Nirma University
Institute of Technology
School of Engineering

B.Tech in Mechanical Engineering

ME101 **Engineering Graphics**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- Understanding the fundamental principles of engineering graphics and related drawing standards
- explain the various methods of producing and presenting graphic information.
- communicate graphically using traditional means and the computer aided tools.
- develop capability to visualize and represent geometry in two dimensions and in three dimensions.
- appreciate role of engineering graphics and modeling for various disciplines of engineering.

Syllabus:

Introduction to Engineering Drawing
Importance and Applications of Engineering Drawing for various branches of engineering, Drawing instruments, BIS Code of Practice, Lines, Lettering and Dimensioning, Scales, Basic Geometrical Construction, Sheet Layout

Engineering Curves
Equations of conic curves and cycloid and their relevance to construction.
Construction of conics by Focus Directrix Method, Construction of Ellipse by Arcs of Circle Method, Parabola by Rectangle Method, Rectangular and oblique Hyperbola.
Construction of Cycloid, Epicycloids and Hypocycloid. Construction of Involutes. Constructions of Archimedean spiral and helix.

Solid Geometry
Concept of Orthographic Projections and Projections of Points, Projections of straight lines inclined to one and both reference planes, Projections of Planes inclined to both reference planes, Projections of solids and sections of solid.

Developments of Surfaces by parallel line method and radial line method.

Interpenetration of Solids
Determination of lines / curves of intersection for interpenetration of Prism to prism, Cylinder to cylinder, Cylinder to cone, Cone to cylinder.

Orthographic Projections
Conversion of pictorial views in to orthographic Projections. Sectional orthographic Projections.

Isometric Projections
Conversion of orthographic views into isometric projections / views.

Computer Aided Drafting Tools
Basic Drawing Creation Tools- creating a line, circle, Arc, Donut, Ellipse, Point, Multi-Line, Polygon, Spline. Using editing tools such as Dividing and Measuring.

Modifying Commands and Views- Rectangular and Polar arrays, modify using BREAK, CHAMFER, COPY, EXPLODE, EXTEND, FILLET, MIRROR, MOVE, OFFSET, PEDIT, ROTATE, SCALE, STETCH, TRIM. Adding Text to Drawings, Dimensioning Tools.

Conventional Representation
Symbols for standard machinery components such as nuts, bolts, locking devices, riveted and welded joints, foundation bolts. Symbols used in electrical, electronics and civil engineering.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory Work will be based on the above syllabus consisting of minimum six drawing sheets.

References:

1. N D Bhatt, Engineering Drawing, Charotar publication
2. K. C. John, Engineering Graphics, PHI Publication.
3. Warren J Luzzader and Jon M Duff, Fundamentals of Engineering Drawing, PHI publication.
4. James D Bethune, Engineering Graphics with AutoCAD® , PHI Publication.
5. IS SP 46 : 2003. Engineering Drawing Practices for Schools and Colleges.

ME102 **Mechanical Workshop Practices**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- comprehend safety measures required to be taken while work in the mechanical workshop.
- select proper tools and cutting data for a given material and manufacturing process.
- properly operate the equipment in the mechanical workshop.
- competent to read and use an engineering drawing for the given job.

Syllabus:

(a) Instruction / demonstration is given for each of the following shops/trades, new materials, tools and equipment used.

1. Joining process
2. Plumbing (metalic & non metalic pipe fittings)
3. Fitting /Assembly practice
4. Sheet Metal work
5. Electroplating
6. Carpentry/ Pattern Making
7. Blacksmithy
8. Painting

(b) Exercise and Term work: Each student is required to prepare simple exercises in the following so as to have a feeling of how the jobs / parts are prepared and use of tools / equipments.

1. Arc Welding / Soldering------02 Hrs
2. Fitting / Assembly. ----------05 Hrs
3. Carpentry Practice ----------02 Hrs
4. Blacksmithy Practice----------02 Hrs

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. H S Bawa, Workshop Practice -I and II by, TMH Publication.
2. Hasan Ali and Khan R A, Manufacturing Processes and Workshop Practice, Scitech Publication
3. K C John, Mechanical Workshop Practice by, PHI Publications.
4. B S Raghuvanshi, A course on workshop technology I and II, Dhanpatrai and sons.

ME105 Introduction to Mechanical Engineering

Course Learning Outcomes (CLO):

At the end of the course, students will able to-

1. relate the importance of engineering in society and industry,
2. infer the role, scope, importance and applications of mechanical engineering,
3. perceive the inter-disciplinary role and importance of mechanical engineering related to various engineering domains,
4. interpret the opportunities and upcoming areas related to mechanical engineering.

Syllabus

Introduction to Engineering
History of engineering, Social relevance of engineering, Role and importance of engineers in industries
Overview of Mechanical Engineering
Major constituents of Mechanical Engineering such as Materials, Mechanics, Design of components, Manufacturing of Products, Thermal and Energy Conversion Systems, etc.
Introduction to Engineering Design
Engineering Design Process, Material Selection, Productivity, Quality, Profitability, Safety, Optimization, Environmental concern, Societal needs, etc.
Emerging Trends and Interdisciplinary Approach
Introduction to emerging trends and interdisciplinary approach related to Mechanical Engineering such as Manufacturing Automation, Internet of Things, Artificial Intelligence, Machine Vision and Robotics, Nanotechnology, Mechatronics, etc.
Career opportunities
Role and responsibilities of a Mechanical Engineer in various industries, Entrepreneurship, Start-up, etc.
Suggested Readings:
1. Saeed Moaveni, Engineering Fundamentals: An Introduction to Engineering , Cengage Learning
2. Jonathan Wickert, Kemper Lewis, An Introduction to Mechanical Engineering, Cengage Learning

HM102 **English (Foreign Language)** **[2 0 2 3]**

Course Learning Outcome:
By the end of this course

- Student will be able to understand and speak a new language
- Student will be more aware about the world outside
- It will add to the knowledge of culture other than their own
- Multi-Linguistic skills will equip them with better communication skills too

Syllabus of English Language:
The course content will encompass following topics

Grammar

- Tenses
- Helping and Modal auxiliary verb
- Concords
- Prepositions
- Idioms
- Synonyms –Antonyms
- Confusables

Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

Poems

- Ode to the skylark – by P B Shelley
- Where The Mind Is Without Fear - by Rabindranath Tagore.
- The Road Not Taken- Robert Frost
- On The Move - by Thom Gunn.

Methodology:
Readings, exercises, role plays, videos will be the basic tools for teaching

As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.

References:

1. Leech Geoffery and Svartik Jan, 'A Communicative Grammar of English', Pearson pub.
2. Murphy Raymond, 'Grammar in Use Intermediate with Answers', Cambridge University Press
3. Selected text in the form of handouts.

2HSI101/2HSB101 English Communication

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

- acquire adequate proficiency in English communication including reading and listening, comprehension, writing and speaking skills, apply the dynamics of communication skills.

Syllabus:

Vocabulary Building

Origin of English Language, Types of English, 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.

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.

Identifying Common Errors in Writing

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

Nature and Style of sensible Writing

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

Writing Practices

Comprehension, Precis Writing, Essay Writing, Idea Expansion.

Oral Communication

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm.

Persuasive Communication

Communication at Workplace: Report, Application and email writing, Referencing, Interviews, Formal Presentations.

Laboratory Work

Practices related to tenses, prepositions, word formation/transformation concord, affixes, one-word substitutes, idioms etc. Vocabulary building, Presentations and Group Discussions.

Self-Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggestion for Readings

1. Selected Texts and excerpts.
2. Selected movies and TED talks
3. King's Speech
4. Babel
5. Episodes of Yes Prime minister
6. Episode of Sherlok
7. Practical English Usage, Michael Swan, OUP. 1995.

8. Remedial English Grammar, F.T. Wood, Macmillan. 2007
9. On Writing Well, William Zinsser, Harper Resource Book. 2001.
10. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006.
11. Communication Skills, Sanjay Kumar and PushpLata, Oxford University Press. 2011.
12. Word Power Made Easy, Norman Lewis.
13. Raymond Murphy, Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers, Cambridge University Press.
14. Collins Academic Skills Vocabulary Organizer.
15. Collins Writing Skills B2+.
16. Real Life Real Listening-Collins.

HM111 **French Language (Foreign Language)**

Course Learning Outcomes:

At the end of the 40 hours course, students will be evaluated on the basis of 4 competences:

- Writing (Filling forms, post cards, small emails, messages),
- Speaking (To present oneself in details, to be able to ask questions in certain given situations, Role Play),
- Written Comprehension (Small texts, post cards, messages),
- Oral Comprehension (Understanding the basic day to day conversations).

Pedagogy: Communicative and Action Oriented Approach

Supplementary: Cultural activities of Alliance Française d'Ahmedabad.

COURSE CURRICULUM

Main guidelines

1) To introduce oneself
2) To ask information about someone
3) To count
4) To communicate in a class
5) To Greet
6) To take leave
7) To ask personal information
8) To ask politely
9) To give personal information
10) To ask the price
11) To ask about likings
12) To express about our likings
13) To talk about a city
14) To name and find out different places in a city
15) To ask and give an explanation
16) To thank and to reply
17) To write a message
18) To give impressions about a place
19) To talk about ones' activities
20) To say where we live
21) To talk about the weather
22) To fix or postpone a meeting
23) To talk briefly about oneself
24) To ask the time and the timings
25) Telephonic conversation
26) To talk about the family
27) To talk about seasons
28) To understand simple information about the weather
29) To appreciate
30) To precise the quantities
31) With relevant vocabulary and grammar points

HM131 German Language (Foreign Language)

Course Learning Outcomes : On completion of the course, the student would be able to:

1. understand & convey expressions associated with everyday routine and topics related to direct circumstances and common requirements in Germany (e.g. seeking and sharing personal information, handling simple conversations related to shopping, making reservations, ordering in restaurants, airports, banks, railway stations, universities and other all such public places).
2. get an insight into the day-to-day socio-economic culture of Germany.
3. appreciate a foreign culture and the importance of learning a foreign language.
4. understand and put basic German grammar such as various types of verbs, nouns, adjectives, tenses and cases to practical & functional use.
5. read, write, speak and understand elementary German and be able to hold simple, short conversations confidently.

Themes & Topics Covered:

- German Greetings & Good-bye's
- Introduction (Seeking introductions & introducing yourself thoroughly in German)
- Orientation: Learning directions & interpreting city plans (Finding your way in the city, inquiring about places, communicating with localities, making basic conversations in Post Offices, Airports, Railway Stations & public places)
- Learning Countries, States & Capitals
- Professions
- Making reservations: Hotels, Taxis & other such routine bookings
- Placing order in Restaurants & learning to find your way around routine requirements
- Learning time, dates, days of the week, numbers & occasions/festivals.

Grammar Covered:

Nouns- In depth study of nouns, with emphasis on case-specific changes

1. Verbs- Regular, Irregular, Helping, Separable & Modal verbs. All with their conjugations
2. Subjects- Nominative and accusative. Correlation between a subject & a verb
3. Cases- Nominative, accusative & dative. Effect of each on nouns & the corresponding changes
4. Articles- Definite & indefinite articles. Its impact & ultimate effect on cases
5. Sentences: Imperative, declarative, exclamatory & interrogative. Positive & negative sentence construction shall also be covered (e.g: "Ja", "doch", as well as " nein", "nicht" & "kein" respectively)
6. Concepts such as adjectives, possessive pronouns, prepositions & adverbsSentence Construction

2CL102/CL103 Environmental Studies

Course Learning Outcomes:

At the end of the course, students will be able to –

1. appraise the multidisciplinary nature of environment and sustainability
2. explain types of environmental pollution and its control measures
3. outline social issues related to environment

Syllabus:

Unit 1: Multidisciplinary Nature of Environment

Environment and its multidisciplinary nature, Ecosystems, biodiversity and its conservation, concept of sustainability, Environmental Impact Assessment, public awareness towards environmental conservation, Environmental legislation, carbon credit and carbon trading

Unit 2: Environmental Pollution, Global Warming and Climate Change

Types of environmental pollution and pollutants, causes, effects and control measures of – air pollution, water pollution, soil/land pollution, noise pollution, radioactive pollution. Role of an individual in prevention of pollution. Case studies on pollution, Effects – acid rain, ozone layer depletion and greenhouse effect. Sources, types and effects of waste, waste disposal and management, e-waste management

Unit 3: Social Issues related to Environment

Environment ethics- issues and solutions. Energy and water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns, environmental protection acts.

Self-Study:

The self-study contents will be declared at the commencement of semester.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 05 Assignments to be incorporated.

Suggested Readings:

1. Dara, S. S., & Mishra, D. D. A textbook of Environmental Chemistry and Pollution Control. S. Chand & Company Ltd.
2. Bharucha, E., Textbook of Environmental Studies, Universities Press.
3. Dhameja, S. Environmental Studies. S. Kataria and Sons.
4. Ristinen, R., & Kraushaar, J. Energy and the Environment, Wiley Publications.
5. Masters, G. Introduction to Environmental Engineering and Science. Prentice-Hall Publications.
6. Basak, A. Environmental Studies. Pearson Publications.

MA101 **Calculus**

Learning outcomes:

On completion of the course student

CLO1: will be able to find higher ordered derivatives and hence represent function in power series of (x-a)

CLO2: will apply the knowledge of function of several variables , its derivatives in engineering problems

CLO3: will apply the knowledge of special functions(Gamma, Beta, Elliptic, Error) and its application in engineering problems

CLO4: will apply the knowledge of multiple integration and its application in engineering problems

Syllabus:

Unit I: Differential Calculus Review of limits, continuity and differentiability, Successive differentiation, Leibnitz theorem (without proof), Indeterminate forms, Taylor's and Maclaurin's expansion of single variable, Partial Differentiation, Total derivative, Chain Rule, Implicit function, Euler's theorem and its applications, Taylor's and Maclaurin's expansion of function of several variables, Maxima and Minima of function of several variables, Lagrange's method of undetermined multipliers, Jacobian.

