear boxes, Gear ratios, Transfer case.

4 STEERING AND SUSPENSION SYSTEMS

Steering requirements, steering system and linkages, steering gears, Steering geometry, Ackermann linkages, Power steering. Purpose, Types of suspension system, Front and rear suspension, Coil spring, Leaf spring, Torsion bars, Shock absorbers, Air and rubber suspension, Plastic suspensions, Independent suspension, Antiroll bar or stabilizer.

5 BRAKES, WHEELS AND TYRES

Function, Internal expanding brakes, Brake lining material, Properties, Hydraulic braking system, Pneumatic braking system, Types of wheel rims, Types of tyres, Cross ply, Radial & tubeless tyres, Specifications of tyres, wheel balancing.

6 HYBRID ELECTRIC VEHICLES AND AUXILLARIES

Introduction to Hybrid Electric Vehicles, Architecture of hybrid and electric vehicles, Regenerative braking, Control system for hybrid and electric vehicles. Battery: Construction, working, methods of rating, charging methods, test, generator and cranking motor with drive purpose. Modern technique, Safety provisions, like air bags/ safety belts, Traction control system

TEXT BOOKS/ REFERENCE BOOKS

1. Heinz Heisler, —Vehicle and Engine Technology, Arnold, London
2. Dr. Kirpal Singh, —Automobile Engineering Vol- I & II, Standard Pub & Dist.
3. Dr. N.K.Giri, —Automobile Technology, Khanna Pub
4. R.B.Gupta, —Automobile Engineering, Satya Prakashan, New Delhi

5. Narang G.B.S., —Automobile Engineering, Khanna Publishers, New Delhi.
6. Crause, W.H., —Automobile Mechanics, Tata McGraw Hill, New Delhi.

B. TECH. SEMESTER – VI
SUBJECT: QUALITY ENGINEERING & RELIABILITY (MH626)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION

Quality – Concept, Different Definitions and Dimensions, Inspection, Quality Control, Quality Assurance and Quality Management, Views of different Quality Gurus, 7 basic QC Tools

2 SIX SIGMA AND PROCESS CAPABILITY ANALYSIS

Methodology of Six Sigma DMAIC, Statistics associated with Six Sigma, Determination of Defects per unit (DPU), Defects per million opportunities (DPMO) and calculating of sigma value of the process, Process capability index - Cp, upper and lower capability indices - Cpk.

3 RECENT TRENDS IN QUALITY MANAGEMENT

Seven Industrial wastes, Lean tools – 5S, visual management, Poka-Yoke, Kaizen, Value stream mapping, Cost of quality, TPM, SMED, JIT and Kanban.

4 DESIGNING FOR QUALITY AND QUALITY SYSTEMS

Quality Function Deployment (QFD), Failure Mode and Effect Analysis (FMEA) – Concept, Methodology and Application. Need for ISO 9000, ISO 9000-2015 Quality System – Elements, Documentation, ISO 14000 – Concepts, Requirements and Benefits.

5 DESIGN OF EXPERIMENTS

Introduction, Methods, Taguchi approach, Steps in experimental design, S/N ratio and analysis of results.

6 RELIABILITY

Reliability Engineering Fundamentals, Basic Elements of Reliability, Measurement of Reliability, Maintenance and Reliability, Quality and Reliability, System Reliability

TEXT BOOKS/ REFERENCE BOOKS

1. Statistical Quality Control by M. Mahajan, Dhanpat Rai Publication
2. Total Quality Management by P. M. Charantimath, Pearson Education
3. Total Quality Management by S. Ramasamy, Tata McGraw Hill
4. Quality Management: A process improvement approach by M. A. Fryman, Cengage Learning
5. Total Quality Management by P. N. Mukherjee, Prentice-Hall of India
6. Total Quality Management- Principles and Practices, Tools and Techniques by K. Suri, Katson Books Publication
7. Taguchi Techniques for Quality Engineering by P. J. Ross, Tata McGraw Hill.

B. TECH. SEMESTER – VI
SUBJECT: PRESSURE VESSELS & PIPING (MH627)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 FACTORS INFLUENCING THE DESIGN OF VESSELS

Types of vessels, methods of fabrication, Design Preliminaries like types of stresses, material of vessel, factor of safety, Poisson's ratio, criteria in vessel design like excessive elastic deformation, plastic instability, brittle rupture and creep, corrosion,

2 VESSELS UNDER INTERNAL/EXTERNAL PRESSURES

General theory of membrane stresses in vessels and its applications to shells and end-closures, stress concentration in plate with hole, Design of nozzles, reinforcement pads, flanges and gaskets, design of pressure vessels under external pressure wall in presence and absence of stiffeners, design of closers subjected to external pressure

3 VESSEL SUPPORTS

Selection and design of different types – bracket or lug support, skirt support & saddle support

4 HIGH PRESSURE VESSELS

Types, design procedure, construction features and materials for high pressure shell and closures

5 PIPING ANALYSIS

Flow diagram, piping layout and piping stress analysis, flexibility factor and stress intensification factor; design of piping system as per B31.1 piping code, piping components and their behaviour

6 PRESSURE VESSEL DESIGN

Introduction to vessel and piping codes and standards, design of vessels for various applications using codes and standards

TEXT BOOKS/ REFERENCE BOOKS

1. Mechanical System Design, Farazdak Haideri, Nirali Prakashan
2. Process equipment design, Brownell L. E & Young. E. D, Wiley Eastern Ltd., India
3. Pressure vessel design, Harvey J F, CBS publication
4. Fundamentals of Machine Components Design, Juvinal R.C, Wiley, India
5. ASME Pressure Vessel and Boiler code, Section VIII Div 1, 2, and 3.
6. American standard code for pressure piping, B 31.1
7. Pressure vessel Design Hand book, Henry H Bednar, CBS publishers and distributors
8. Design Data (PSG College of Engg. & Tech.), DVP Printers

B. TECH. SEMESTER – VI

SUBJECT: ADDITIVE MANUFACTURING & REVERSE ENGINEERING (MH628)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION TO ADDITIVE MANUFACTURING (AM)
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Introduction to AM, AM evolution, Distinction between AM & CNC machining, Generic Steps in AM processes, Classification of AM processes

2 VAT PHOTOPOLYMERIZATION AM PROCESS
Stereo lithography Apparatus, Working Principles, details of processes, Products, materials, advantages, limitations and applications - Case studies

3 AM PROCESSES FOR SOLID MATERIALS
Fused deposition Modeling, Laminated object manufacturing Working Principles, details of processes, Products, materials, advantages, limitations and applications - Case studies

4 AM PROCESSES FOR POWDER MATERIALS
Selective Laser Sintering, Direct Metal Laser Sintering, Laser Engineered Net Shaping, Selective Laser Melting, Electron Beam melting (EBM): Processes, materials, products, advantages, applications and limitations – Case Studies.

5 DATA PROCESSING AND POST PROCESSING
Additive manufacturing file formats, Defects and Issues in Data Formats; Pre-processing – Part orientation and support structure generation, Model Slicing, Contour Generation, Tool Path Generation, Build File preparation, Machine Set-up; Post Processing – Product quality evaluation, support structure removal, Improvement of finish, geometry and aesthetics.

6 REVERSE ENGINEERING (RE) AND CAD MODELING
Basic concept, Digitization techniques, Model Reconstruction, Data Processing for Rapid Prototyping, Reverse Engineering methodologies and techniques, Selection of RE systems, RE software, RE hardware, RE in product development.

TEXT BOOKS/ REFERENCE BOOKS

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing by Ian Gibson, David W Rosen, and Brent Stucker, Springer.
2. Rapid Prototyping: Principles and Applications in Manufacturing by Rafiq Noorani John Wiley and Sons.
3. Reverse engineering -An industial perspective by Vinesh Raja, Kiran J Fernandes, Springer.
4. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer.

5. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling by D.T. Pham, and S.S. Dimov, Springer.
6. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, and Leong Kah Fai, World Scientific, 2015.

B. TECH. SEMESTER – VI
SUBJECT: SUPPLY CHAIN MANAGEMENT (MH629)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION

Introduction of logistics, inbound-outbound logistics, supply chain objectives, importance of supply chain management, process view- push/pull, supply chain drivers and barriers.

2 SUPPLY CHAIN NETWORK

Role of supply chain network, design options for network- drop shipping hub and spoke method, warehouse storage, last- mile delivery, cross-dock, customer pick up points, factors affecting network, design decision.

3 TRANSPORTATION IN SUPPLY CHAIN

Role and importance of transportation in supply chain, modes of transportation, options for design of transportation network.

4 SOURCING AND PRICING

Sourcing strategies and benefits, third party logistics and fourth party logistics, supplier assessment and selection, 4R strategy for revenue management.

5 COORDINATION IN A SUPPLY CHAIN

Bull-whip effect, vendor managed inventory, collaborative planning, forecasting and replenishment, customer relationship management, supplier relationship management, role and benefits of IT in supply chain management, supply resource management, customer relationship management, ERP, E-commerce.

6 STRATEGIC ALLIANCE AND INTEGRATION IN SUPPLY CHAIN

Reasons and purpose of strategic alliance (SA), ways and means of entering into SA, types of SA, concept, types and benefits of supply chain integration.

TEXT BOOKS/ REFERENCE BOOKS

1. Supply Chain Management: Strategy, Planning, and Operation by S. Chopra and P. Meindel, Pearson Education.
2. Industrial Engineering and Production Management by Martang Telsang, S. chand.
3. Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies by D. Simchi-Levi, P. Kaminsky, E. Simchi-Levi, McGraw-Hill Publication.
4. Supply Chain Management- Processes, System and Practice by N. Chandrasekaran, Oxford University Press
5. Operations Management; Contemporary Concepts and Cases by Shroeder, G., McGraw Hill publication

B. TECH. SEMESTER – VI
SUBJECT: INDUSTRIAL ENGINEERING (MH621)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION TO INDUSTRIAL ENGINEERING AND PRODUCTIVITY

Objectives of industrial engineering, function if an industrial engineer, techniques of industrial engineering, introduction to productivity, difference between production and productivity, productivity measures factors influencing productivity, productivity improvement tools.

2 PLANT LOCATION SELECTION AND PLANT LAYOUT

Introduction, system view of location, comparison of location, factor affecting plant location, quantitative methods for evaluation of plant location, principals of plant layout, types of plant layout, factors affecting layout, types of flow patterns.

3 INSPECTION AND STATISTICAL QUALITY CONTROL

Introduction, types of inspection, method of inspection, quality control and statistical quality control, tools for SQC, control charts for variables and attribute, acceptance sampling.

4 ERGONOMICS

Introduction, Man machine system, Anthropometry, Work place design.

5 ENTREPRENEURSHIP

Introduction, concept, functions of an entrepreneur, product identification, sources of industrial finance, resources allocation, government incentives to entrepreneurs.

6 FUNCTIONAL MANAGEMENT

Marketing Management, Operations Management, Material management and purchasing, Personnel Management, Financial Management, Maintenance management.

TEXT BOOKS

1. Industrial Engineering and Production Management by Martang Telsang, S. chand.
2. Industrial Engineering and Production Management by M. Mahajan, Dhanpat Rai & Co.

REFERENCE BOOKS

1. Industrial Organisation & Engineering Economics, T. R. Banga & S.C. Shrama,, Khanna Publishers.
2. Industrial Engineering, Vivek Deshpande, Mehul Gor and Jaydeepsinh Ravalji, Ria publishing house.
3. Production and Operations Management, Everett E. Adam, Ronald J. Ebert, Prentice Hall of India

B. TECH. SEMESTER – VII
SUBJECT: FINITE ELEMENT METHODS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	Prac	TW	Total	Lect	Tut	Prac	Total
3	0	2	40	0	0	50	90	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCT TO FINITE ELEMENT METHODS

Introduction and basic concept of finite element method, general steps for finite element method, application of FEM, advantage of FEM, shape function, types of elements, potential energy approach,stiffness matrix, stiffness matrix for spring element, direct stiffness method, boundary conditions

2 ONE DIMENSIONAL STRUCTURAL PROBLEM

Natural and global co-ordinate systems, linear shape function, stress-strain and displacement relationship, stiffness matrix for bar element, load vector, boundary condition, elimination approach, structural problems: axial bar elements, thermal effects in axial bar elements, quadratic shape function, displacement, stress and strain for quadratic element, element stiffness matrix for quadratic element. Examples on one dimensional structural problem

3 TRUSS PROBLEMS

Global stiffness matrix for bar arbitrarily oriented in the plane, stresses in truss element, truss element problems

4 TWO DIMENSIONAL STRUCTURAL PROBLEM

Principles for 2D problems- plane stress and plane strain, constant strain triangular element – shape function, element stiffness matrix and equation, plane stress problem, isoparametric formulation of quadrilateral element- shape function, examples, Examples on two dimensional structural problem

5 DEVELOPMENT OF BEAM EQUATION

Beam stiffness matrix on Euler Bernoulli's beam theory, distributed loading, work equivalence method, beam element with nodal hinge, beam element problems

6 DEVELOPMENT OF FRAME EQUATION

Rigid plane frame, element stiffness matrix of frame element, plane frame examples

TEXT BOOKS/REFERENCE BOOKS

1. D. L. Logan, A First Course in the Finite Element Method, Cengage Learning, Mc Graw Hil.
2. Farazdak Haidery, CAD / CAM and Automation, Nirali Prakashan.
3. Tirupathi K. Chandrupatla and Ashok D. Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall of India Private Ltd.
4. J. N. Reddy, An Introduction to Finite Element Methods, Mc Graw Hill.
5. S.S. Rao, The Finite Element Methods in Engineering, Pergamon, New York

6. O.C. Zienkowicz, The Finite Element Method in Engineering science, Mc Graw Hill.
7. P. Sesh, Finite Element Analysis, PHI Learning Private Limited
8. K.J Bathe, Finite Element Procedures in Engineering Analysis, prentice-hall Inc.

B. TECH. SEMESTER – VII
SUBJECT: THERMAL SYSTEM DESIGN

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCTION

Basic considerations in design: engineering design, formulation of the design problem, conceptual design, steps in the design process. Heat exchanger classification, basic design methodologies - number of transfer units (NTU) Method and Logarithmic Mean Temperature Deference (LMTD) Method

2 DESIGN OF DOUBLE PIPE HEAT EXCHANGERS

Introduction, thermal and hydraulic design of inner tube, thermal and hydraulic analysis of annulus- hairpin heat exchanger with bare inner tube and hairpin heat exchangers with multi tube finned inner tubes

3 DESIGN OF SHELL & TUBE HEAT EXCHANGERS

Basic components- shell types, tube bundle types, tubes and tube passes, tube layout, baffle type and geometry, allocation of streams; basic design procedure of a heat exchanger- preliminary estimation of unit size, rating of the preliminary design; shell-side heat transfer and pressure drop- kern method and bell–delaware method

4 DESIGN OF COMPACT HEAT EXCHANGERS

Heat transfer enhancement, plate-fin heat exchangers, tube-fin heat exchangers, heat transfer and pressure drop for finned-tube and plate-fin exchangers

5 DESIGN OF LOW TEMPERATURE REFRIGERATION (CRYOGENICS)

Review of basics of refrigeration, limitations of vapour compression refrigeration systems, cascade refrigeration system, liquefaction of gases, linde system for liquefaction of air, claude system for liquefaction of air, liquefaction of hydrogen, liquefaction of helium