Unit II: Integral Calculus Review of proper and improper integrals, Reduction formulae, Beta-Gamma functions, Error function, Tracing of curves, Rectification, Quadrature, Volume of solid of revolution, Area of surface of revolution, Double integral and evaluation, Change of order of integration, Change of variable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

References:

1. Thomas' Calculus(Latest edition), Pearson publication.
2. G B Thomas and R. L. Finney, Calculus and Analytic Geometry (Latest edition), Narosa Publication, Delhi.
3. James Stewart, Calculus (Latest edition), Thomson Learning.
4. B. S. Grewal, Higher Engineering Mathematics, (Latest edition) Khanna publication, Delhi.
5. Dr. K. R. Kachot, Higher Engineering Mathematics Vol I (Latest edition), Mahajan Publication, Ahmedabad.
6. Sharma and Yeolekar, Engineering Mathematics Vol. I. (Latest edition), PHI, New Delhi.

2MA201/MA102 Calculus and Differential Equations

Course Learning Outcomes (CLO)

At the end of the course, students will be able to-

1. apply differential and integral calculus to solve engineering problems,
2. use power series to solve differential equations appears in engineering filed,
3. deal with functions of several variables that are essential in engineering.

Syllabus:

Calculus

Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions

Infinite Series

Convergence of series, tests for convergence, power series, Taylor's and Maclaurin's series. Series for exponential, trigonometric and logarithmic functions

Multivariable Calculus: Differentiation

Limit, continuity and partial derivatives, total derivative and chain rule, Euler's theorem, Taylor's series in two variables, Tangent plane and normal line, Maxima, minima and saddle points Method of Lagrange multipliers

Multivariable Calculus: Integration

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities).

Ordinary Differential Equations

Second order linear differential equations with constant coefficients, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties

Partial Differential Equations: First Order

First order partial differential equations, solutions of first order linear and non-linear PDEs

Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. G B Thomas and R L Finney, Calculus and Analytic geometry; Pearson
2. T Veerarajan, Engineering Mathematics; McGraw-Hill
3. B V Ramana, Higher Engineering Mathematics; McGraw-Hill
4. N P Bali and M Goyal, A text book of Engineering Mathematics; Laxmi Publications
5. B S Grewal, Higher Engineering Mathematics; Khanna Publishers
6. E Kreyszig, Advanced Engineering Mathematics; John Wiley & Sons
7. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems; Wiley India

8. S L Ross, Differential Equations; Wiley India
9. E A Coddington, An Introduction to Ordinary Differential Equations; Prentice Hall India
10. E L Ince, Ordinary Differential Equations; Dover Publications
11. G F Simmons and S G Krantz, Differential Equations; McGraw Hill

MA201 **Linear Algebra**

Learning outcomes:
On completion of the course student

CLO1. will have basic knowledge of vector space.
CLO2. will have basic knowledge of matrix algebra..
CLO3. Will able to apply the knowledge of linear algebra in solving system of linear equations.

Unit:-1. Matrix theory: Review of algebra of matrices, Rank of matrix, Inverse of matrix by Gauss-Jordan method, Solution of system of algebraic simultaneous equations, Linearly dependent and Linearly independent functions, Caley-Hamilton Theorem (without proof), eigen values and eigen vectors, Eigen values and eigen vectors of orthogonal, symmetric, skew-symmetric matrices, Hermitian matrix, skew-Hermitian matrix, Unitary matrix, Normal matrix, Algebraic and geometric multiplicity, Diagonalization, Spectral theorem for Real symmetric matrices, Application of quadratic forms.

Unit:-2. Vector space and Linear transformations: Definition of vector space, subspaces, linear combination, Linearly dependent and linearly independent vectors, Basis of vector space, Dimension, Rank-Nullity theorem (statement and verification by examples), Definition of linear transformation, types of linear transformations (Rotation, Reflection, Expansion, Contraction, Projection), Matrix of Linear transformations, Change of basis and similarity.

References:

1. David C. Lay, Linear algebra and its application, (Latest edition), Pearson publication, New Delhi.
2. E. Kreyszig, Advanced engineering mathematics (Latest edition), John Wiley.
3. H. Anton, Elementary linear algebra with applications (Latest edition), John Wiley.
4. K Hoffman & Ray Kunze, Linear Algebra, PHI, New Delhi.
5. J. P. Sharma and M. Yeolekar, Engineering mathematics, Vol-II, (Latest edition), PHI publication, New Delhi.
6. S. Kumaresan, Linear algebra - A Geometric approach (Latest edition), PHI, New Delhi.

CE104 **Computer Programming**

Course Learning Outcomes (CLOs):
At the end of the course, students will be able to –

1. recognize the importance and apply C language constructs in program development,
2. analyse the problem and select the most appropriate method to solve it,
3. evaluate the correctness of the developed solution.

Syllabus:

Unit I

Introduction to Computers: Introduction to Computers and the Internet in Industry and Research, The Internet and World Wide Web, web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps. Test-Driving a C Application in Linux, Running a C program Using GNU for debugging.

Unit II

Introduction to Programming: Memory Concepts, datatypes, operators and expressions, Decision Making, Bitwise Operators, Flowchart, Algorithms, Pseudocode, Test-cases, Repetition Statement, Counter-Controlled Repetition, Sentinel-Controlled Repetition, Nested Control Statements. Introduction some Simple C Program, I/O handling.

Programming with C: keywords, syntax and library functions, datatypes, declarative, imperative and decision statements. Control structures.

Unit III

Functions: Math Library Functions, User defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration.

Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.

Unit IV

Pointers: Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation.

Characters and Strings: Fundamentals of Strings and Characters, Character-Handling Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.

Unit V

Structures: Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions

File Processing: Files and Streams, Creating a File, Reading and writing Data from a File.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Above concepts are to be implemented in C-language atleast with emphases on logic development and debugging, 10 experiments are to be carried out.

Tutorial Work:

The tutorial work will be based on the topics covered in the syllabus. Minimum 10 tutorials should be carried out.

Suggested Readings:

1. Deitel and Deitel , C How to Program, Pearson
2. E. Balagurusamy, 'Programming in ANSI C", McGraw Hill
3. Yashwant Kanitker, Let Us C, BPB Publications
4. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India
5. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
6. David Gries, The Science of Programming, Springer
7. Dromey R.G., How to solve it by computers, Prentice Hall of India
8. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
9. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
10. Sedgewick R., Algorithms in C, Addison Wesley
11. Schaum Ourline Series, Programming in C, , McGraw-Hill
12. E. Balagurusamy, Pointer in C, McGraw Hill

CE101 **Art of Programming**

Learning Outcome:

- Students will get acquainted with basic components and capabilities of a typical computing system.
- Students will be able to critically think about basic problems and develop algorithms to solve, validate and verify with computing systems.
- Students will be able to identify appropriate language constructs and approach to computational problems.
- Students will be acquainted with coding standards including documentation which are required to be used for the development of effective, efficient and maintainable programs.

Syllabus:

Introduction to Computer Systems: Basic computer organisation, operating system, editor, compiler, interpreter, loader, linker, program development.

Data Storage and Operations: Various data representation techniques, data types, constants, variables, arrays, various arithmetic and logical operations in a typical programming environment.

Algorithms and Flow charting: Introduction to computer problem solving, concepts and algorithms and flow chart, tracing of an algorithms.

Algorithm to Program : Specifications, top down development and stepwise refinement as per programming environment needs. Imperative style of correct and efficient programming, introductory concepts of time and space complexities.

Loops and Controls Construct : conditional and unconditional execution. Simple versus nested controls. Various aspects of repetitive executions, iterative versus recursive programming styles, assertions and loop invariants.

Errors and Debugging: Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory.

Structured Programming: Introduction to modular approach of problem solving, concepts of procedure and functions for effective programming.

Coding Conventions: Variable naming, function naming, indentation, usage and significance of comments for readability and program maintainability.

Laboratory Work:

Above concepts are to be implemented in any High Level Programming Language (preferably C-language) atleast 10 experiments are to be carried out.

References:

1. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
2. Dromey R.G., How to solve it by computers, Prentice Hall of India
3. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
4. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
5. Sedgewick R., Algorithms in C, Addison Wesley
6. Yashwant Kanitker, Let Us C, BPB Publications
7. Schaum Ourline Series, Programming in C, , McGraw-Hill
8. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India

CY101/2CY101 Chemistry

At the end of the course, students will be able to –

1. relate the fundamentals and their application in various field of engineering,
2. identify and apply the principles of green chemistry in improving the existing technology,
3. categorize the materials on the basis of their properties,
4. select appropriate method of analysis and interpret its result.

Syllabus

Unit 1

Water and its Treatment

Introduction, Sources of water impurities, Hardness of water, Degree of hardness, Softening of water, Water treatment processes, Problems with boiler feed water and its treatments Specifications for drinking water (BIS standards)

Unit 2

Fuel

Calorific Value, Types of fuel, Selection of fuels, Analysis of coal:- proximate and ultimate analysis, Flue gases:- Orsat apparatus, Alternative fuels:- Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Ethanol, Bio-diesel

Unit 3

Lubricants

Classification and functions of lubricants, Properties:- lubricating oil and greases, Selection of lubricants

Unit 4

Polymers and Composite materials

Introduction to Polymers and Polymerization, Elastomers, classification and uses, Biopolymers:-Cellulose and starch, Advanced polymeric materials, Composites:- Introduction, classification and applications

Unit 5

Green Chemistry

Overview, Set of Principles of Green Chemistry, Industrial applications

Unit 6

Engineering Materials

Adhesives:- characteristics, classification, and uses, Fullerenes:- structure, properties and applications, Nano rods:- brief introduction, Organic Electronic Materials:- introduction, types and applications, Liquid Crystals:- Introduction, classification and applications, Explosives:- Introduction, Classification, Characteristics, Disarmament, Weapons of Mass Destruction (WMD), peaceful uses of explosives

Unit 7

Overview of electrochemical systems

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. P.C. Jain and Monika Jain, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
3. S.S. Dara, Textbook of Engineering Chemistry, S. Chand and Company.
4. Mike Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry.
5. J.C. Kuriacose and J. Rajaram, Chemistry in Engineering and Technology, Tata Mc Graw Hill.
6. Prasanta Rath, Engineering Chemistry, Cengage Learning.
7. Sunita Rattan, A Textbook of Engineering Chemistry, S.K. Kataria & Sons.

PY101/2PY101 **Physics** **[2 1 2 4]**

Course Outcomes (CO):

At the end of the course, students will be able to -

1. Acquire the knowledge of fundamental principles of physics and relate to the engineering science,
2. Apply the concepts of Physics for solving Engineering problems,
3. Relate principles of Physics for solving new and challenging problems of technology.

Syllabus:	**Teaching hours**: **30**
Physics of Nanomaterials: Introduction to Quantum Physics: Particle in a three dimensional box, Introduction – Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical, Magnetic, Optical, Mechanical, Characterization techniques – X ray Diffraction (XRD) - Single Crystal, Powder and Laue techniques, Low energy Electron Diffraction (LEED), Scanning Electron Microscopy, Tunnelling Electron Microscopy, Nanostructures; Carbon nanotubes Characteristics and applications, Nanotechnology and environment.	06
Lasers and Holography: Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.	06
Introduction to Fiber Optics: Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.	04
Nuclear and Plasma Physics: Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators – pinch of synchrotron radiation, nuclear fission as a source of energy, Nuclear radiation counters – Geiger Mullar Counter, scintillation counter. Basic concepts of Plasma physics: Introduction to Electrostatics and Electromagnetics, Curl, Divergence and Gradient of fields, Maxwell's equations, Motion of charged particle in E and B homogeneous field, Pinch effect, Magnetic trapping of plasma, Van Allen radiation belt.	05
Physics of Vacuum Techniques and Cryogenics: Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics – use of liquid Nitrogen and liquid Helium, Applications of cryogenics in refrigeration, space and medical field	04
Engineering of Auditorium and Ultrasonics: Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezoelectric method, Properties and application of ultrasonic waves	05

Laboratory Work:
A minimum of 10 experiments based on above syllabus will be arranged.

Self- Study:
Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:
1.M N Avadhnulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand.
2.T. Pradeep, Nano: The Essentials, New Central book Agency.
3.S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
4.B. L. Theraja, Physics for Engineers, S Chand Publication

EE104 **Electrical Workshop**

Course Outcomes (CO)

At the end of the, a student will be able to –

1. identify and propose appropriate electrical and electronic components for relevant applications,
2. select and make use of various laboratory equipment,
3. build simple domestic and industrial wiring systems,
4. apply basic maintenance and troubleshooting skills to house hold electrical appliances,
5. extend the awareness about safe practices in electrical systems.

Syllabus

Wiring Techniques

Designing of domestic and industrial wiring, selection of wire, load calculations

Introduction to Electronic Components

Study of various electronic components like, power and signal diodes, zener diodes, BJTs, FETs, LED, LDR, Photo diode, Photo transistor, SMD components, general purpose ICs, use of bread board

Lab Equipment

CRO, DC regulated power supply, function generator, multimeter, single-phase and three-phase auto-transformer (variac)

Introduction to Electrical Components

Study of different types of switches, solid state and electromagnetic relays, contactors, rheostats, different types of capacitors, resistors, variable inductor (choke) etc.

Soldering Techniques

Basics of soldering techniques, effectiveness of soldering and problem associated with soldering, general purpose board soldering

Basics of Household Electrical Equipment

Rewiring / replacement of fuse, switch board layout, functioning of switch, fan regulator, tube light, electric iron, electric heater

Electrical Safety and Protection

Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays

Designing of Electrical Panel

Basic design steps and criteria, selection of various components, layout of panel, ferruling, crimping, lugging, annunciation, display, mimic, meter mounting etc.

Introduction to DC Machine

Study of various parts of DC machine. Operation of DC machine as DC motor

References

1. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta
2. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons
3. Sengupta R., Textbook of Principles and Reliable Soldering Techniques, New Age International (P) Ltd
4. B. L. Theraja, A. K. Theraja, Textbook of Electrical Technology Vol – III, S. Chand Publishers., New Delhi
5. K. B. Bhatia, Textbook of Fundamentals of Maintenance of Electrical Equipment Khanna Publishers
6. Er. Mehta S. D., Textbook of Electronic Product Design Vol – I, S. Chand Publishers., New Delhi

7. Dr. S. K. Bhattacharya, Dr. S. Chatterji, Textbook of Projects in Electrical, Electronics, Instrumentation and Computer Engineering, S. Chand Publishers., New Delhi
8. National Electrical Code: Bureau of Indian Standards, Govt. Of India, 2011 Operating Manuals of Various Equipment

2EE101 Elements of Electrical and Electronics Engineering

Course Outcomes (CO)

COs are clear statements of the expectations for student achievements in the course.
At the end of the course, a student will be able to –

1. interpret the importance of electrical energy and relate its usage in various applications,
2. illustrate the role of circuit elements in different system conditions,
3. distinguish the operational aspects of ac-dc systems and comprehend the principles of electromechanical energy conversion,
4. recognise the functions of electronic devices and basic circuits,
5. apply the concepts of number based conversion and Boolean algebra for digital logic design.

Syllabus

Unit - 1

Review of dc Circuits

Kirchhoff's laws, solution of star-delta circuits, Joule's law of electric heating, relationship between various energy units, charging and discharging of capacitor, series-parallel magnetic circuits, fringing effect, comparison between electric and magnetic circuit, Concept of induced emfs, series-parallel connection of inductors, rise and decay of current in inductive circuit.

Unit - 2

Single-phase AC Circuits

Generation of alternatingemf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits.

Unit - 3

Three-phase AC Circuits

Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, power measurement in three-phase circuit, variation in wattmeter reading with power factor.

Unit - 4

Electromechanical Energy Conversion

Concept of electro-mechanical conversion, energy balance, elementary concept of electrical machines, types of rotating electrical machines.

Unit - 5

Analog Electronics

Half and full wave rectifiers, special purpose diodes, regulator, BJT and its applications, amplifier, oscillator, overview of opto-electronics devices, opto-couplers, transducers, Operational amplifier, Comparator, Timer IC and multivibrators.

Unit - 6

Digital Electronics

Number systems and its arithmetic, binary codes, Boolean-algebra & simplification of Boolean expression; logic gates, concept of universal logic; implementation of Boolean expressions using logic gates, application of digital circuits (e.g. adder, subtractor, multiplexer, de-multiplexer, analog to digital converter, digital to analog converter

References

1. B.L.Theraja, A.K. Theraja, Textbook of Electrical Technology Volume I –, S. Chand & Co.
2. A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical

Engineering –TMH Publishing Co.
3. U. A. Patel, Textbook of Elements of Electrical Engineering, Mahajan Publishing House, Ahmedabad.
4. J. Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd.
5. Vincent Del Toro, Textbook of Principles of Electrical Engg., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta.
7. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons.
8. Robert Boylestad, Louis Mashlsky, Electronics Devices and Circuit theory, Peerson
9. M. Morris Mano, Digital logic and computer Design, PHI

EE101 **Elements of Electrical Engineering**

Learning Outcome:
The course is designed to introduce to a novice about the fundamentals of the electrical engineering. At the end of the course, it is expected that student will be able to express the behavior of basic electrical components like resistor, inductor and capacitor under DC and AC application. The students are exposed to single-phase and poly-phase systems and circuits and shall be able to comprehend the same. The student will be able to appreciate safety requirements and usage of safety devices. The learner will be able to understand and apply the basics of electrical engineering in their respective field of engineering.

Syllabus:
Review of DC Circuits
Resistor, temperature effect on resistance, Kirchhoff's laws, solution of series-parallel and star-delta circuits, Joule's law of electric heating, relationship between various energy units, types of capacitor, charging and discharging of capacitor, fundamentals of magnetic circuits, fringing effect, series-parallel magnetic circuits, comparison between electric and magnetic circuit
Electromagnetic Induction
Faraday's laws of electromagnetic induction, concept of induced emfs, coefficient of coupling, series-parallel connection of inductors, rise and decay of current in inductive circuit, hysteresis and eddy current loss
Single-phase AC Circuits
Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits
Three-phase AC Circuits
Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, introduction to rotating vector, power measurement in three-phase circuit, solution of balanced and unbalanced systems
Domestic and Industrial Wiring
Basic domestic wiring methods, types of cable, accessories, PVC conduit and PVC casing, salient features of industrial wiring, consideration on cross sectional area and insulation strength based on voltage and current rating, design calculations, protective systems, Indian standard wiring practices
Electrical Safety and Protection
Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays
Batteries
Different types of batteries, need of batteries, charging and discharging of batteries, methods of charging

Laboratory Work:
This shall consist of at least 10 practicals based on the above syllabus.

References:
1. Electrical Technology, Volume I – B.L.Theraja, A.K. Theraja; S. Chand & Co.
2. Basic Electrical Engineering – A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, TMH Publishing Co.
3. Elements of Electrical Engineering – U. A. Patel, Mahajan Publishing House, Ahmedabad.
4. Basic Electrical Engineering – I. J. Nagrath, TMH Publishing Co. Ltd.

5. Principles of Electrical Engg.– Vincent Del Toro, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Electric Wiring – Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
7. Electrical Design Estimating and Costing – Surjit Singh, Dhanpat Rai & Sons.

ME301 **Kinematics**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- understand the concept of machines, mechanisms and related terminologies.
- analyze a planar mechanism for displacement, velocity and acceleration graphically.
- analyze various motion transmission elements like gears, gear trains, cams, belt drive and rope drive
- synthesis the planar mechanism for function generation and path generation

Syllabus

Links & Mechanism:

Links- kinematics pairs, higher and lower pairs, constraints, slider crank chains, double slider crank chains, inversions. Exact straight line mechanism of Peaucelliers. Pantograph, steering gear mechanisms, Condition for correct steering, Davis and Ackermann steering gears.

Motion:

Velocity and acceleration in machine parts, instantaneous center, centrode, its laws, velocity and acceleration diagrams for simple kinematic mechanisms.(Vector and graphical approach). Computer aided Kinematic Analysis of Mechanism like Slider Crank Mechanism, Four-Bar Mechanism.

Friction:

Inclined plane, condition for maximum efficiency, pivot & collar friction, uniform pressure & uniform wear, friction circle, friction axis. Belt & rope drive effect of centrifugal stress on power transmitted, slip & creep effect, use of Jockey pulleys.

Cams: Types of cams & followers, displacement, velocity and acceleration of followers, construction of cam profiles with knife-edge, roller and flat faced reciprocating and oscillating followers.

Gear Trains: Simple, compound and reverted wheel train, epi-cyclic gearing, analysis of Sun and Planet system, examples of multi speed epi-cyclic gear boxes, bevel gears, epi-cyclic trains' differential gear.

Synthesis of Mechanisms: Analytical and graphical method for Four-bar and Slider crank mechanism.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. S S Ratan, Theory of Machines, TMH Publication
2. R L Norton, Kinematics and Dynamics of Machinery, Tata MacGraw Hill Publication
3. A G Ambekar, Mechanism and Machine Theory, PHI Learning Private Ltd.

4. Amitabha Gosh & Asok Kumar Mallik, Theory of Mechanisms and Machines, East West Press.
5. Uicker J.J.,Pennock G.R., Shigley J.E., “Theory of Machines and Mechanisms, Oxford University Press.
6. Rao J.S and Dukkipati R.V, “Mechanism and Machine Theory”, Wiley-Eastern Ltd., New Delhi.
7. John Hannah and Stephens R.C, “Mechanics of Machines”, Viva Low-Prices Student Edition

ME304 **Manufacturing Processes - I**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand basics of machining & casting process
- acquire knowledge & ability to select parameters of machining & casting for practical application
- interpret the various factors affecting casting & machining quality
- prepare jobs related to machining and casting.

Syllabus:

Foundry Processes: Classification of manufacturing processes, Advantages of casting processes over other manufacturing processes.

Sand Casting: Principle, patterns, types, materials, layouts, allowances, Mould, moulding sands and other mould ingredients, gating system, making of mould, moulding machines, cores and coremaking, core making machines, fillets, locating pads, melting of metals in foundry, cupola and other furnaces, melting of non-ferrous metals, pouring, solidification of casting, cleaning of casting, behaviour of cast metal, shell mould casting.

Hard Mould Casting Process: Metal mould casting processes: Permanent mould casting, low pressure casting, slush casting, die casting, die casting machines, centrifugal casting, precision investment casting, lost foam casting process, continuous casting.

Basic Machine Tools: Machine tool classification, working, primary cutting motion and auxiliary motions in machine tools.

Metal Cutting Lathes: Engine Lathes, construction arrangement and principal units of engine lathes, specification of engine lathes, operations carried on engine lathe, attachment extending the processing capacities of engine lathes, description of other types of lathes, plain turning lathes, multiple tool lathes, special purpose lathes, turret lathes, horizontal and vertical, lathes, machining time on lathe.

Drilling: Purpose and field of application of drilling machines, upright drill processes, radial drills. Specification of drilling machine, machining time on drill. Boring operation, Purpose and field of applications

Milling: Purpose and types of milling machines, general purpose milling machines, different types of milling operations, milling cutters, attachments extending the processing capabilities of general purpose milling machines, Gear cutting on milling machine, indexing types, machining time, Specification of milling machine.

Planers, Shapers and Slotters: Classification: Attachments extending the process capacities of each, difference between planer and shaper, specifications.

Grinding Machines and Abrasives: Classifications of grinding machines, cylindrical grinders, Internal grinders, surface grinders, tool and cutter grinders, surface finishing. IS specifications of grinding wheel, loading and glazing Super finishing operations.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus.

References:

1. Chattopadhyay, Machining and Machine tools, Wiley India Pvt. Limited
2. P N Rao, Manufacturing Technology Foundry, Forming and welding, Tata McGraw Hill Publications P N Rao, Manufacturing Technology Metal cutting and Machine tools, Tata McGraw Hill Publications
3. Richard R. Kibbe, Roland O. Meyer, John E. Neely, Warren T. White Machine tools practices, Prentice Hall PTR
4. Heine Loper and Rosenthal, Principles of Metal Casting, Tata McGraw Hill Publications
5. Jutz-Scharkus, Wasterman Tables, New Age Publications.
6. Heinrich Gerling and Karl H. Heller, All about machine tools, Standardsmedia Publications.

ME305 **Industrial Drafting and Machine Design**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the basic of mechanical design process and design of simple machine components like shaft, key, coupling , lever power screw etc.
- select various flexible power transmitting device such as belt drives such as belt drive and chain drive from manufacture's catalogue.
- apply the knowledge of computer aided drafting tools to prepare production drawings of machine components.
- determine tolerances for proper fit to achieve functional requirements of assembly.

Syllabus:

Design Consideration of Machine Parts

Loads, different types, factor of safety, stress, design stress factors affecting its selection, determination of factor of safety, tensile, compressive, shear, bending, bearing, crushing stresses, bending and torsional shear stress, transverse shear, principal stress determination, eccentric loading, bearing pressure.

Keys and Couplings

Design of sunk keys, design of a muff, clamp, flange (protected type) and bushed pin type of flexible coupling.

Shafts

Design stress, design of axles, spindles and shafts on the basis of strength, based on Rankines' and Guests' theory, design of shafts on the basis of rigidity.

Design of Joints

Design of Springs

Wahls' factor and its use in design of spring, effect of end connections on design of compression spring, design of helical tensile spring and compression spring for circular wire. Buckling of compression spring. Length and number of turns calculation, design of leaf spring.

Design of Parts Subjected to Buckling such as connecting rod, push rod and piston rods.

Power Screws

Types of threads, design of screw with different types of threads used in practice. Design of nuts, design of C clamp, screw jack, design of toggle jack, design of coupler.

Levers

General procedure of design of levers, design of foot and hand operated levers, design of bell crank lever, design of rocker arm for valves of engine.

Design of Flexible Drives

Flat and V Belt drives, design of pulleys for these drives, chain and sprocket drive

Syllabus for Laboratory:

Part A: Machine Drawing

Drawing fundamentals: Types of drawing, Dimensioning terms and notations, dimensioning rules, conventional representation of various components

Machining symbols and surface texture: Indication of machining allowance, Indication of surface roughness

Limit, Fits & Tolerances: Basic definitions concerning limits, fits & tolerances and its representation on drawing; Calculation using tables and formulae

Geometric Dimensioning & Tolerancing: Feature control frame; geometric characteristic symbol; Meaning and representation of form, orientation, profile, runout and location tolerance on drawing

Interpretation of Views: Missing line and missing view identification

Part B: Drafting Software

Basic drawing tools: Point, Line, Polyline, Multiline, Rectangle, Circle, Arc, Polygon, Spline, Ellipse, Hatch and Text

Editing tools: Copy, Move, Mirror, Offset, Pattern, Rotate, Lengthen, Trim, Scale, Chamfer, Fillet, and Break

Setup tools: Units, Grid, Snap, Ortho, Polar, Layer, Colour, Linetype, Line weight, Point style, Multiline style, Drawing limits and Dimension style

Display and view tools: Zoom, Pan, Rotate, Shading, Areal view, 3D views etc.

Dimensioning tools: Linear, Aligned, Radius, Angular, Coordinated dimension, Leader, Base line, Continuous and GD&T frame.

Drawing layout and printing tools: Layout and model space, Viewport, Configuring plotting device.