6 DESIGN OF HEATING VENTILATION & AIR CONDITIONING (HVAC)

Review of basics of air conditioning, introduction of cooling load estimation, components of cooling load, solar heat gain through outside walls, roof & glass, sensible heat gain due to infiltration, ventilation, occupants, products. Pressure losses in ducts, friction factor of ducts, duct design, methods of duct design

TEXT BOOKS/REFERENCE BOOKS

1. Y. Jaluriya, Design and Optimization of Thermal System, CRC Press
2. S. Kakac, Heat Exchanger: Selection, Rating and Thermal Design, CRC press
3. C. P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill
4. R. K. Shah, Fundamental of Heat Exchanger Design, John Wiley & Sons Inc.
5. R. J. Dossat, Principal of Refrigeration, Pearson publication

B. TECH. SEMESTER – VII
SUBJECT: TRIBOLOGY

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCTION
Introduction to Tribology, introduction to bearings

2 FRICTION AND WEAR
Introduction, concept of tribosystem, laws of friction, theory of friction, types of friction, friction properties of metallic and non-metallic materials, effects of friction, COF, friction reducing measures, wear, causes of wear, types of wear, wear of different materials, effect of wear, steps of wear prevention

3 LUBRICATION AND LUBRICANTS
Importance of lubrication, boundary lubrication, mixed lubrication, hydrodynamic lubrication, hydrostatic lubrication, elastohydrodynamic lubrication, types & properties of lubricants, lubricant additives, SAE classification, smart lubricants

4 HYDRODYNAMIC & HYDROSTATIC LUBRICATION
Introduction, various theories of lubrication, Petroff's equation, Reynold's equation, mechanism of pressure development, plane-slider bearing, idealized journal bearing, step bearing, analysis of finite bearing, principle of hydrostatic lubrication, fixed restrictor, hydrostatic step bearing, rectangular thrust bearing, multirecess journal bearing

5 ELASTO-HYDRODYNAMIC LUBRICATION
Principles and application, Hertz theory, pressure-viscosity term in Reynold's equation, Ertel-Grubin equation, rolling element bearings, EHL of gear teeth contact

6 TRIBO MEASUREMENT
Friction and wear measurements, bearings performance measurements, rolling element bearing endurance test, material characterization techniques

TEXT BOOKS/REFERENCE BOOKS

1. Majumdar, B. C., Introduction to Tribology of Bearings, S. Chand & Company Ltd., Delhi, 2010.
2. Hirani H., Fundamentals of Engineering Tribology with Applications, Cambridge University Press, Delhi, 2015.
3. Cameron A., Basic Lubrication Theory, Ellis Horwood Ltd., UK, 1981.
4. Hamrock B. J., Fundamentals of Fluid Film Lubrication, Schmid, Jacobson.
5. Halling J. (Editor), Principles of Tribology, Macmillian, 1984.
6. Williams J.A., Engineering Tribology, Oxford Univ. Press, 1994.
7. Neale, M.J., Tribology Hand Book, Butterworth Heinemann, 1995.
8. Stolarski T.A., Tribology in Machine Design, Industrial Press, 1990.

B. TECH. SEMESTER – VII
SUBJECT: ADVANCED MANUFACTURING PROCESS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 INTRODUCTION

Advanced engineering materials and the limitations of conventional manufacturing processes; classification of advanced manufacturing processes

2 ADVANCED METAL REMOVAL PROCESSES

Process principle, metal removal mechanism, parametric analysis and application of various non-conventional machining processes like mechanical energy based processes, chemical and electro chemical energy based processes, thermal energy based processes, introduction of hybrid machining processes

3 ADVANCED WELDING PROCESSES

Physics of welding, solid state welding processes, radiant energy welding processes, estimation of welding cost, introduction to welding automation

4 ADVANCED METAL FORMING PROESSES

Introduction of metal forming processes, introduction of high energy rate forming processes, merits and demerits of HERF processes, various HERF processes like electromagnetic forming, explosive forming, electro hydraulic forming and stretch forming

5 MICRO AND NANO MANUFACTURING

Introduction to micro and nano manufacturing technology, advantages and applications of nanotechnology, overview of nano fabrication methods: top-down and bottom-up approaches, lithography, deposition, CVD, PVD, etching, and material modification methods, processes and equipment

6 PROCESSING OF CERAMICS

Applications, characteristics, classification, processing of particulate ceramics, powder preparations, consolidation, drying, sintering, hot compaction, area of application, finishing of ceramics

TEXT BOOKS/REFERENCE BOOKS

1. E. P. DeGarmo, J. T Black, R. A. Kohser, Materials and Processes in Manufacturing (8th Edition), Prentice Hall of India, New Delhi
2. A. Ghosh, and A. K. Mallik, Manufacturing Science, Affiliated East-West Press Pvt. Ltd. New Delhi
3. G.F. Benedict, Marcel Dekker, Nontraditional Manufacturing Processes, Inc. New York
4. Mark James Jackson, Micro Fabrication and Nano Manufacturing, CRC Press, 2005
5. P. C. Pandey and H. S. Shan, Modern Machining Processes, Tata McGraw Hill

6. S. Kalpakjian and S. Schmid, Manufacturing Processes for Engineering Materials, Prentice Hall
7. R. S. Parmar, Welding Processes and Technology, Khanna Publisher
8. Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta and John J. Moore, Introduction to Nanoscience and Nanotechnology by, CRC Press, Boca Raton, 2009

B. TECH. SEMESTER – VII
SUBJECT: INTERNAL COMBUSTION ENGINES

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

DETAILED SYLLABUS

1 AIR STANDARD, FUEL-AIR AND ACTUAL CYCLES

Introduction: assumptions, Joule or Brayton cycle, dual combustion cycle, comparison between Otto, dual and diesel cycles, applications of IC engines. Valve/Port timing diagram for four-stroke/two- stroke SI/CI engine, fuel-air cycles and their significance, factors affecting the fuel air cycle, difference between actual cycles and fuel- air cycles.

2 COMBUSTION IN SI AND CI ENGINES AND FUEL SUPPLY SYSTEMS

Introduction, homogeneous and heterogeneous mixtures, ignition limits, stages of combustion in SI engine, detonation or knocking in SI engines, effect of engine variables on knock or detonation. Control of detonation. Stages of combustion in CI engine, diesel knock, comparison of knock in SI and CI engines, CI engine combustion Chambers, cold starting of CI engines. Carburetion, simple carburettor: essential parts and its working. Requirement of fuel injection system, classification of mechanical injection system, fuel injection pump, fuel injectors, nozzle and its type. Classification of electronic injection system, Multi-point Fuel Injection System (MPFI), Gasoline direct injection system (GDI)

3 CONVENTIONAL AND ALTERNATIVE FUELS FOR IC ENGINES

Fuels for SI engines: desirable properties, volatility and its effects on engine performance, rating of S.I. engine fuels: HUCR, octane number, performance number and triptane rating. Fuels for CI engines: desirable properties, rating of C.I. engine fuels: cetane number, diesel index, aniline point, API gravity and specific gravity. alternative fuels: CNG, bio diesel and hydrogen, introduction to hybrid technology

4 IC ENGINE SYSTEMS

Lubrication System- function of lubrication, lubrication of engine components, lubrication system, properties of lubricants, additives for lubricants, SAE rating of lubricants.

Ignition System- Function of ignition system, requirements of ignition system, battery ignition system, magneto ignition system, electronic ignition system, firing order of the engine cylinders.

Cooling System- Need for cooling system, types of cooling system: air (direct) cooling system, liquid (indirect) cooling system

Governing System-Function of governor, methods of governing: hit and miss method, quality governing and quantity governing.