Solid modeling tools: Primitive solid modeling entity, Union, Subtraction and Intersection of solid, Extrude, Revolve etc.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References

1. V B Bhandari , Design of Machine Elements, TMH Publications
2. V B Bhandari , Introduction to Machine Design, TMH Publications
3. 7P. Kannaiah, Machine design by, Scitech Publication

4. J E Sighley, Mechanical Engineering Design, TMH Publications
5. Norton. R. L, Design of Machinery, TMH Publications
6. Robert C. Juvinall, Fundamentals of Machine Component Design, John Wiley & Sons.
7. BIS, SP46:2003: Engineering Drawing Practice for Schools and Colleges
8. Dr. K.L.Narayan, Dr. P. Kannaih, K.Venkata Reddy, Machine Drawing, New Age International Publishers
9. P S Gill, Geometric Dimensioning & Tolerancing, S. K. Kataria & Sons
10. ASME Y14.5-2009: Dimensioning and Tolerancing, ASME
11. Gene R Cogorno, Geometric Dimensioning and Tolerancing for Mechanical Design, McGraw-Hill
12. G. Henzold, Elsevier, Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection.
13. Sham Tickoo, AutoCAD 2012: A problem-solving approach, Delmer Cengage Learning

2ME301 Material Science and Engineering

Course Outcomes(CO):

At the end of the course, students will be able to –

1. relate mechanical properties with structure of materials,
2. recommend heat treatment of steel material using phase diagram,
3. select material for intended application,
4. analyze the microstructure of ferrous and nonferrous material.

Syllabus

UNIT I

Crystal Structures and Mechanical Properties:

Various crystal structures and their characteristics, Imperfection in solids, Plastic deformation by slip, True stress-true strain, Generalized Hooke's law, Yielding and yield strength, Resilience, Toughness and elastic recovery, Impact test, Hardness measurement

UNIT II

Phase Diagram and Theory of Alloys:

Phase rule, Cooling curves, Lever rule, Important binary phase diagrams, isomorphous system, Eutectic system, Peritectic system, Construction, Significance and applications of phase diagrams, Iron-iron carbide (Fe-Fe_3C) equilibrium diagram, Solid solution and its classification, Hume-Rothery's rule

Steel: Classification of steel, Effect of alloying elements, Stainless steel, Tool steel, Designation of steel

Cast iron: Classification of cast iron, Properties and uses of Grey, White, Malleable, and Spheroidal graphite cast iron

UNIT III

Heat Treatment

Purpose of heat treatment, Study of heat treatment processes, TTT diagram, Surface hardening processes, Hardenability and its determination, heat treatment of ferrous and nonferrous materials

UNIT IV

Nonferrous Metals and Alloys, Ceramic, Composite and Polymeric Materials:

Copper alloys and Aluminum alloys: Classification, Composition, Properties and applications

Ceramics, Composite materials and Polymeric materials: classification, Properties, Fabrication, Processing and Applications

Various nondestructive testing methods

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments/exercise to be incorporated

Suggested Readings:

1. Callister W.D., Materials Science and Engineering, Wiley India (P) Ltd.
2. Avener S.H., Physical Metallurgy, Tata McGraw Hill Education
3. Raghavan V., Materials Science and Engineering- A first Course, PHI publication

4. Askeland D.R., The Science and Engineering of Materials, Cengage Learning
5. Dieter George E., Mechanical Metallurgy, McGraw Hill Education

2ME303 Thermodynamics

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. infer basic concepts related to thermodynamics,
2. summarize thermodynamic properties of gases and steam and apply it to related system analysis,
3. apply the laws of thermodynamics for various processes,
4. explain concepts of entropy, irreversibility and exergy and apply it to various processes,
5. analyze air standard and power generation cycle, and, compute their performance.

Syllabus

UNIT - I

Fundamental Concept, Properties of Gas and Vapour

Microscopic and macroscopic point of view, Thermodynamic system and control volume, Thermodynamic properties, processes and cycles, Homogeneous and heterogeneous systems, Thermodynamic equilibrium, Quasi-static process, Pure substance, Concept of continuum, Various types of energies, Zeroth law and temperature measurement, Work transfer and its types, Heat transfer and its types, sensible heat, latent heat, specific heat, point functions and path functions, Revision of ideal gas concept and non-flow processes such as constant pressure, constant volume, isothermal, isentropic and polytropic, Real gases and real gas mixtures, Various equation of state Compressibility charts, Difference between properties of ideal gas and vapour, Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-V-T surface; Use of steam tables and properties tables,Saturation tables; Superheated tables; Identification of states & Determination of properties, Mollier's chart, Dryness fraction determination, Steam Calorimeters- Barrel, Separating, Throttling and Combined Separating and Throttling calorimeters

UNIT - II

First Law of Thermodynamics

First law for a closed system undergoing a cycle and change of state, internal energy- a property of the system, PMM1, Steady flow energy equation applied to Nozzle, Diffuser, Compressor, Turbine, Throttling process, Heat exchanger, Filling and emptying process

UNIT - III

Second Law of Thermodynamics, Entropy and Exergy

Limitation of the first law of thermodynamics, cyclic heat engine, energy reservoir, Kelvin-Plank and Clausius' statements, equivalence of the statements, reversibility and irreversibility Causes of irreversibility, Carnot's theorem and its corollary, Thermodynamic temperature scale, Statement of third law of thermodynamics, Clausius theorem, The property of entropy, inequality of Clausius, Entropy change for reversible and irreversible processes, principle of increase of entropy, application of entropy principle, Entropy generation in closed and open system, entropy and disorder, High and low grade energy, Available and unavailable energy, Hemholtz & Gibbs function, availability (exergy) of closed; steady flow; and open system processes, Irreversibility and Guoy Stodola Theorem, Second law efficiency

UNIT - IV

Gas and Vapour Power Cycle

Carnot cycles, Rankine cycle, Comparison of Carnot and Rankine cycle, Calculations of Rankine cycle, Variables affecting efficiency of Rankine cycle, Air standard cycle assumptions, Otto, Diesel and Dual cycle, their air standard efficiencies and comparison. Brayton cycle.

Use of computer software for problem solving.

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Nag P. K., Engineering Thermodynamics, McGraw Hill Education.
2. Moran M. J., Shapiro H.N., Fundamentals of Engineering Thermodynamics, John Wiley & Sons.
3. Sonntag R. E., Borgnakke C., Introduction to Engineering Thermodynamics, John Wiley & Sons.
4. Boles M.A., Cengel Y.A., Thermodynamics: An Engineering Approach, McGraw Hill Education.

2ME304 **Theory of Machines**

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. infer the concepts of machines and mechanisms,
2. analyse planar mechanisms for displacement, velocity and acceleration by graphical and analytical methods,
3. make use of out static and dynamic force analysis for various planer mechanisms by graphical and analytical methods,
4. analyse various motion transmission elements like gears, gear trains and cams.

Syllabus

UNIT - I

Links & Mechanism

Links- kinematics pairs, higher and lower pairs, constraints, slider crank chains, double slider crank chains, inversions,Exact straight line mechanism of Peaucelliers,Pantograph,steering gear mechanisms, Condition for correct steering, Davis and Ackermann steering gears

UNIT - II

Motion

Velocity and acceleration in machine parts, instantaneous center, centrode, its laws, velocity and acceleration diagrams for simple kinematic mechanisms,(Vector and graphical approach). Computer aided Kinematic Analysis of Mechanism like Slider Crank Mechanism, Four-Bar Mechanism.

Static Force Analysis

Graphical, vector and algebraic method,

Dynamic Force Analysis

Graphical, vector and algebraic method,

UNIT - III

Cams

Introduction to various mechanical transmission drives, types of cams & followers, dynamic analysis of cam –follower mechanisms, jump phenomena, unbalance, spring surge etc.

UNIT - IV

Gear Trains

Simple, compound and reverted wheel train, epi-cyclic gearing, analysis of Sun and Planet system, examples of multi speed epi-cyclic gear boxes, bevel gears, epi-cyclic trains' differential gear.

Gears

Gears – Theory of Gears, arc of contact, path of contact and contact ratio, Interference, Under cutting, Force analysis, spur, helical, bevel and worm gears

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory Work will be based on the above syllabus with minimum 10 experiments/exercises to be incorporated.

Suggested Readings:

1. Rattan S. S., Theory of Machines, Tata McGraw Hill Education
2. Norton R. L., Kinematics and Dynamics of Machinery, Tata McGraw Hill Education
3. Ambekar A. G., Mechanism and Machine Theory, PHI Learning Private Ltd.
4. Ghosh Amitabha & Mallik Ashok Kumar, Theory of Mechanisms and Machines, East West Press.
5. Uicker J.J., Pennock G.R., Shigley J.E., Theory of Machines and Mechanisms, Oxford University Press.
6. Rao J.S and Dukkipati R.V., Mechanism and Machine Theory, Wiley-Eastern Ltd., New Delhi.
7. Hannah John and Stephens R.C, Mechanics of Machines, Edward Arnold

2ME305 Mechanics of Solids

Course Outcomes(CO):

After successful completion of the course, student will be able to-

- identify various types of stresses developed in structural elements,
- analyse structural elements under the effect of force systems,
- relate properties of materials, principal stresses and theories of failure,
- analyze machine elements subjected to friction force.

Syllabus

UNIT - I

Statics and Distributed forces

Principles of statics, Particle, rigid body, Coplanar, Concurrent and non-concurrent parallel and non-parallel forces, Composition and resolution of force, couples and their properties, combination of coplanar couple and forces, Centre of gravity, moment of inertia

UNIT - II

Friction

Static and sliding friction, inclined plane friction, ladder friction, wedges, belt and rope friction. Power screws

UNIT - III

Strength and Elasticity

Stresses: Axial, normal, in-plane, tensile, compressive, shear, flexural, Thermal and hoop, complementary shear. Strain: Linear, shear, Lateral, Thermal and volumetric, Poisson's ratio, Elastic constants and relation between them and bodies subjected to loads in three directions. Mechanical Properties of Materials

UNIT - IV

Stresses in beams and Shafts

Types of supports, support reactions, Bending moment and shear force diagrams in statically determinate beams subjected to different types of loading, Relation between bending moment, shear force and rate of loading, Theory of simple bending, bending stresses and their distribution, moment of resistance, modulus of section, composite beam sections, distribution of shear stress in different sections, Torsion of solid and hollow circular shafts, shear stress due to torsion, angle of twist, Torsional moment of resistance.

UNIT - V

Principal stresses and Theories of Failure

Compound stresses, analysis of principal planes and principal stresses. Mohr Circle. Maximum Principal stress theory, Maximum shear stress theory, and Distortion Energy theory

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Meriam J.L., Kraige L.G., Engineering Mechanics: Static, Wiley-India
2. Hibbeler R.C., Mechanics of Materials. Pearson
3. Beer F. P., Johnston E. R., & Dewolf J.T., Mechanics of Materials, Tata McGraw-Hill Education
4. Shah H.J., Junnarkar S.B., Mechanics of Structures Vol-1, Charotar Publishing House Pvt Limited

5. Rattan S. S., Theory of machines, Tata McGraw Hill Education.
6. Timoshenko S. P. & Young D.H., Elements of Strength of Materials, East-West Press Private Limited.

2ME306 **Introduction to Computer Aided Drafting**

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. develop the 3D features like extrude, revolve, sweep, blend (loft), swept blend,
2. develop 3D features for constructions of hole, rib, round chamfer, patterns, datum planes, datum axis and others,
3. build assembly of components using solid modelling software,
4. create 2D drawings of mechanical components from their assembly and parts.

Syllabus

UNIT - I

Solid modelling

Creating solid model of components using features like extrude, revolve, sweep, blend, loft, swept blend etc.

Use of other features like hole, helical profile, Rib, pattern, mirror, trim, dimensions, planes, axes, etc. for constructions of geometry

UNIT - II

Assembly modelling

Creating an assembly from the solid models of components. Create sections, exploded views

UNIT - III

Drafting

Creating assembly drawing, Bill of Material (BOM), detail drawing of components as per drawing standards

Suggested Readings:

1. Tickoo S., Pro/Engineer, Creo Paramatric 3.0 for Engineers and Designers, Dreamtech Publishing.
2. Tickoo S., SolidWorks 2016 for engineers and Designers, Dreamtech Publishing
3. Tickoo S., NX 10.0 For Engineers and Designers, Dreamtech Publishing

EE322 **ELECTRICAL TECHNOLOGY**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand construction, operating principle and characteristics of rotating electrical machines used in manufacturing industries.
- acquire knowledge about various power semiconductor devices and applications in power converters.
- understand different families of digital integrated circuits and programmable logic devices for manufacturing automation.

Syllabus:

- **Electric Motors**

DC motors – working principle, torque relations, characteristics, starting, speed control and application. Induction motor – working principle, torque relations, torque slip characteristic, starting, speed control and application

- **Fundamentals of Electric Drives**

Group and individual drive, speed-time relation, time taken and number of revolutions made in bringing a motor to a standstill, examples load equalization – calculation for flywheel, motors for industrial service **Transformers**

Working principle & construction transformer, theory of an ideal transformer, emf equation, phasor diagram of transformer on no load and on load, exact and approximate equivalent circuit of transformer, regulation of transformer, auto-transformer, welding and furnace transformers, concept of three – phase transformer

- **Heating and Welding**

Methods of electrical heating, design of heating elements, resistance ovens and furnaces, induction and arc furnaces, eddy current and dielectric heating, different methods of resistance and arc welding

Protection of Industrial Installation

Protection of motors, electrical safety rules and precautions.

Characteristics of Devices

Transistor, SCR and UJT

- **Power Supplies**

Transistor, SCR, single-phase rectifier – with filter and stabilizer, poly phase rectifier, controlled rectification

Digital Circuit

Transistor as switch, logic gates, multivibrator, flip – flop

Microprocessor Basics

Introduction and architecture of 8085 & associated instruction set.

- **Stepper Motor**

Construction, principle and working.

Self Study:

Microprocessor 8085 programming

References:

1. E. Fitzgerald, Electric Machinery, TMH Publications
2. B.L. Theraja, A Textbook of Electrical Technology Vol.-II, S.Chand and Co.
3. S. L. Uppal, Electrical Power, Khanna Publications
4. H.C. Rai, Industrial and Power Electronics, Umesh Publications
5. R. S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085/8080A, Wiley Eastern Limited

SS341 **Economics for Engineers**

Course Learning Outcome (CLO):

After successful completion of the course, students will be able to

- understand the basic economic theory and economic way of thinking
- analyze macro - economic policies
- evaluate the economic efficiency in engineering projects

Syllabus

Module: - 1 MICRO ECONOMICS

Basic Economic Concepts: Meaning and understanding of basic economic concepts

Demand and Supply: Meaning and Determinants of Demand and Supply, Law of Demand and Supply, Elasticity of Demand and Supply.