Objectives of Supercharging and Turbocharging.

5 ENGINE PERFORMANCE PARAMETERS, MEASUREMENT AND TESTING

Introduction, sources of losses, factors affecting mechanical friction, performance parameters. Measurement of brake power: (a) absorption type dynamometer:

rope brake dynamometer, prony brake dynamometer, electrical dynamometer (b) transmission type dynamometer. measurement of frictional power, measurement of indicated power of multi-cylinder engine by Morse test.

6 ENGINE EMISSIONS AND ENGINE MANAGEMENT SYSTEMS

Emission of pollutants from SI and CI engines, control of emissions from SI and CI engines, emission norms. Typical engine management system layout for modern SI and CI engines.

TEXT BOOKS/REFERENCE BOOKS

1. V.M. Domkundwar, A Course in Internal Combustion Engines, Dhanpatrai & Co
2. Mathur& Sharma, Internal Combustion Engines, Dhanpatrai& sons
3. V. Ganeshan, Internal Combustion Engines, Tata McGraw hill
4. Ramalingam, Internal Combustion Engines, Scitech publications
5. H. N. Gupta, Internal Combustion Engines, PHI Learning, New Delhi
6. B. L. Singhal, Internal Combustion Engines, Tech-max publications
7. S. S. Thipse, Internal Combustion Engines, Jaico Publishing house
8. John Heywood, Fundamental of I.C. Engines, McGraw Hill Publication

B. TECH. SEMESTER – VII
SUBJECT: ROBOTICS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION TO ROBOTICS

Brief history, basic concepts of robotics such as definition, three laws, elements of robotic systems i.e. robot anatomy, DOF, misunderstood devices etc., classification of robotic systems on the basis of various parameters such as work volume, type of drive, etc., associated parameters i.e resolution, accuracy, repeatability, dexterity, compliance, rcc device etc., industrial applications of robots

2 CONTROL SYSTEM AND COMPONENTS

Basic concept, control systems, robot activation and feedback components, positions and velocity sensors, linear and rotary actuators and control valves

3 DRIVES AND CONTROL FOR ROBOTICS

Types of drives, types of transmission systems, actuators and their selection while designing a robot system, types of controllers, introduction to closed loop control.

4 ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Methods of Robot Programming, characteristics of task level languages, lead through programming methods, motion interpolation, basics of artificial intelligence, goals of artificial intelligence, AI techniques, problem representation in AI, problem reduction and solution techniques, application of AI and ES in Robots

5 END EFFECTORS

Grippers-types, operation, mechanism, force analysis, tools as end effector, consideration in gripper selection and design

6 ROBOT SENSORS

Desirable features, tactile, proximity and range sensors, applications of sensors in robotics, robotic vision systems, image capturing, image processing and analysis, image segmentation, pattern recognition, training of vision systems

TEXT BOOKS/REFERENCE BOOKS

1. Saeed B Niku, Introduction to Robotics Analysis, Systems, Applications, PHI.
2. Mohsen Shahin poor, A Robot Engineering Text Book, Harper and Row Publishers, NY.
3. Mikell Groover, Industrial Robotics, McGraw Hill Publications.
4. Robert J Schilling, Fundamentals of Robotics – Analysis and Control, PHI.
5. Ganesh S Hegde, Industrial Robots, Laxmi Publications.

6. Werner G Holz, Robotic Technology, Principles and Practice, Van Nostrand Reinhold Co. NY.
7. Richard D Klaffer, Thomas A Chmielewski, Michael Negin, Robotic Engineering – An Integrated Approach, PHI.
8. John J Craig, Intro to Robotics, Mechanics and Control, Pearson Education.

B. TECH. SEMESTER – VII
SUBJECT: DESIGN OF AUTOMOTIVE POWER TRANSMISSION SYSTEMS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 DESIGN OF IC ENGINE CYLINDER AND LINER

Selection of material for cylinder and liner, design of cylinder, design of cylinder head and stud

2 DESIGN OF IC ENGINE PISTON

Design requirements for piston, piston material, piston ribs and piston cup, piston rings, piston pin

3 DESIGN OF IC ENGINE CONNECTING ROD

Design of connecting rod, stresses in connecting rod, connecting rod ends

4 DESIGN OF CRANK SHAFT

Design of crankshaft, crank shaft materials, design criteria of crankshaft. Valve gear design, design of rocker arm, tappet, valve spring, push rods

5 DESIGN OF GEAR BOX

Concept of speed reducer and gear box, general design procedure of gear box, determination and fixation of spindle speeds, selection of the best structure diagram, selection of gear layout and ray diagram, determination of number of teeth on gears

6 POWER TRANSMISSION CASE STUDY

Design sequence for power transmission, power and torque requirements, force analysis, gear and shaft design and selection, bearing and key selection

TEXT BOOKS/REFERENCE BOOKS

1. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Publishing Co. Ltd
2. R. S. Khurmi and J.K.Gupta, Machine Design, S.Chand Publishers,New Delhi.
3. R. G. Budynas and J. Keith Nisbett., Shigley's Mechanical system Design, McGraw-Hill Publishing Co. Ltd
4. Shigley J.E. and Mischke C.R., Mechanical Engineering Design, McGraw Hill Publ. Co. Ltd.
5. M. F. Spott, T. E. Shoup, L. E. Hornberger, S. R. Jayram & C. V. Venkatesh, Design of Machine Elements, Pearson Education Inc
6. Farazdak Haideri, Mechanical System Design, Nirali Prakashan
7. Design Data (PSG College of Engg. & Tech.), DPV Printers.

B. TECH. SEMESTER – VII
SUBJECT: ENERGY MANAGEMENT

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 ENERGY SCENARIO

Classification of energy, Indian energy scenario, sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future

ENERGY CONSERVATION ACT 2001 AND RELATED POLICIES

Energy conservation act 2001 and its features, notifications under the act, schemes of bureau of energy efficiency (BEE) including designated consumers, national action plan on climate change

2 FINANCIAL MANAGEMENT

Investment-need, appraisal and criteria, financial analysis techniques simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of energy service companies (ESCOs)

3 ENERGY MONITORING AND TARGETING

Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)

4 ENERGY MANAGEMENT & AUDIT

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering

5 ENERGY EFFICIENCY IN THERMAL UTILITIES AND SYSTEMS BOILERS

Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas. Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation, thermic fluid heaters, super critical boilers

Heat Exchangers: Types, networking, pinch analysis, multiple effect evaporators, condensers, distillation column, etc.

Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential.

	Co-generation**:** Definition, need, application, advantages, classification, saving potentials. Heat balance, steam turbine efficiency, tri-generation, microturbine **Solar PV panel, Grid connections, and Transmission systems:** Classifications, energy–load calculations, distributions, and efficiency measurement
6	**ENERGY AND ENVIRONMENT, AIR POLLUTION, CLIMATE CHANGE** United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM – bachat lamp yojna and industry; Prototype Carbon Fund (PCF)

TEXT BOOKS/REFERENCE BOOKS

1. Rai G. D., Nonconventional Energy Sources, Khanna Publishers, 2011.
2. Rao S. and B. B. Parulekar, Energy Technology, Khanna Publishers, 2005.
3. Pujara A.A., Energy Conservation and Management, Books India Publications,2021
4. Albert Thumann, Handbook of Energy Audits, 6th Edition, The Fairmont Press
5. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4
6. 3.W. C. Turner, Energy Management Handbook, John Wiley and Sons, A Wiley Inter-science publication

B. TECH. SEMESTER – VII
SUBJECT: RECENT TRENDS IN QUALITY MANAGEMENT

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION

Introduction, recent trends in quality control, Lean philosophy, Introduction of Six sigma, difference between Lean and Six Sigma

2 LEAN MANUFACTURING

Introduction, Muri, Mura and Muda of Lean, tool and techniques of Lean manufacturing