Production Function: Meaning, production with one variable input, the law of variable proportion, the laws of returns to scale. Economies of Scale

Cost Function: Different types of costs, the short run and long run cost functions.

Market Structure: Meaning and characteristics of different types of market – Perfect Competition Monopoly Monopolistic Competition and Oligopoly

Module-2 MACRO ECONOMICS

Introduction to Macro Economics: Basic Macro Economic Concepts, National Income Accounting, Concepts of National Income and Methods of National Income Computation

Inflation: Meaning, types, causes, effect and remedial measures.

Money and Banking: Meaning and Functions of money, Money Supply, Commercial Banks and Central Bank-Meaning and Functions

Public Finance: Government Expenditure, Receipts, Budget and Deficits.

Self -Study: The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Books:

1. Micro Economics Robert S Pindyck, Daniel L Rubinfeld, Prem L Mehta - Pearson
2. Principles of Economics N.Gregory Mankiw, Thomson South Western , Pearson
3. Modern Economics – H.L.Ahuja – S.Chand & Company
4. Macro Economics – Rudiger Dornbush, Stanley Fisher, Richard Startz – Tata Mc-Graw-Hill
5. Principles of Macro Economics, C.Rangarajan and B.H.Dholakia, The McGraw Hill
6. Economics , Samuelson and Nordhaus, Tata McGraw Hill
7. Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore, Adapted by Ravikesh Srivastava, Oxford University Press

2HS341 **Principles of Management**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various theories and processes of management
2. relate with different functional areas of management
3. appreciate the role and need of managers in different organisations

Syllabus:

Unit I

Nature of Management: Concept, Significance, Role & Skills, Levels of Management, Concepts of POSDCORB (Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting). Overview of Decision making. Evolution of Management thoughts, Contribution of F.W Taylor, Henri Fayol and Contingency Approach. Overview of Indian thoughts on Management, Management by Objectives (MBO)

Unit II

Planning: Meaning, Importance, Elements, Process

Unit III

Organizing: Concepts, Structure (Formal & Informal, Line & Staff and Matrix), Meaning, Advantages and Limitations of organizing. Departmentation: Meaning, Basis and Significance, Span of Control: Meaning, Factors affecting span of Control, Centralization vs. Decentralization, Delegation: Authority & Responsibility relationship

Unit IV

Directing, Co-ordination and Controlling: Leading : Concept of leadership, Directing: Meaning and Process, Co-ordination as an Essence of Management, Controlling: Meaning, Process and Technique

Unit V

Functional Management: Introduction to different functional aspects of management- Finance, Operations, Marketing, Human Resource and Strategic Management

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents

Suggested Readings:

1. Koontz & Weihrich , Essentials of Management; Tata McGraw Hill
2. Tripathy & Reddy , Principles of Management; Tata McGraw Hill
3. Kreitner & Mohapatra, Management ; Biztantra
4. Robbins , Decenzo & Coulter, Fundamentals of Management; Pearson Education
5. Stoner, Freeman & Daniel R Gilbert, Management; Pearson Education
6. Robbins & Coulter, Management; Prentice Hall (India) Pvt. Ltd

ME401 **Dynamics of Machinery–I**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- understand the basic principles of dynamics
- carry out static and dynamic force analysis for various planer mechanisms by graphical, analytical and virtual work method.
- understand basic analysis of gears, gyroscope governors and cam dynamics.
- conduct the experiments to understand various concepts of dynamics

Syllabus

Static Force Analysis
Graphical, vector and algebraic method, virtual work method.
Dynamic Force Analysis
Graphical, vector and algebraic method.
Gyroscope
Motion of a gyroscope, regular precession, forced precession.
Governors
Centrifugal and inertia governors.
Gears
Gears – Theory of Gears, arc of contact, path of contact and contact ratio, Interference, Under cutting, Force analysis, spur, helical, bevel and worm gears, corrected gearing.
Cam Dynamics – Dynamic analysis of cam –follower mechanisms, jump phenomena, unbalance, spring surge etc.
Self Study:
The self study contents will be declared at the commencement of semester. Around 10%of the questions will be asked from self study contents.

Laboratory Work:
Laboratory Work will be based on the above syllabus

References

1. J.E. Shigley, Theory of Machines and Mechanism, Oxford University Press
2. Ghosh and Malik, Theory of Machines and Mechanism, Longman Publications.
3. Kenneth J Waldron and Gary L Kinzel, Kinematics, Dynamics and Design of Machinery, John Wiley & Sons Australia Publications.
4. R L Norton, Kinematics and Dynamics of Machinery, Tata McGraw Hill Publications.

ME402 **Metrology & Instrumentation**

Course Learning Outcome:

After successful completion of the course, student will be able to

- explain the basic principles underlying instruments associated errors and their remedies.
- apply the basic concepts learned in developing metrology instruments.
- follow the instructions to calibrate and use metrology instruments.
- select the appropriate instrument for practical applications.

Syllabus:

Standards of Measurements: Line standards, end standards, classification of standards, sources of error in measurement.

Limits, fits and gauges: Tolerances, limits, fits and allowances, Indian standard for limits and fits, gauge including their design, Indian standard for plug and ring gauges, interchangeable manufacturing.

Linear measurements: Calipers, surface plates, vernier height gauge, vernier depth gauges, micrometers, slip gauges.

Angular measurements: Bevel protector, sine principle and sine bars, angle gauges, clinometers, optical instrument for angle measurements.

Comparators: Characteristics of comparators, uses, advantages and disadvantages of various types of comparators. SIGMA mechanical comparator, Zeiss optotest comparator, Electronic comparator, Pneumatic comparator.

Measurement of surface finish: Meaning of surface texture, surface roughness, terminology as per Indian standards, methods of measuring surface finish, direct instrument measurement.

Metrology of screw thread: Screw thread terminology, effect of pitch errors, measurements of various elements of thread.

Gear measurement: Sources of error in manufacturing gears, rolling tests, measurements of individual elements.

Measurement by Light wave interference: Principle and its applications.

Generalized measurement system and Glossaries: Measurement system model, static and dynamic characteristics of an instrument, classification of instruments Calibration process, Traceability.

Pressure measurements: Basic methods of pressure measurement, dead weight gauges and manometers, elastic transducers and force balance transducers.

Temperature measurement: Measurement of temperature using Liquid in glass thermometer, pressure thermometers, thermocouples, resistance thermometers, bimetallic thermometers, thermistors, radiation and optical pyrometer.

Motion measurements: Measurements of displacement, velocity & acceleration, strain gauges, LVDT, capacitive, photoelectric & Inductive transducers, encoder.

Force, torque and shaft power measurement: Force measurement using transducer (pneumatic and hydraulic load cells, strain gauge load cells, piezoelectric load cells), torque measurement on rotating shaft, electrical type dynamometer.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. Graham Smith, Industrial Metrology, Springer Publication.
2. Metrology and Industrial Instrumentation, Instrument society of America Publication.
3. D.S. Kumar, Mechanical measurement and control, Metropolitan Publishers Co.

ME403 **Manufacturing Processes II**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand basics of metal forming and welding process.
- select appropriate metal forming & welding processes including process parameters for practical applications.
- interpret the various factors affecting metal forming & welding quality.
- perform practice jobs related to metal forming and welding processes by applying theoretical knowledge acquired.

Syllabus:

Fundamentals of metal forming- Classification of forming processes, mechanics of metal working, temperature in metal working, hot working, cold working, strain rate effects, metallurgical structure, hydrostatic pressure, workability, residual stresses.

Primary metal working processes- Forging: Introduction, Classification of forging processes, forging equipments, forging dies, forging defects.

Rolling of metals- Introduction, Classification of rolling processes, principle of metal rolling mills, simplified analysis of rolling load, rolling variables, roll pass design, defects in rolled products.

Extrusion- Introduction, Classification of extrusion processes, extrusion equipments, hot extrusion, cold extrusion, deformation, lubrication and defects in extrusion, hydrostatic extrusion, Extrusion of seamless pipes and tubes.

Drawing of rods, wires and tubes – Wire and tube drawing equipments,toolings,sizing, coining and embossing.

Advanced forming processes – Hydro forming, Laser forming, hot forming

Sheet metal working- Cold forming, high energy rate forming, Spinning and their applications.

Press Work- Types of press, drive mechanisms for presses, feed mechanisms, Drawing, deep drawing, squeezing, bending, blanking, piercing, notching etc., press tools, die classification, elements of die and punch design.

Fabrication Process– Welding- Various welding process, Heat Sources, arc welding- SMAW, GMAW, SAW, GTAW, gas welding, thermit welding, braze welding, resistance welding, induction welding, electron beam welding, laser welding, Plasma arc cutting, forge welding, friction welding, Cold welding, explosion welding. Recent developments in welding processes: Electroslag welding, Narrow gap welding, Under water welding.

The formation of a fusion welded joint, the factors involved, the welding arc, the cathode, the arc, powder source characteristics, source of current supply for arc welding, metal transfer, heat flow, HAZ, thermal stresses, metallurgical aspect of welding.

Electrode coatings, electrode classification and selection, welding defects and their detection, expansion, contraction, distortion and residual stresses in welding. Method of controlling distortion and stresses in welding.

Soldering and brazing, process description and application.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus.

References:

1. George E. Dieter, Mechanical Metallurgy, MCGRAW-HILL Higher Education Publication.
2. P.N.Rao, Manufacturing Technology: Foundry, Forming & Welding, Tata McGraw Hill Publication.

ME404 **Fluid Mechanics**

Course Learning Outcome:

After successful completion of the course, student will be able to

- develop an understanding of the fundamental principles of fluid mechanics and related applications.
- learn the fundamentals of fluid statics, kinematics and dynamics and their applications.
- study the fundamentals of pressure measurements, flow measurements and their calibration aspects.
- understand the necessity and concept of dimensional analysis, boundary layer and compressible flow.

Syllabus

Properties of Fluid: Introduction, classification of fluids, ideal and real, Newtonian and non Newtonian etc. Physical properties such as viscosity, compressibility, capillarity, surface tension with application and numerical problems, vapour pressure

Fluid Statics: Pressure at a point, centre of pressure on plane and curved surface, pressure measurement with manometers - simple, inclined, U-tube, inverted U-tube, single column manometer, micromanometer- single & differential with numerical problems. Buoyant force, stability of submerged body and floating body. Metacentre & metacentric height - analytical and experimental determination with problems.

Kinematics of Fluid Flow: Description of fluid flow- Langrangian method, Eulerian method, classification of flow-steady and unsteady, uniform and non-uniform.

One, two and three dimensional flow definition, laminar & turbulent flow. Stream line, path line, streak line, stream tube, stream lines, equipotential lines, flow net, methods of drawing flow net (graphical, analytical and electrical analogy method) Continuity equation for 3-dimensional flow Cartesian Co-ordinates. Vortex flow, free vortex flow and force vortex flow

Fluid Dynamics: Euler's equation along stream tube and in Cartesian Co-ordinates. Bernoulli's equation in one dimension flow and problems. Water hammer and its effects.
Flow Measurement- Measurement of flow with venturimeter, orifice meter, nozzle meter, notches (triangular & rectangular), Orifice, types of orifice, hydraulic coefficients of circular orifice (C_d, C_v, C_c, C_r)

Dimensional Analysis: Fundamental dimensions, dimensional homogeneity, Rayleigh's method and Buckingham's' method. dimension less numbers and their significance. Hydraulic similitudes, Type of models, Problems related to Reynolds number and Froude number.

Viscous Flow: Flow between two parallel fixed plates, Couette flow, viscous flow through pipes, Hagen - Poiseullis' equation friction factor, Moody diagram, Darcy Weisbach equation, study of viscometers- Capillary tube type, rotating cylinder, falling sphere, Saybolt/ Redwood viscometer.

Laminar and Turbulent Boundary Layer Flows: Description of boundary layer, Boundary layer parameters, Boundary layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Prandtl's boundary layer equation.

Compressible Fluid Flow: Thermodynamic concept, Equations governing compressible flow, Equation of state, Continuity equation, Euler's equation, Momentum equation, speed of sound wave, Mach number, classification of flow based on mach number, Mach cone, Mach angle. Stagnation properties. Pitot tube with compressibility correction factor.

Introduction to CFD: Basics, applications, methodology.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory Work will be based on the above syllabus.

References:

1. Yunus Cengel, Fluid Mechanics , Tata McGraw Hill Publication
2. F M White, Fluid Mechanics , Tata McGraw Hill Publication
3. Fox and McDonald, Introduction to Fluid Mechanics,Wiley International Publication
4. J Schlichting, Boundary Layer Theory, Springer
5. J D Anderson, Computational Fluid Dynamics, Springer

MA402 Mathematics for Mechanical Engineering

Learning Outcomes:

- Ability to express physical phenomenon in mathematical formulation
- Ability to understand and solve differential equations
- Basic knowledge of widely used numerical techniques and their applications
- Have knowledge of Fourier series & Fourier transform.
- Have knowledge of Laplace transform & application to ordinary differential equations.

Fourier Series: Periodic functions, Dirichlet's conditions, Fourier series, Euler's formulae, Fourier expansion of periodic functions with period 2π, Fourier series of even and odd functions, Fourier series of periodic functions with arbitrary periods, half range Fourier series, Harmonic analysis.

Laplace Transforms: Motivation, Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations, Laplace transforms of periodic, Unit step and Impulse functions.

Ordinary Differential Equations: Definition, formation, order and degree, First order and first degree differential equation, Linear differential equations of higher order with constant coefficients, complimentary function, method of undetermined coefficients, method of variation of parameters, Higher order linear differential equations with variables coefficients (Cauchy's and Legendre's equation), Simultaneous linear differential equations, Models for the real world problems and their solutions in particular, Modelling of Deflection of beams, Free oscillations, Forced oscillations, Resonance.

Partial Differential Equations: Formation of Partial differential equations, directly integrable equations, Models of Engineering problems leading to first order partial differential equations. Langrange's equation. Applications to the Wave equation, one-dimensional heat and Laplace equation.

Numerical Methods: Motivation, Errors, Truncation error, Rounded off error, Absolute error, Relative error and Percentage error, Solution of algebraic and transcendental equations by Newton-Raphson, Bisection, False position and iteraction methods, Convergence of these methods.

Self Study :

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorials :

This shall consist of solution of at least 8 tutorials (TA) based on the above syllabus.

Books:

1. Higher Engineering Mathematics (Third Edition) Vol-II, By Dr. K.R. Kachot., Publisher: Mahajan Pub. House, Ahmedabad.
2. Advanced Engineering Mathematics (Fifth Edition), Erwin Kreyszig, Publisher: John Wiley, 1999.
3. Higher Engineering Mathematics, Dr. B.S. Grewal, Publisher: Khanna, New Delhi.
4. Elementry Differential Equation, By W.E.Boyce and R.Diprima, Publisher: John Wiley – 2005.
5. Numerical Methods for Engineers with Programming and Software Ppplications, By S.C. Chapra and R.P. Canale, Publisher: McGraw-Hill – New York – 1998.
6. Fourier Series & Boundary Value Problems, R.V. Churchill & J.W. Brown, Publisher: McGraw-Hill – 2006.

2ME401 **Metrology & Quality Control**

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. relate engineering aspects of metrology,
2. make use of various measuring instruments,
3. assess the correctness of measuring instrument,
4. identify suitable quality control tool for given application.

Syllabus

UNIT - I

Linear and Angular Measurements:

Standards of measurement, Line standards, end standards, sources of error in measurement. Various Linear measuring instruments like Calipers, surface plates, vernier height gauge, vernier depth gauges, micrometers, slip gauges.

Comparators: classification and Characteristics of comparators, uses, working principal, advantages and disadvantages of various types of comparators. Angular measurements: Bevel protector, sine principle and sine bars, angle gauges, clinometers, optical instrument for angle measurements

UNIT - II

Measurement and Instrumentation: Measurement system model, methods of measurements, static and dynamic characteristics of an instrument, classification of instruments, uncertainty in measurement, Calibration process, Measurement of pressure, temperature, motion, force and torque. Introduction to coordinate measuring machines

UNIT - III

Measurement of Surface Finish : Meaning of surface texture, surface roughness, terminology as per Indian standards, methods of measuring surface finish, direct instrument measurement, Measurement by Light wave interference: Principle and its applications

Measurement of screw threads and gears: Metrology of screw thread: screw thread terminology, effect of pitch errors, measurements of various elements of thread. Gear measurement: Sources of error in manufacturing gears, rolling tests, measurements of various elements

UNIT - IV

Limits, fits and gauges: Tolerances, limits, fits and allowances, basis of system, hole basis and shaft basis system, types of fits and their interpretation types of gauges and gauge design

UNIT - V

Fundamental of Quality

Definition, need and evolution of quality, dimensions of product and service quality, basic statistical measure / terms, source of variation, chance and assignable causes of variations, measures of central tendency, measures of dispersion, normal distribution, control charts for variable and attribute, process capability, quality assurance, acceptance sampling, cost of quality, quality control tools

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments/exercise to be incorporated

Suggested Readings:

1. Galyer J.F.W. and Shot bolt, Metrology for Engineers, Thomson Learning
2. Mahajan M., A Text Book of Engineering Metrology, Dhanpat Rai & Sons
3. Juran J.M. and Gryna Frank M, Quality planning and analysis, Tata McGraw Hill Education.
4. Mitra Amitava., Fundamentals of Quality Control and Improvement, John Wiley & Sons.
5. Grant E.L., Statistical Quality Control, McGraw-Hill Education.
6. Kaoru Ishikawa, Introduction to Quality Control, Modern Productivity and Quality Publishing Pvt. Ltd.

2ME402 Fluid Mechanics and Hydraulic Machines

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. demonstrate the fundamentals of fluid statics, kinematics and dynamics and their applications,
2. apply the principles of energy conservation and dimensional analysis to solve fluid flow problems,
3. demonstrate the applications of impact of jet for various hydraulic machines,
4. evaluate the performance of pumps and hydro turbines.

Syllabus

UNIT - I

Introduction

Properties of fluids, viscosity, compressibility, surface tension, Newton's law of viscosity, pressure and discharge measurements techniques, hydrostatic pressure on plain surfaces, Stability of submerged and floating bodies.

UNIT - II

Fluid Kinematics and Dynamics

Description of fluid flow- Langrangian method, Eulerian method, Classification of flow, stream line, path line, streak line, free and forced vortex flows, control volume, Continuity equation for 3-dimensional flow in cartesian co-ordinates, momentum and energy equations ,Euler's equation along stream line, Bernoulli's equation and its applications.

UNIT - III

Dimensional Analysis

Need for dimensional analysis, Buckingham's' method, Dimension less numbers and their significance, Hydraulic similarities, Type of models, Model analysis.

Viscous Flow

Flow between two parallel fixed plates, Couette flow, viscous flow through pipes, introduction of hydrodynamic boundary layer, Hagen - Poiseullis' equation, friction factor, Moody diagram, Darcy Weisbach equation, study of viscometers- Capillary tube, rotating cylinder, falling sphere, Saybolt/ Redwood viscometer.

UNIT - IV

Impact of Jet

Impact of jet on fixed and moving flat and curved vanes, single and multiple vanes.

UNIT - V

Hydraulic Turbines

Major components of hydropower plants, classification, construction, working principle and velocity triangles of Pelton, Francis and Kaplan turbines, governing, velocity triangles, performance curves, specific speed, cavitation.

UNIT - VI

Pumps

Centrifugal pump: working principle, classification, velocity triangles, various heads and losses, pressure rise through impeller, priming, characteristics curves, similarity relations, and specific speed.

Working principles of reciprocating and various rotary pumps.

Use of computer software for problem solving.

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments/exercise to be incorporated

Suggested Readings:

1. Cengel Y.A., Fluid Mechanics, Tata McGraw Hill Education.
2. Fox McDonald, Pritchard Mitchell, Fluid Mechanics,Wiley international.
3. White Frank, Fluid Mechanics, McGraw Hill Education.
4. MunsonYoung, Okishi Huebsh, Fundamentals of Fluid Mechanics, Wiley India.

2ME404 Dynamics of Machines

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. make use of dynamic force analysis of engine parts and analyze gyroscopic effect,
2. formulate the equations of motion for linear single D.O.F. free, damped and forced vibratory systems,
3. apply the concept of vibration isolation and absorber considering 2 D.O.F for mechanical systems,
4. estimate the unbalance for different rotating and reciprocating mechanical systems analytically, graphically and experimentally.

Syllabus

UNIT - I

Dynamic Force Analysis

Engine force analysis, dynamically equivalent systems, correction couple & T-Theta diagram.

Gyroscope

Motion of a gyroscope, regular precession, forced precession.

UNIT - II

Mechanical Vibration- Undamped and Damped free vibration

Single degree of freedom systems, Longitudinal, Torsional and Transverse, damped and undamped, Methods of determining natural frequency and mode shapes of vibrations.

UNIT - III

Forced vibration of single degree of freedom systems

Forced vibration with harmonic and non-Harmonic excitations, vibration isolation and transmissibility. Vibration measuring instruments. Single degree of freedom systems, Longitudinal, Torsional and Transverse, damped and undamped forced vibrations frequency and mode shapes of vibrations.

Two and multi degree of freedom systems

Longitudinal vibrations. Isolators and absorbers, Critical speeds of shaft.

UNIT - IV Balancing

Balancing of rotary and reciprocating masses, balancing of inline engines, balancing machines, field balancing, balancing of rigid and flexible rotors.

Self - Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory Work will be based on the above syllabus with minimum 10 experiments/exercises to be incorporated.

Suggested Readings:

1. Shigley J.E., Theory of Machines and Mechanism, Oxford University Press
2. Ghosh Amitabh , Mallik A.K., Theory of Machines and Mechanism, Longman Publications.
3. Waldron Kenneth J. and Kinzel Gary L, Kinematics, Dynamics and Design of Machinery, John Wiley & Sons Australia Publications.
4. Norton R. L., Kinematics and Dynamics of Machinery, Tata McGraw Hill Education.
5. Rao S. S., Mechanical Vibration, Prentice Hall.
6. Rattan S. S., Theory of Machines, Tata McGraw Hill Education.

2ME405 Introduction to Machine Design

Course Outcomes(CO):

After successful completion of the course, student will be able to-

1. develop the fundamental concepts of mechanical design process,
2. design simple machine components like lever,springs,power screws,
3. design power transmitting elements such as shaft ,keys and couplings .

Syllabus

UNIT - I

Shafts

Design stress, design of axles, spindles and shafts on the basis of strength, based on Rankines' and Guests' theory

UNIT - II

Keys and Couplings

Design of sunk keys, design of a muff, clamp, flange (protected type) and bushed pin type of flexible coupling

UNIT - III

Design of Springs

Wahls' factor and its use in design of spring, effect of end connections on design of compression spring, design of helical tensile spring and compression spring for circular wire. Buckling of compression spring. Length and number of turns calculation, design of leaf spring

UNIT - IV

Levers

General procedure of design of levers, design of foot and hand operated levers, design of bell crank lever, design of rocker arm for valves of engine

UNIT - IV

Power Screws

Types of threads, design of screw with different types of threads used in practice. Design of nuts, design of C clamp, screw jack

Suggested Readings:

1. Bhandari V. B., Design of Machine Elements, Tata McGraw Hill Education..
2. Bhandari V. B., Introduction to Machine Design, Tata McGraw Hill Education.
3. Kannaiah P., Machine design by, Scitech Publication
4. Sighley J. E., Mechanical Engineering Design, Tata McGraw Hill Education.
5. Norton. R.. L., Design of Machinery, Tata McGraw Hill Education.
6. Juvinall R. C, Fundamentals of Machine Component Design, John Wiley & Sons.

2ME401 Power Plant Engineering - II

Steam Nozzles: Types, application of continuity and SFE equations, concept of critical pressure, super-saturated flow, effect of variation of back pressure.

Steam Turbines: Principle of operation, types, flow of steam through impulse bladings, flow of steam through reaction bladings, losses, reheat factor, internal efficiency, constructional details.

Industrial Steam Turbines: Back pressure, pass out and mixed pressure turbines.

Method of Improving Performance of Steam Turbines: Regenerative feed water heating, reheat cycles.

Steam Turbine Governing: Types, part load performance.

Gas Turbines: Types, performance parameters, means of improving performance, constructional details, starting, ignition systems and lubricating systems.

Combined Cycle Power Plants: arrangements, advantages, parameters affecting the performance, analysis.

Jet Propulsion: Types, components, performance parameters, applications.

Laboratory work will be based on the topics covered under the above syllabus.

Text/Reference Books:

1. Steam & Gas Turbines by R Yadav.
2. Gas Turbine by Ganeshan.
3. Theory and design of steam turbine by W.J. Kearton.

ME405 **Seminar** **[0 0 2 1]**

Course Learning Outcome:

After successful completion of the course, student will be able to

- learn independently topic of interest
- develop presentation and communication skills through presentation
- develop writing skills through report presentation based on study

Syllabus

The Seminar is aimed to widen the scope of knowledge of students in the area of Mechanical Engineering. To fulfill this aim students are required individually study any topic in details. The topic of seminar will be based on the recent developments in the area of Mechanical Engineering.

During semester students are required to present work carried on seminar topic. At the end of the semester, the students will be required to submit detailed report. It should consist of abstract and objectives of study, critical literature review, certain analysis if carried out, conclusion and references pertaining to the topic undertaken by him/her. Entire semester work will be presented during final presentation before the examiners at the time of final evaluation.

2HS342 **Principles of Economics**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various basic economic principles
2. relate the economic fundamentals with engineering practices
3. infer the macro-economic aspects of engineering projects

Syllabus:

Unit I

Basic Economic Concepts: Needs, wants, means/resources – marginal principle and economic efficiency, trade - off, opportunity cost, rationality, externalities, differences between micro economics and macro economics

Unit II

Demand and Supply: Meaning and determinants of demand and supply, law of demand and law of supply equilibrium between demand and supply.. The concept of elasticity – meaning and types

Unit III

Production, Cost and Revenue: Production function, law of variable proportion and laws of returns to scale, different types of costs – variable cost, fixed cost, total cost, average cost, average fixed cost, average variable cost and marginal cost, Total revenue, average revenue and marginal revenue, profit function

Unit IV

Market Structures & Pricing: Concept of market and equilibrium- characteristics of perfect competition, monopoly, monopolistic competition and oligopoly–price determinations

Unit V

Macro-Economic Environment: Basic macro- economic concepts –aggregate demand aggregate supply, money, income employment consumption savings and investment. National Income Accounting-concepts and methods of national income recent changes in the methodology of national income accounting

Unit VI

Banking: Meaning and functions of commercial banks and central bank

Unit VII

Inflation: Meaning, and types of inflation, Causes and effect of inflation on different **s**ectors of the economy

Unit VIII

International Trade: Meaning and significance of International Trade, Cases for and against globalization. World Trade Organization (WTO) – functions and recent deliberations in World Trade Organization (WTO)

Self -Study:

The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Mankiw, N. G. Principles of Economics. Mason. Mason,USA: South-Western Cengage Learning.
2. Samuelson P. A. & Nordhaus, W.D. Economics. India: Tata McGraw Hill Education.

3. Pindyck, R.S., Rubinfeld, D. L. & Mehta, P. L. Micro Economics. New Delhi, India: Pearson.
4. Ahuja H.L. Modern Economics. New Delhi,India: S. Chand & Company Ltd.
5. Dornbusch, R., Fisher, S, & Startz, R. Macro Economics. India: Tata McGraw Hill Education.
6. Gupta, G. S. Macro Economics Theory and Applications. India:Tata McGraw Hill.