3 SIX SIGMA

Introduction, DMAIC and DMADV methodology of six sigma, project selection, problem solving approach, DMAIC and DMADV road map, RACI matrix

4 SIX SIGMA PROJECT METHODOLOGY

Introduction, concept of DMAIC/DMADV phase, tools and techniques used during each phase, toll gate review, case study

5 DATA ANALYTICS

Data fundamentals, data analysis, performance calculations, software based exercise. project tool kit exercise

6 STATISTICAL ANALYSIS AND STATISTICAL PROCESS CONTROL

Basic statistical analysis, data collection and sampling method, multi vari study, SPC tools, control charts

TEXT BOOKS/REFERENCE BOOKS

1. N. Gopalkrishnan, Simplified Lean Manufacturing, PHI Learning Pvt. Ltd., 2010
2. Peter Pande, Robert Neuman and Roland Cavanagh, The Six Sigma Way, MC Graw-hill
3. Roger Burghall, Vince Grant and John Morgan, Lean Six Sigma Business Transformation for Dummies, Wiley Publishers.
4. Jeffrey K. Liker, The Toyota Way, McGraw Hill Publishers.
5. Michael C. Thomsett, Getting Started in Six Sigma, Wiley Publishers

B. TECH. SEMESTER – VII
SUBJECT: CONTROL ENGINEERING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 BASIC CONTROL SYSTEM

Components of a control system, types of control systems, effect of feedback system

2 MATHEMATICAL MODELING OF MECHANICAL SYSTEM

System differential equation of electrical, mechanical, thermal, hydraulic and electro mechanical network, analogy

3 TIME DOMAIN PERFORMANCE OF CONTROL SYSTEM

Typical test signals, unit step response of first and second order systems. Time response specifications, time response specifications of second order systems, steady state errors and error constants

4 BLOCK DIAGRAM ALGEBRA

Block diagram algebra, reduction of block diagram, transfer function from a block diagram, signal flow graphs, gain formula for signal flow graphs, state diagram from differential equations

5 STABILITY ANALYSIS

Concepts of stability, necessary conditions for stability, routh stability criterion. Introduction to root-locus techniques, the root locus concepts, construction of root loci

6 CONTROLLER ACTIONS AND STATE SPACE ANALYSIS

Basic control actions and controllers – on – off. Proportional, derivative and integral controllers, concepts of state, state variable and state models for electrical systems, solution of state equations

TEXT BOOKS/REFERENCE BOOKS

1. Nagrath & Gopal, Control Systems Engineering, New Age International Publishers
2. Ogata K, Modern Control Engineering, Pearson Ed
3. Kuo Benjamin. C, Automatic Control System, Prentice Hall
4. Nise, Norman S John, Control Systems Engineering, Wiley & Sons, New York
5. S K Bhattacharya, Control Systems Engineering, Pearson Education
6. D. Ganesh Rao, K. Chennavenkatesh, Control Engineering, Pearson Education

B. TECH. SEMESTER – VII
SUBJECT: OPERATION RESEARCH

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	1	0	60	40	0	0	100	3	1	0	4

DETAILED SYLLABUS

1 LINEAR PROGRAMMING

Introduction to operation research, requirement of linear programming (LP), basic assumptions, formulation of LP, solution techniques of LP: graphical methods, analytical methods: simplex and big M

2 TRANSPORTATION

Transportation problems definition, solution methods: north-west corner method, least cost method, vogel's approximation method. Degeneracy in transportation, stepping stone method, and modified distribution method, un-balanced problems

3 ASSIGNMENT AND QUEUING THEORY

Assignment problems definition, Hungarian method for a solution, variation of assignment problem non-square matrix, restriction on assignments, maximization problem, travelling salesman problem. terms used in queuing theory, Kendall's notation, operating characteristics, and probabilistic queuing models

4 INVENTORY CONTROL

Inventory classification, different costs associated with inventory, economic order quantity, inventory models with deterministic demands, selective approaches to inventory control: ABC, VED, FSN and XYZ analysis

5 REPLACEMENT MODELS AND GAMES THEORY

Introduction to replacement theory, replacement of capital equipment which depreciated with time, replacement by alternative equipment, group and individual replacement policy. Introduction to game theory, characteristics of game theory, two person-zero sum games, pure strategy, mixed strategies (2x2, mx2, 2xn), arithmetic, dominance theory, and sub-game method to solve the game

6 NETWORK ANALYSIS

Terms used in network analysis, network or arrow diagram, fulkerson's rule, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), crashing of network

TEXT BOOKS/REFERENCE BOOKS

1. Gupta P. &Hira D.S., Operation Research, S. Chand & Company Ltd.
2. N D Vohra, Quantitative Techniques in Management, Tata McGraw-Hill
3. Hamdy Taha, Operations Research: An Introduction, Pearson
4. R. Paneer Selvam, Operations Research, Prentice Hall of India Pvt. Ltd.
5. J. K. Sharma, Quantitative Techniques for Managerial Decisions, MacMillan India Ltd.

B. TECH. SEMESTER – VII
SUBJECT: EFFECTIVE TECHNICAL COMMUNICATION

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	0	0	60	3	0	0	3

DETAILED SYLLABUS

1 INTRODUCTION

Basics and importance of technical communication, general and technical communication, objectives and characteristics of technical communication, process of communication, interpersonal and organisational communication levels, non-verbal communication

2 TECHNICAL WRITING

Writing technical reports, technical proposals, formal letters, memos, email, email etiquette, business letters, research papers and technical descriptions, application letter writing, resume writing, follow-up letter writing, minutes of meeting, making notes, SOP writing

3 TECHNICAL COMMUNICATION

Effective public speaking, formal presentations, presentation aids, interviews, group discussions, telephone etiquette

4 ENGINEERING ETHICS

Ethics and excellence in engineering, role and responsibility of engineer, moral reasoning and code of ethics

5 SELF DEVELOPMENT

Importance of attitude, goal setting

6 SELF-ESTEEM

Self-esteem, steps to building positive self-esteem

TEXT BOOKS/REFERENCE BOOKS

1. Raman Sharma, Technical Communications, 3rd Edition, Oxford Publication, London
2. David F. Beer and David McMurrey, Guide to Writing as an Engineer, 3rd Edition, John Willey, NewYork
3. Shiv Khera, You Can Win, Macmillan Books, New York
4. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York
5. Diane Hacker, Pocket Style Manual, Bedford Publication, New York
6. Sharma, R. and Mohan, K., Business Correspondence and Report Writing, TMH New Delhi
7. Xebec, Presentation Book, TMH New Delhi

B. TECH. SEMESTER – VII
SUBJECT: SEMINAR

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	100	0	100	0	0	1	1

DETAILED SYLLABUS

The students are required to prepare/present seminar on given topic.

The students will undertake Seminar work for the period of full semester. They may opt for design/develop and fabricate small innovative product.

They are supposed to prepare and submit a seminar report as a part of their term work and give presentation on their work. The faculty should monitor the students for their seminar work regularly every week. They are to be examined based on viva and/or demonstration.

B. TECH. SEMESTER – VII
SUBJECT: SUMMER INTERNSHIP

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	4	0	0	50	0	50	0	0	2	2

DETAILED SYLLABUS

The students are required to undergo summer internship training during summer vacation after 6th semester for minimum duration of 4 weeks.

The students will undertake project work/ assigned work by the company for the period of summer internship. They may opt for design/develop and fabricate assigned project work. They are supposed to prepare and submit a project report as a part of their term work and give presentation on their work progress after completion of the summer internship.

The faculty should examine students based on external viva at the end of semester.

B. TECH. SEMESTER – VIII
SUBJECT: COMPUTATIONAL FLUID DYNAMICS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	2	40	0	25	25	90	2	0	1	3

DETAILED SYLLABUS

1 PHILOSOPHY OF COMPUTATIONAL FLUID DYNAMICS AND GOVERNING EQUATIONS

Computational fluid dynamics: why; computational fluid dynamics as a research and design tool; models of the flow- finite control volume; infinitesimal fluid element; the continuity equation-model of the finite control volume fixed in space; model of the finite control volume moving with fluid model of an infinitesimally small element fixed; the momentum equation; the energy equation; equations for viscous flow (the Navier-Stokes equation); equations for Inviscid flow (the Euler equations); physical boundary conditions

2 MATHEMATICAL BEHAVIOR OF PARTIAL DIFFERENTIAL EQUATIONS: THE IMPACT ON CFD

Introduction; classification of quasi-linear partial differential equations; classification of quasi-linear partial differential equations partial differential equations: the eigenvalue method; hyperbolic equations; parabolic equations; elliptic equations

3 BASIC ASPECTS OF DISCRETIZATION

Introduction; introduction to finite differences; difference equations; explicit and implicit approaches: definitions and contrasts; errors and an analysis of stability; stability analysis: a broader perspective; general transformation of the equations; metrics and jacobians; form of the governing equations particularly suited for CFD revisited: the transformed version; boundary-fitted coordinate systems; elliptic grid generation; adaptive grids; some modern developments in grid generation; some modem developments in finite-volume mesh generation: unstructured meshes and a return to Cartesian meshes

4 CFD TECHNIQUES

Introduction; the Lax-Wendroff technique; Maccormack's technique; viscous flows, conservation form, and space marching; the relaxation technique and its use with low-speed inviscid flow; aspects of numerical dissipation and dispersion; the pressure correction technique; central differencing of the incompressible Navier-Stokes equations; computer graphic techniques used in CFD: x-y plots; contour plots; vector and streamline plots; scatter plots; mesh plots; composite plots.

TEXT BOOKS/REFERENCE BOOKS

1. H. K. Versteeg,W Malalasekera, An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Pearson Education Ltd.
2. Suhas V Patankar, Numerical Heat Transfer and Fluid Flow, Hemisphere Publishing Co.
3. Anil W Date, Introduction to Computational Fluid Dynamics, Cambridge University Press.
4. JiyuanTu, Guan Heng Yeoh, Chaoqun Liu, Computational Fluid Dynamics: A Practical Approach, Elsevier.
5. Tapan K. Sengupta, Fundamentals of Computational Fluid Dynamics, Universities Press.
6. Sharma, A., 2021. Introduction to Computational Fluid Dynamics: Development, Aplication and Analysis. Springer Nature.
7. Pieter Wesseling, Principles of Computational Fluid dynamics, Springer International Edition

B. TECH. SEMESTER – VIII
SUBJECT: MECHATRONICS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	2	40	0	25	25	90	2	0	1	3

DETAILED SYLLABUS

1 HYDRAULIC & PNEUMATIC CONTROL

Hydraulic actuators, characteristic of hydraulic components control valves, sources of hydraulic power hydraulic meters, pistons and transmission, elements of circuit design, accumulation control circuit such as position control and speed control circuit, pneumatic power supply, amplifiers with different controlling actions, pneumatic valves and cylinders, theory of four way and pilot valves

2 ELECTRICAL CONTROL SYSTEMS

Speed control of D.C. motors, remote control positional servo mechanism (including effect of gearing between motor and load

3 MICROPROCESSOR, SENSORS AND TRANSDUCERS

Microprocessors, 8085 architecture, 8085 assembly language programming, jump loop & call instructions, counters & timers, 8085 addressing modes, arithmetic logic instructions & programs, performance terminology of sensors, displacement, position & proximity sensors-i, displacement, position & proximity sensors-ii, force, fluid pressure, liquid flow sensors, temperature, light sensor, acceleration and vibration measurement, semiconductor sensor

4 ARDUINO BASED DIGITAL CONTROL

Introduction of hardware & software, basics of arduino, functional block diagram of arduino, functions of each pin of arduino, arduino development board diagram (including different blocks): ide, i/o functions, looping techniques, decision making techniques, programming of an arduino, basic circuit for arduino, basic interfacing & i/o concept, interfacing led, switch and seven segment led & its code, IOT applications

TEXT BOOKS/REFERENCE BOOKS

1. Nagrath & Gopal, Control Systems Engineering, New Age International Publishers
2. Jeremy blum, Exploring Arduino: Tools and Techniques for Engineering, Willey Publication
3. R. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram Int.
4. Kuo, Benjamin.C, Automatic Control System, Prentice
5. Kenneth Ayala, The 8051 Microcontroller, Cengage Learning
6. Ethan Thorpe, Arduino: Advanced Methods and Strategies of Using Arduino
7. Ogata K, Modern Control Engineering, Pearson Education
8. Ryan Turner, Arduino Programming The Ultimate Beginner's Guide to Learn Arduino Programming Step by Step, Nelly B.L. International Consulting Ltd.

B. TECH. SEMESTER – VIII
SUBJECT: COMPUTER INTEGRATED MANUFACTURING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	2	40	0	25	25	90	2	0	1	3

DETAILED SYLLABUS

1 INTRODUCTION

Nature and role of the elements of the CIM system, CIM wheel, evolution of CIM, manufacturing automation protocol, challenges and trends

2 GROUP TECHNOLOGY (GT) AND FLEXIBLE MANUFACTURING SYSTEMS (FMS)

Group Technology

Introduction, basic GT layouts, process layouts, product layouts, designing of process layout, service layout, designing of product layout, coding systems (RFID, QR, DIS)

Flexible Manufacturing Systems

Introduction, dedicated manufacturing systems, major elements of FMS, problems with FMS, mixed models assembly lines, cell technology and FMS, optimization of FMS

3 SHOP FLOOR CONTROL (SFC) AND AUTOMATED GUIDED VEHICLES (AGV)

Shop Floor Control

Introduction, shop floor control features, phases of SFC, methodology, application, shop floor data collection, data input techniques

Automated Guided Vehicles

Introduction, history, features of AGV, basic functions of AGV, types of AGV systems, design of AGV system

4 AI AND SIMULATION IN MANUFACTURING

Introduction, historical prospective, types of simulation, techniques of simulation, applications of simulations, case studies

TEXT BOOKS/REFERENCE BOOKS

1. A. Alavudeen and N. Venkateshvaran, Computer Integrated Manufacturing, PHI Learning Pvt. Ltd, New Delhi.
2. Groover, M.P., Automation, Production Systems, and Computer Integrated Manufacturing, Prentice Hall Press.
3. 1. Weatherall, A., Computer Integrated Manufacturing: from Fundamentals to Implementation, Butterworth- Heinemann.
4. Vajpayee, S. K., Principles of Computer Integrated Manufacturing, Prentice-Hall of India, New Delhi, 2005.
5. P. Radhakrishnan, S.Subramanyan and V.Raju, CAD/CAM/CIM., New Age International Publishers.

B. TECH. SEMESTER – VIII
SUBJECT: OPTIMIZATION TECHNIQUES

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	2	40	0	25	25	90	2	0	1	3

DETAILED SYLLABUS

1 INTRODUCTION

Introduction, historical development, engineering application, optimization techniques, classification. Basic concepts of optimization-convex and concave functions, necessary and sufficient conditions for stationary points

2 LINEAR & NONLINEAR PROGRAMMING

Introduction, linear programming and its applications; duality in linear programming, sensitivity analysis. Introduction, one-dimensional minimization methods-elimination methods unrestricted search, exhaustive search, dichotomous search, Fibonacci method, golden section method, interpolation methods

3 UNCONSTRAINED AND CONSTRAINED OPTIMIZATION TECHNIQUES

Introduction, classification, Univariate method, Powell's pattern search method, Cauchy's method, Newton's method. Introduction, classification, technique of variable transformation, penalty functions- exterior penalty function, interior penalty function

4 UNCONVENTIONAL OPTIMIZATION

Introduction, genetic algorithms, simulated annealing, particle swarm optimization

TEXT BOOKS/REFERENCE BOOKS

1. S. S. Rao, Optimization theory & Applications, New Age International.
2. N. V. S. Raju, Optimization Methods for Engineers, PHI publications.
3. G. S. Beveridge and R. S. Schechter, Optimization Theory and Practice, McGraw-Hill.
4. G. V. Rekllaitis, A. Ravindran, and K. M. Ragsdell, Engineering Optimization-Methods and Applications. John Wiley, New York.