SS342 **ICT Tools**

Course Learning Outcome:
After successful completion of this course, student will be able to

- Identify and survey of various modern ICT based tools and technologies
- describe the building blocks of the tools useful for academic/research/application development
- apply the knowledge of engineering to configure, deploy and implement the tool so as to facilitate requirements of efficient working methodology on various systems
- develop and demonstrate the tools and their features with appropriate case studies
- discuss and work in a group and inculcate attitude to learn the recent advancements in ICT domain

Syllabus:
At least 5 tools have to be explored by the students as per their need to be decided in consultation with the respective Course Coordinator for the respective Program.
Survey of ICT Tools: Understanding the components of ICT, Document Generation Tools, Document Publishing, Moodle as Learning Management system, Latex for document writing, Simulation tools, Data Analysis, Graph generation and plotting, Video Conferencing tools(Skype), Webcasting, Website development, Picasa for image editing and presentation, effective presentation development, pdf converters, NetMeeting, Verisign, SMS Gateways, Payment Gateways
e- Resources: Google Speech, Google tools, YouTube, Wikipedia, Wiki books, NPTEL, Text to audio conversion tools, Web Publishing, Plagiarism, Online Certifications

The tools specific to the branch can be identified by the course coordinator and approved by Dean FOTE, can be covered.

Self Study:
To be decided by course coordinator at the beginning of semester, which will be a blend of one or more of the e-Learning Resources, Video Lectures, Online courses, tools, research material, web links etc. along with the related assessment component(s). Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. Online courses and ICT in Education - Emerging Practices and Applications (http://www.igi-global.com/bookstore/titledetails.aspx?TitleId=46981)
2. http://www.avu.org/Courses-Tables-List/ict-integration-education.html
3. http://wiki.ask.com/Information_and_communication_technologies_in_education
4. International Journal of education and development using ICT (http://ijedict.dec.uwi.edu)
   Official websites and resources of the tools mentioned in the syllabus

ME501 **Dynamics of Machinery-II**

Course Learning Outcome:

After learning this course, student will be able to

- derive the equations of motion for arbitrary linear single D.O.F. system, 2 D.O.F. and multi D.O.F. systems and solve the equation of motion.
- apply the concept of resonance, self-excited vibrations, and motion and force transmission in mechanical systems
- apply the concept of vibration isolation and absorption of mechanical vibration.
- estimate the unbalance for different rotating and reciprocating mechanical systems analytically and experimentally

Syllabus:

Mechanical Vibration- Undamped and Damped free vibration: Single degree of freedom systems, Longitudinal, Torsional and Transverse, damped and undamped, methods of determining natural frequency and mode shapes of vibrations.
Forced vibration of single degree of freedom systems: Forced vibration with harmonic and non-Harmonic excitations, vibration isolation and transmissibility. Vibration measuring instruments. Single degree of freedom systems, Longitudinal, Torsional and Transverse, damped and undamped forced vibrations frequency and mode shapes of vibrations.
Two and multi degree of freedom systems: Longitudinal, Torsional and Transverse, damped and undamped, free and forced vibrations, methods of determining natural frequency and mode shapes, vibrations. isolators and absorbers, critical speeds of shaft, continuous system.
Balancing- Balancing of rotary and reciprocating masses, field balancing, balancing of rigid and flexible rotors, balancing of mechanisms, balancing machines.
Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory Work will be based on topics covered under the above syllabus.

References:

1. S. S. Rao, Mechanical Vibration, Prentice Hall PTR Co.
2. J. E. Shigley, Theory of Machines and Mechanism, Oxford University Press.

ME502 **Power Plant Engineering**

Course Learning Outcome:

After successful completion of the course, student will be able to

- comprehend construction and working of various components of coal based thermal power plant.
- analyze performance parameters of steam and gas turbines.
- understand construction and working of nuclear power plant.
- comprehend the pollution problem from thermal power plant and its control methods.

Syllabus:

Economics of Power Generation – Load-Duration Curves, Power Plant Economics

Boilers – Types of boilers, mountings and accessories, packaged boiler, high-pressure high duty boilers, Indian Boiler Act, inspection.

Natural draught, estimation of height of chimney and condition of maximum discharge, induced, forced and balanced draught systems.
Condensers, principles of operation and construction, estimation of vacuum efficiency, air leakage, air and water handling capacity determination.
Cooling towers, construction, operation and maintenance.
Nuclear reactors, construction and working.

Steam Nozzles – Types, application of continuity and SFE equations, concept of critical pressure, super-saturated flow, effect of variation of back pressure.

Steam Turbines – Principle of operation, types, flow of steam through impulse bladings, flow of steam through reaction bladings, losses, reheat factor, internal efficiency, constructional details.

Industrial Steam Turbines –Back pressure, pass out and mixed pressure turbines.

Method of Improving Performance of Steam Turbines –Regenerative feed water heating, reheat cycles.

Steam Turbine Governing – Types, part load performance.

Gas Turbines – Types, performance parameters, means of improving performance, constructional details, starting, ignition systems and lubricating systems.

Combined Cycle Power Plants – Arrangements, advantages, parameters affecting the performance, analysis.

Pollution problems of thermal power plant and its control.

Self Study:
The self-study contents will be declared at the commencement of semester. Approximately 10% of the questions will be asked from self-study contents.

References:

1. Power Plant Engineering by M. M. El Wakil, McGraw Hill
2. Power Plant Engineering by P. K. Nag, TMH Publication
3. Steam & Gas Turbines and Power Plant Engineering by R Yadav, Central Publishing House

ME503 **Fluid Power Engineering**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- demonstrate the applications of impact of jet for various hydraulic machines.
- understand the basics and working of hydropower stations and its components.
- evaluate the performance of hydro turbo machines.
- analyse the performance of various compressors.
- apply fundamentals of hydraulics to different hydraulic systems.

Syllabus:

Hydropower Station – Types, layout, major equipment.

Impact of jet – Impact of jet on fixed and moving flat and curved plates.

Hydraulic turbines– Classification, construction, major components, operation of Pelton wheel, Francis and Kaplan turbines, governing, performance and selection of turbines, cavitation.

Pumps:

Reciprocating pump – Various types, construction, operation, characteristics and efficiency of single stage reciprocating pump

Centrifugal pump – Constructional features, basic theory, pressure rise through impeller, characteristics curves, priming, maximum suction limit, minimum starting speed to deliver the discharge, specific speed.

Compressors:

Reciprocating compressors – Terminology, single stage compression without and with clearance, power requirement and condition for minimum work, free air delivery, need for multi staging, condition of minimum work for multi-staging, inter-stage cooling, heat rejected during compression and intercoolers, mean effective pressure, indicated power, mechanical efficiency, isothermal efficiency, advantages of multistage compression, demerits

Centrifugal compressor– Construction and operation, ideal energy transfer, velocity diagram, isentropic efficiency, static and total temperatures, power input factor, slip and slip factor, pressure coefficient, pre-whirl, effect of blade shapes on performance, different losses, blade angles, surging and choking.

Axial flow compressors – Construction and operation, velocity diagram and work done factor, pressure ratio, static pressure rise, degree of reaction, selection, blade loading and flow coefficient, aerofoil blading, performance characteristics.

Rotary compressors – Types, salient features, applications.

Other hydraulic machines – Construction details, operation and application of hydraulic accumulator, intensifier, ram, fluid coupling and torque converter

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus

References:

1. Yunus Cengel and John Cimbala, Fluid Mechanics, Tata McGraw Hill Publishing Co. Ltd.
2. V. L. Patel and R. N. Patel, Fluid Power Engineering, Mahajan Book Depot.
3. D. S. Kumar, Fluid Mechanics and Fluid Power Engineering, S.K. Kataria & Sons.
4. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Firewall Media.
5. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co. Pvt Ltd.

ME504 **Heat and Mass Transfer**

Course Learning Outcomes:

After successful completion of the course, the student will be able to

- comprehend the principles of heat transfer by various modes such as conduction, convection and radiation.
- define and solve steady-state and transient problems in heat transfer.
- appreciate the usage of analytical and numerical methods in solving conduction heat transfer problems.
- apply principles of heat transfer in the working and analysis of heat exchangers.
- comprehend the basic principles of boiling, condensation and mass transfer.

Syllabus:

Conduction: Derivation of generalized equation in Cartesian and cylindrical coordinates, one-dimensional steady state heat transfer equations, heat transfer calculations in slabs, cylinders, spheres and temperature calculations at any position with constant and variable thermal conductivity, use of electrical analogy and estimation of resistance and heat transfer, factors affecting thermal conductivities of various substances, variation of thermal conductivity with temperature for various substances, properties of insulation and their importance, elementary one-dimensional transient heat conduction in solids. Use of finite difference techniques for solving heat conduction problems.

Heat transfer through extended surfaces: Necessity of extended surfaces, types, arrangement, heat transferred under different boundary conditions, fin effectiveness and fin efficiency, application of fins, determination of number of fins.

Critical thickness of insulation, calculation related to heat transfer.

Radiation: Concept of black and grey surfaces, laws of radiation, Kirchoff's, Stephan–Boltzman's, Planck's and Wien's laws, emissivity, electrical analogy, heat exchange between black and grey surfaces and enclosed body and enclosure, radiation shield and their effects, use of electrical analogy methods.

Convection – Dimensionless number and their use, continuity equation, concept of hydrodynamics and thermal boundary layers, momentum equation & energy equation, derivation of generalized equation in dimensionless groups for free & forced convection by dimensional analysis and principle of similarity, use of empirical co-relations to determine heat transfer co-efficient in natural and forced convection for parallel, counter and cross flow arrangements.

Heat Exchangers: Fouling of heat exchangers, fouling factors, overall heat transfer coefficient, LMTD calculation for parallel flow, counter flow and cross flow heat exchangers, effectiveness – NTU method, effectiveness and efficiency of heat exchangers, estimation of surface area, number of passes, heat transfer rate for heat exchangers.

Mass transfer: Fick's law, equimolal diffusion, diffusion of vapours through a stagnant medium, applications.

Boiling and Condensation: Boiling curve and modes of pool boiling, flow boiling, film and dropwise condensation.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions in the examination will be asked from self study contents.

Laboratory Work:

Laboratory Work will be based on the above syllabus.

References:

1. Heat and Mass Transfer, Cengel & Ghajar, McGraw Hill
2. Fundamentals of Heat and Mass Transfer, Incropera & DeWitt, John Wiley
3. Heat Transfer, S P Sukhatme, Universities Press

ME505 **Control Engineering**

Course Learning Outcome:
After successful completion of the course, student will be able to

- formulate the mathematical model for the mechanical system through various tools like nodal diagram, block diagram and signal flow diagram
- estimate system response characteristics, steady state error and stability for first and second order system analytically
- identify the various components of hydraulic and pneumatic system and their use in circuit design
- select various control action and suitable controller for the application.

Syllabus:
Theory of Automatic Control – Definition and terminology, classification of control systems, Open loop and closed loop systems and advantage. System differential equation of electrical, Mechanical, Thermal, Hydraulic & Electromechanical network, liquid level systems etc., system analogy. Block diagrams and signal flow graph representation of physical systems. Block diagram algebra, Mason's Gain Formula.
Time Response Analysis – Time response of first and second order control system to various input, steady state errors. Stability Analysis, Routh's stability criteria and root locus methods
Frequency Response Analysis – Advantages and Limitations of frequency domain approach, steady state response, Bode Plot, Polar Plot Analysis
Basic control actions and controllers –on – off, proportional, derivative and integral controllers, combined actions.
Hydraulic system – Components of Hydraulic system, Elements of circuit design, applications of hydraulic circuit. Hydraulic control actions
Pneumatic systems –Components of Pneumatic system, Pneumatic control actions.
Electrical and Electronic controls – Components of electrical and electronic systems & its applications, Introduction to PLC and its applications
Introduction of software for control engineering

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Katsuhiko Ogata, Modern Control Engineering, Prentice Hall
2. Industrial Hydraulic Manuals by VICKERS, Eaton Hydraulics
3. Fluid Power by Anthony Esposito, Pearson India
4. Control System Principles and Design, M. Gopal, McGraw Hill

ME511 **Foundry Technology**

Course Learning Outcome:

After successful completion of the course, student will be able to

- analyze the various casting processes.
- design a mould and die for various casting processes.
- interpret the various factors affecting casting quality
- select and apply modern engineering tools and techniques for analysis of casting processes.

Syllabus:

Casting techniques: Sand mould casting using sodium silicate as binder, Shell moulding processes, Investment casting process, Die casting, Centrifugal casting process, Full mould casting process, Semi-solid metal casting process, Hot box process, Ester catalysed phenolic nobake warm box, Phenolic nobake resin bonded moulding techniques,

All above processes are to be studied in detail with merit of the process and limitation along with commonly cast alloys by the process concerned.

Solidification of castings – Solidifications of Metals, nucleation, free energy concept, critical radius of nucleus, nucleation and grain growth in metals and alloys, constitutional super cooling, columnar,equiaxed and dendritic structures, freezing of alloys, centerline feeding resistance, time of solidification, types of solidification.

Gating system design: Principle of casting design, elements of gating system, fundamentals of fluid flow, aspiration of gases in gating system, design of gating system, types of gates, slag trap and filters, riser design and placement, feeding efficiency,. Casting yield, filling time with reference to different cast metals and alloys.

Analysis of any one casting process.

Quality control techniques: Ingots – characteristics, nature of cooling, methods of making ingots, cast structures, mechanical properties and relationship, defects in casting and their remedies.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. P.L. Jain, Principle of Foundry Technology, Tata McGraw Hill
2. Heine & Rosenthall, Principle of Metal Casting, Tata McGraw Hill
3. B.Ravi, Metal Casting: Computer-aided design and Analysis, PHI
4. P N Rao, Manufacturing Technology: Foundry, Forming and Welding, Tata McGraw Hill
5. Ghosh and Malik, Manufacturing Science, East-West Press, New Delhi

ME521 **Mechatronics**

Course Learning Outcome:

After successful completion of the course, student will be able to

- acquire knowledge of mechatronics system
- understand functionality of various components used in mechatronics system
- select the sensors, actuators and controllers for given applications
- design and analyse mechatronics system

Syllabus:

Introduction: Introduction to Mechatronics, systems, measurement systems, control systems, mechatronics approach.