B. TECH. SEMESTER – VIII
SUBJECT: POWER PLANT ENGINEERING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION: ECONOMICS OF POWER GENERATION

Introduction to various power plants, general layout of thermal power plant, load curves, load duration curves, base load and peak load power plants, connected load, demand, maximum demand/ peak load, demand factor, load factor, plant capacity factor, plant use factor, diversity factor, tariff for electric energy

2 STEAM GENERATOR AND CONDENSER

High pressure boilers: La-Mont boiler and Benson boiler, supercritical boiler, heat balance sheet for boiler. Necessity of condenser in power plant, elements of steam condensing plant, types of condensers, sources of air in condenser, effects of air leakage in condenser, methods for obtaining maximum vacuum in condenser, vacuum efficiency, condenser efficiency, Dalton's law of partial pressure used for condenser analysis, determination of mass of cooling water required in condenser, necessity of cooling towers, types of cooling towers

3 MATERIAL HANDLING SYSTEM, BOILER DRAUGHT AND FEED WATER TREATMENT

Coal handling systems- introduction, belt conveyor, pulverized fuel handling systems. Fuel burning systems- introduction, fluidized bed combustion systems ash handling systems- introduction, layout of ash handling system, Electro Static Precipitator (ESP). Boiler draught- introduction, natural draught and design of chimney, artificial draught (forced, induced and balanced). Feed water treatment- introduction, necessity of feed water treatment, deaeration

4 NUCLEAR POWER PLANT

Nuclear fusion and fission, chain reaction, nuclear fuels, components of nuclear reactor, classification of reactors, pressurized water reactor, boiling water reactor, fast breeder reactor

TEXT BOOKS/REFERENCE BOOKS

1. Arora, S.C. and Domkundwar, S., Power Plant Engineering, Dhanpat Rai & Co. Delhi
2. R.K. Rajput, Power Plant Engineering, Laxmi Publication, Delhi
3. P.K. Nag, Power Plant Engineering, Tata McGraw-Hill Co.
4. Wakil M. M., Power Plant Technology, McGraw Hill, 1985

B. TECH. SEMESTER – VIII
SUBJECT: FAILURE ANALYSIS AND FRACTURE MECHANICS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION AND FUNDAMENTALS OF FAILURES

Need and scope of failure analysis and prevention, engineering disasters and understanding failures, fundamental sources of failures – deficient design, imperfections in base metals, improper manufacturing, improper service conditions, poor assembly service and maintenance

2 TOOLS FOR FAILURE ANALYSIS & GENERAL PROCEDURE

Pareto diagram, fishbone diagram and FMEA, fault tree analysis, reliability, general procedure of failure analysis, determination of types of fracture, simulated test service conditions and analysis of evidences

3 FUNDAMENTALS OF FRACTURE MECHANICS

Introduction and overview of fracture mechanics, fracture mechanics approach to design, effect of material properties on fracture, linear elastic fracture mechanics (LEFM)

4 LINEAR ELASTIC FRACTURE MECHANICS

Atomic view of fracture, stress concentration effect, Grifith theory, energy release rate, instability and R-curve, stress analysis of cracks, stress intensity factor and different modes of loading, crack tip plasticity, fracture toughness, determination of plastic zone shape and size, stress intensity factor as a failure criteria

TEXT BOOKS/REFERENCE BOOKS

1. Otegui, J. L., Failure Analysis-Fundamentals and Applications in Mechanical Components, Springer Chem, 2014,
2. Brooks, C. R. and Choudhary, A., Failure Analysis of Engineering Materials, McGraw Hill Education, 2002.
3. Kumar, P., Elements of Fracture Mechanics, McGraw Hill
4. Anderson, T. L., Fracture Mechanics Fundamentals and Applications, CRC Press, 1994
5. Becker, W. T. and Shipley, R. J., Failure Analysis and Prevention, ASM Handbook, ASM International, 2002,
6. Brock, D., Elementary Engineering Fracture Mechanics, Maritinus Nijhoff Publishers, 1982.
7. Rolfe, S. T. and Barson, J. M., Fracture and Fatigue Control in Structures, PHI, 1977

B. TECH. SEMESTER – VIII
SUBJECT: PRODUCT DESIGN AND DEVELOPMENT

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION

Importance of product design, types of design, product definition, product specification, product and technology development cycle, concept generation and evaluation methods

2 MATERIAL AND PROCESS SELECTION

MATERIAL SELECTION

Importance, classification, material performance characteristic, selection criteria, Ashby Material selection chart

PROCESS SELECTION

Importance, types of manufacturing processes, sources of information, selection criteria, material and process selection methods

3 VARIOUS CONCEPTS OF DESIGN AND PRODUCT ASSEMBLY

Benchmarking, DFM, DFA, DFX, design for ergonomics, design for safety, aesthetic considerations in design, product design for environment, robust design, Quality Function Deployment (QFD), concurrent engineering

PRODUCT ASSEMBLY

Introduction to assembly modeling. top-down and bottom-up approaches. mating conditions representation schemes, generation of assembly sequences

4 RAPID PROTOTYPING

Introduction to rapid prototyping. different types of additive manufacturing processes

TEXT BOOKS/REFERENCE BOOKS

1. A. K. Chitale and R. C. Gupta, Product Design and Manufacturing, PHI
2. Ulirich Karl T. and Eppinger Steven D, Product Design and Development, Mc-Graw Hill
3. Dieter George E., Engineering Design, Mc-Graw Hill
4. James G. Bralla, Handbook of Product Design for Manufacturing, Mc-Graw Hill

B. TECH. SEMESTER – VIII
SUBJECT: PRODUCTION PLANNING AND CONTROL

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION

Introduction to Production Planning and Control (PPC), Objectives and Functions of PPC.

2 FORECASTING MODELS AND AGGREGATE PLANNING

Nature and use of forecast, different forecasting methods: qualitative and quantitative. Introduction to aggregate planning, objectives, options for matching capacity and demand, and strategies for aggregate planning.

3 MATERIAL PLANNING

Master production plan, Master Production Schedule (MPS), Materials Requirement Planning (MRP-I), Manufacturing Resource Planning (MRP-II),Lot sizing in MRP Systems and ERP

4 PRODUCTION SCHEDULING AND LINE BALANCING

Techniques of scheduling: Gantt chart, sequencing, single machine scheduling, flow shop scheduling, job shop scheduling. Concept of mass production system, objective of assembly line balancing, rank positional weight method.

TEXT BOOKS/REFERENCE BOOKS

1. M. Mahajan, Industrial Engineering and Production Management, Dhanpat Rai Publication.
2. Martand Telsang, Industrial Engineering and Production Management, S. Chand Publication.
3. R. Panneerselvam, Production and Operation Management, PHI Publication
4. Buffa, Modern Production Management, John Willey Publication.
5. S. N. Chary, Theory and Problems in Production and Operation Management, Tata-McGraw Hill Publication.
6. V. Deshpande, M. Gor and J. Ravalji, Industrial Engineering, Ria Publishing House

B. TECH. SEMESTER – VIII
SUBJECT: ENERGY STORAGE TECHNOLOGY

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION

Necessity of energy storage, different types of energy storage, mechanical, chemical, electrical, electro chemical, magnetic, electromagnetic, thermal

2 THERMAL ENERGY STORAGE (TES)

Sensible TES, passive and active systems. main means of accumulation, latent TES selection of phase change materials depending on the application. Types of storage systems by change of phase, - cold TES - seasonal TES - characteristics of heat storage materials. Testing, safety, standards and system sizing, energy conservation using TES, energy analyses of TES systems

3 ELECTROCHEMICAL ENERGY STORAGE

Lead acid battery, Li-ion battery, Ni metal hydride battery, capacitor etc. comparison, technical characteristics, battery states and their estimation methods, battery-based hybrid storage system, battery aging. performance characteristics, testing, safety, standards and system sizing for mobile and stationary application. Introduction of battery management system, battery thermal management, requirement of battery storage integration

4 HYDROGEN ENERGY STORAGE

Introduction, properties of hydrogen, hydrogen production methods, solid state storage, liquid state storage, compressed gas storage, metal hydrides, safety and management

TEXT BOOKS/REFERENCE BOOKS

1. J. Jensen and B. Sorenson, Fundamentals of Energy Storage, Wiley-Interscience, New York,
2. Huggins R. A., Energy Storage: Fundamentals, Materials and Applications, Springer
3. Dincer I. and Rosen M. A.,Thermal Energy Storage: Systems and Applications, Wiley pub.
4. G. Pistoia, Electric & Hybrid Vehicles, Elsevier B. V.
5. R. Narayan and B. Viswanathan, Chemical and Electrochemical Energy System, University Press

B. TECH. SEMESTER – VIII
SUBJECT: MECHANICS OF COMPOSITE MATERIALS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION TO COMPOSITE MATERIALS

Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites. Applications and future potential of composites

2 MACROMECHANICAL BEHAVIOR OF A LAMINA

Introduction, restrictions on engineering constants for isoptropic materials, stress-strain relations for anisotropic materials, stiffnesses, compliances, and engineering constants for orthotropic materials, restrictions on engineering constants for orthotropic materials, stress-strain relations for plane stress in an orthotropic material, stress-strain relations for a lamina of arbitrary orientation

3 MICROMECHANICAL BEHAVIOR OF A LAMINA

Introduction, mechanics of materials approach to stiffness, bounding methods, Semi-empirical methods, strength of unidirectional lamina

4 BIAXIAL STRENGTH THEORIES

Maximum stress theory, maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, numerical problems

TEXT BOOKS/REFERENCE BOOKS

1. Robert M. Jones, Mechanics of Composite Materials, McGraw-Hill, 1985
2. Isaac M. Daniel and Ori lshai, Engineering Mechanics of Composite Materials, Oxford University Press, 2006
3. Autar K. Kaw, Mechanics of Composite Materials, Tayler & Francis, 2006
4. Madhujit Mukhopadhyay, Mechanics of Composite Materials and structure., University press (India) Pvt Ltd., 2004

B. TECH. SEMESTER – VIII
SUBJECT: ADVANCED METAL FORMING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION

Introduction of metal forming as a manufacturing process and its relation with other processes, advantages of metal forming as a manufacturing process, classifications of metal forming processes – bulk and sheet forming, forming equipment, presses (mechanical, hydraulic)

2 MATERIAL PROPERTIES AND FORMING

Typical stress strain diagram for ductile materials, description of material properties of metals and alloys (yield strength/flow stress, ductility, strain hardening, strain rate sensitivity, effect of temperature, friction, lubrication and hydrostatic pressure on yield strength). Tensile test, effect of properties on forming

3 BULK FORMING PROCESSES

Extrusion: Introduction, calculation of extrusion load, defects in extrusion

Wire drawing processes: Introduction, defects, maximum possible reduction, wire drawing load calculation. Rolling: Classification, types of mill, analysis of longitudinal strip or sheet rolling process (calculation of roll separating force, torque & power, angle of bite, maximum reduction in rolling), rolling defects, roll flattening, roll camber

4 SHEET FORMING PROCESSES

Various sheet metal operations, blanking and punching operations, compound and progressive dies, nesting, clearance, forces in blanking, bending of plates, bendability, spring back, bending force, stress and strain in bending, stress in deep drawing, drawability. drawing load, sheet formability: forming limit curve – concept and evaluation, formability tests, theoretical prediction, factors affecting FLC

TEXT BOOKS/REFERENCE BOOKS

1. Surender Kumar, Technology of Metal Forming Processes, Prentice-Hall of India Pvt. Ltd.
2. Dieter G. E., Mechanical Metallurgy, McGraw Hill, 1988.
3. G. W. Rowe, Principle of Industrial Metal Working Processes, CBS Publishers
4. Altan T., Metal Forming – Fundamentals and Applications – American Society of Metals, Metals park, 2003
5. ASM Hand book, Forming and Forging, Ninth edition, Vol – 14, 2003
6. Taylan Altan, Soo-Ik Oh and Harold L. Gegel, Metal Forming-Fundamentals and Applications American Society for Metals

B. TECH. SEMESTER – VIII
SUBJECT: SAFETY AND MAINTENANCE

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
2	0	0	40	0	0	0	40	2	0	0	2

DETAILED SYLLABUS

1 INTRODUCTION TO MAINTENANCE

Types of maintenance - breakdown, preventive and predictive maintenance Repair cycle - repair complexity, lubrication and lubricants, maintenance of mechanical transmission systems and process plants

2 PREDICTIVE & BREAKDOWN MAINTENANCE

Vibration and noise as maintenance tool - wear debris analysis - condition monitoring concepts applied to industries - Total Productive Maintenance (TPM)

3 RELIABILITY

Definition, concept of reliability-based design, failure rate, MTTF, MTTR, MTBF, failure pattern, system reliability: series, parallel and mixed configurations - availability and maintainability concepts applications

4 SAFETY AND STANDARDS

Causes of accidents in industries - accident reporting and investigation performance measuring safety; factories act and rules. general safety considerations in - machine shop machineries-pressure vessels and pressurized pipelines; operation and inspection of extinguishers; prevention and spread of fire-emergency exit facilities, safety standards

TEXT BOOKS/REFERENCE BOOKS

1. P. Gopalakrishnan, Maintenance and Spare Parts Management, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2013
2. H P Garg, Maintenance Engineering, S Chand and Company
3. L. S. Srinath, Reliability Engineering, Affiliated East West press, 2005
4. Rolland P. Blake, Industrial Safety, 1st Edition, Prentice Hall of India Pvt. Ltd., 2003.
5. R. C. Mishra and K. Pathak, Maintenance Engineering and Management, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2012.

B. TECH. SEMESTER – VIII
SUBJECT: PROJECT

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	4	0	0	100	0	100	0	0	2	2

DETAILED SYLLABUS

The students are required to prepare term project on given topic.

The students will undertake project work for the period of full semester. They may opt for design/develop & fabricate small innovative product. They are supposed to prepare and submit a project report as a part of their term work and give presentation on their work. The faculty should monitor the students for their project work regularly every week. They are to be examined based on viva and/or demonstration.

B. TECH. SEMESTER – VIII
SUBJECT: INDUSTRIAL TRAINING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
0	3	12	0	0	100	150	100	0	0	2	2

DETAILED SYLLABUS

The students are required to undergo industrial training for 8 weeks during semester.

The students will undertake project work/ assigned work by the company for the period of full semester. They may opt for design/develop & fabricate assigned project work. They are supposed to prepare and submit a project/training report as a part of their term work and give presentation on their work progress on regular basis. The faculty should monitor the students for their project/training work regularly. They are to be examined based on external viva at the end of semester.