Sensors and Actuators: Performance Terminology, displacement, position and proximity, velocity and motion, fluid pressure, temperature sensors, light sensors, selection of sensors,

Microprocessors and Micro controllers: Signal processing.Architecture, pin configuration, instruction set, programming of microprocessors Interfacing input and output devices, interfacing D/A converters and A/D converters with applications.

PLC: Basic structure, input/output processing, programming, mnemonics-timers, internal relays and counters, data handling, analog input/output, selection of a PLC.

Mechatronics design: Stages in designing mechatronic systems, traditional and mechatronic design, possible design solutions, various case studies.

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. W. Bolton, Mechatronics ,Pearson Education India
2. Michael B. Histand and David G. Alciatore, Introduction to Mechatronics and Measurement Systems, Tata McGraw-Hill Education

ME541 **Work Study**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the concepts of productivity and work study and ergonomics.
- apply the tools of method study to reduce the work content of a given job.
- relate the different techniques of work measurement.
- compare the various wage and incentive schemes for the improvement of productivity.

Syllabus:

Productivity: Concept of productivity, factors influencing productivity, productivity measurement, basic work content, productivity and its relation with work study.

Method study – Objective and procedure of method study, recording techniques charts, diagrams.

Motion study – Classification of movements, principle of motion economy, basic elements of motion, therbligs, motion analysis, SIMO charts, two handed process charts, use of cine film, cycle graph and chrono cycle graph.

Work measurement – Work measurement techniques, stop watch time study, time study procedure, rating, qualified worker, standard time, work sampling, standard data, synthesis, PMTS, analytical estimating.

Wage Administration – Wage payment plans, types of wage and incentive schemes, relation between incentives and productivity

Organization of work study departments – Position of work study, personnel in organization structure, selection and training of work study personnel.

Ergonomics – Psycho physiological data, anthropometry, normal and maximum work areas, location of control knobs, visual display, fatigue in industry, environmental requirements.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1 I L O, Introduction to work study
2 Ralph M Barnes, Motion and Time Study Design and Measurement of Work, John Wiley & Sons
3 L.C. Jhamb, Work study and Ergonomics, Everest Publishing House.
4 Mikell P. Groover,Work Systems and the Methods, Measurement, and Management of Work, Prentice Hall

ME571 **Advanced Machining Methods**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand and compare various non-traditional manufacturing processes.
- evaluate various parameters on performance of various non-traditional manufacturing processes.
- select a non-traditional manufacturing processes for given application.
- devise a mathematical model for non-traditional manufacturing processes.

Syllabus:

Introduction: Needs of manufacturing industries and role of newer & innovative processes for the solutions, classification, areas of applications.

Theory and applications of mechanical (erosion) machining: Abrasive jet, Abrasive water jet, water jet, abrasive flow, ultrasonic machining, mechanism of material removal, analysis and effect of various parameters on the performance of the processes.

Electrochemical, Chemical Machining and Elector Chemical Grinding: Principle, mechanism, electrolytes, surface finish, plant, critical parameters applications and limitations, mechanism of material removal, analysis and effect of various parameters on the performance of the processes.

Thermal energy methods of material processing: Electro-Discharge Machining-principle, process parameters, wire-cut EDM, mechanism of material removal, tool electrode and dielectric fluids, analysis and effect of various parameters on performance of the process.

High-energy beam welding processes: Laser beam, electron beam, plasma beam, ion beam machining, mechanism of material removal, analysis and effect of various parameters on the performance of the processes.

Micromachining and Nanomachining: Introduction to Micromachining, Nanomachining, different micromachining and Nano-machining techniques requirements & applications.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. P. C. Pandey, H. S. Shan, Modern Machining Processes, Tata McGraw Hill
2. V K Jain, Introduction to Micromachining, Alpha Science International Ltd.
3. G.F Benedict, , “Nontraditional Manufacturing Processes” CRC Press
4. J. A McGeough, , “Advance Method of Machining”, Springer

ME506 **Mini Project - I**

Course Learning Outcome:

After successful completion of the course, student will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

SS561 **Creativity and Innovation**

Course Learning Outcome:

By the end of this course students will be able to:

- Understand the importance of R directed thinking complementing L directed thinking
- Infer and discover processes and methods of creative problem solving
- Enhance and correlate their creative and innovative thinking skills
- Understand various disruptive innovations and techniques
- Analyze and apply various tools of creativity to some basic problems

Syllabus:

1. INTRODUCTION:

- Introduction to Creativity and Innovation
- Creativity V/s. Innovation
- Creativity as thinking skill
- Critical Thinking V/s. Creative Thinking
- Lateral Thinking
- Engineering and Creativity
- Creativity in Problem Solving

2. TOOLS FOR CREATIVITY:

- Brain storming
- Mind mapping
- SWOC Analysis
- Fishbone diagram
- Six thinking hats
- Borrowing brilliance
- Da Vinci's seven principles
- Provocation and movement
- Examples and case studies

3. WHOLE NEW BRAIN

- L directed thinking V/s. R directed thinking
- From agriculture age to Industrial age to Information age to Conceptual Age
- Need to high touch – design, story symphony, empathy, play, meaning

4. SKILLS FOR DISRUPTIVE INNOVATORS

- Introduction
- Associating
- Questioning
- Observing
- Networking
- Experimenting
- Putting skills into practice
- Case studies

5. MEDICI EFFECT

- Introduction
- Intersection
- Creating medici effect

- Making intersectional ideas happen
- Case studies

6. TRIZ INNOVATION

- Introduction
- Ideality
- Resources
- Contradictions
- Pattern of innnovation
- Case studies

7. BIO MIMICRY

- Introduction
- Design of various products inspired by nature like Green building, bullet train, Nike Clothing, Velcro, Adhesive Tape, Turbine, self-heating plastic, friction reducing swimming suit, automated robot, screen display, deep blue

8. JUGAAD INNOVATION:

- Introduction
- Jugaad tactics: Seek Opportunities in Adversity, Do more with less, Think and act Flexibly, Keep it simple, Include the margin, Follow your heart.
- Case studies

9. CASE STUDY BY IDEO DESIGN THINKING MODEL

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Daniel H. Pink, A whole new mind, Pearson publication, New Delhi
2. Benyus, J.M.1997. Biomimicry:Innovation Inspired by Nature, HarperCollins,New York
3. Technical Innovation Center Inc, USA Altshuller G (1997) 40 Principles. TRIZ Keys to Technical Innovation. Technical Innovation Center Inc, USA Andrews P
4. Kelly, Tom (2001): The Art of Innovation, Lessons in Creativity from IDEO, America's Leading Design Firm, Doubleday, NY
5. Tina Seelig, Ingenius, A Crash course on Creativity Hayhouse, U.K
6. Edward de Bono, Lateral Thinking, Be more creative and productive, Penguin India
7. Edward de Bono, Teach Yourself to Think, Penguin India
8. Edward de Bono, Six Thinking Hats, Little Brown and Company
9. Jonah Lehrer, Imagine, How creativity works, Canongate, Edinburgh, London
10. John Adair, The Art of Creative Thinking, Kogan Page India, New Delhi
11. Jeff Dyer, Hall Gregersen & Clayton M. Christensen, The Innovator's DNA, Harvard Business Publishing
12. Daniel Goleman, Emotional Intelligence, Bloomsbury Publishing India P.Ltd.
13. Howard Gardner, Five Minds for the Future, Harvard Business Review Press
14. Malcolm Gladwell, Blink: The Power of Thinking Without Thinking, Hachette Book Group USA
15. Navi Radjou, Jaideep Prabhu, Simone Ahuja, Jugaad Innovation, Wiley Publisher

ME601 **Production Technology**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand types of tools, their geometries and cutting fluids used for various machining processes
- select and justify machining parameters for practical applications
- design Jig and Fixtures for various application
- perform on automatic and unconventional machines

Syllabus:

Cutting Tools: Classification, tool signature of single point cutting tools, tool materials, multi point cutting tools, types and their geometry, form tools, selection of standard tools.

Theory of metal cutting: Orthogonal and oblique cutting, theory of chip formation, types of chips, chip thickness ratio and shear plane angle, forces and power in machining, concept of machinability, tool wear and tool life, Effect of tool wear and machining variables on the surface quality of different materials, economics of machining, cutting fluids.

Analysis of machine tools: Working and auxiliary motions in machine tools, machine tools drive, function and types of machine tools structures, materials for machine tool structure, study of general features of machine tools beds, slide ways, guide ways, columns, bearings etc.

Semi-Automats and Automats: Classification, working, tool layout–single spindle and multi spindle automats, transfer machines: basic types and construction.

Newer machining techniques: Need, classification, principle and working with their applications. USM, AJM, ECM, EDM.

Gear manufacturing: Types of gears, study of different gear generating and forming methods with their special features, gear finishing processes.

Jigs and Fixtures: Definition, their usefulness in mass production, design principles, locators and clamps, jig bushes, type of jigs and fixtures.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus.

References:

1. P. C. Pandey and C. K. Singh, Production Engineering Sciences, Standard Publishers Distributors
2. HMT, Production Technology, Tata McGraw-Hill Publishing Company Ltd.

ME602 **Machine Design-I**

Course Learning Outcome:
After successful completion of the course, student will be able to

- apply various design concepts like Design for Assembly, Design for Manufacturability in their design problems.
- design basic machine elements like pressure vessel, welded joints and riveted joints to withstand loads and deformations for a given application, while considering additional specifications.
- evaluate the life of mechanical components subjected to fluctuating loading
- design mechanical systems like hydraulic press, single plate clutch, multiplate clutch, centrifugal clutch and mechanical brakes

Syllabus:

1. **Design philosophy** – Fail safe and safe life design concepts DFA, DFM, ergonomics, theories of failures, contact stresses, thermal stress, creep, concurrent engineering.
2. **Standardization** – Limit, fit, tolerance, preferred numbers, process capability.
3. **Designs of welded and riveted joints**. – Design of butt weld joints, Design of parallel and transverse fillet joint, Design of welded joints subjected to eccentric loading, Design of riveted joint for various configurations.
4. **Design of machine components under fatigue loading** –Design for finite and infinite life for completely reversed load, Design based on Gerber, Goodman and Soderberg criteria, Application of fatigue loading for design of shafts, axles, various mechanical components etc.
5. **Design of Pressure Vessels** – Thin and thick pressure vessels, compound cylinder with internal and external pressures.
6. **Design of clutches and brakes –** Design of various mechanical clutches like single plate, multiplate, centrifugal clutch etc., Design of various mechanical brakes like block brake, band brake, internal expanding shoe brake etc.

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory Work will be based on topics covered under the above syllabus.

References:

1. V. B. Bhandari, Design of Machine Element, Tata McGraw Hill
2. Shigley, Budnyas, Nisbett, Mechanical Engineering Design, Tata McGraw Hill
3. R. L. Norton, Machine Design, Pearson Education
4. R. C. Juvinall, K. M. Marshek, Fundamentals of Machine Component Design, John Wiley & Sons

ME603 **Thermal Engineering**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand various refrigeration system and analyze its performance
- review basics of psychometry and apply it to related processes
- comprehend the fundamentals of I C engine and its various sub systems
- analyze performance of I C engine
- understand properties and characteristics of traditional fuel and alternate fuels used in I C Engine

Syllabus:

Refrigeration: Reversed Carnot cycle, COP, heat pump cycle and its COP, Vapour Compression Refrigeration (VCR) cycle, its representation and calculation using T-s and p-h diagram, influence of sub cooling and super heating on COP, effect of varying suction and discharge pressures on the performance of VCR cycle, simple vapour absorption refrigeration cycle, Electrolux refrigeration system, Bell Coleman cycle, its COP, and its comparison with Carnot cycle, Refrigerants and their desirable properties.

Psychrometry: Psychrometry terms, calculation of Psychrometric terms using Psychrometric charts and tables.

Psychrometric processes: Their representation on Psychrometric chart, calculations related to relevant processes.

IC Engines: Construction and function of parts of two stroke, four stroke petrol and diesel engines, their valve timing diagram.

Fuels: Fuels for petrol and diesel engines, Octane and Cetane rating of fuels, additives, alternative fuels.

Fuel supply system: Simple carburetor- working principle and limitations, Requirements of diesel injection system, types of injection system, construction and working of fuel pump and injector.

Ignition system: Requirements of ignition system, battery, magneto and electronics ignition system, construction and working of spark plug

Cooling system: Air cooling, different water cooling systems, comparison of air and water cooling system, anti freezing substances

Lubricating system: Properties of lubricants, types of lubricating systems

Scavenging: Scavenging process in two stroke and four stroke engines, scavenging systems and scavenging pumps

Supercharging: Objective, advantages and disadvantages of supercharging, methods of supercharging, turbo charging

Testing of Engines: Performance tests of petrol and diesel engines, performance curves for constant and variable speed engines, heat balance sheet, tests to determine mechanical efficiency

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus

References:

1. Frank Kreith, Shan K. Wang, Paul Norton, Air Conditioning and Refrigeration Engineering, CRC Press
2. C.P. Arora, Refrigeration and Air Conditioning, Tata McGrawHill Publication
3. J B Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publication
4. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Publication
5. Mathur M. L. and Sharma R. P., Internal Combustion Engines, Dhanpat Rai and Sons
6. Paul W. Gill, James H. Smith and Eugene J. Ziurys, Fundamentals of Internal Combustion Engines, Oxford & IBH Publishing Housing Co. Pvt. Ltd.

ME604 **Mini Project- II**

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

ME643 **Robotics Engineering**

Course Learning Outcome:

After successful completion of the course, student will be able to

- apply the concept of robotics to select the type of manipulator best suitable to the application
- formulate the mathematical relations for kinematic analysis of robotic manipulator.
- integrate the structural design, actuator selections, drive system, sensor and control system necessary to implement a robot in a specific job task

Syllabus:

Robot technology:

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components

Robot motion analysis and control:

Robot arm kinematics, Forward & inverse kinematics solutions robot arm dynamics, Robot Work Space and Trajectory design.

Langrange-Euler formulation, Newton-Euler formulation, Generalized D'Alembert equation of motion, dynamic model of two axis planer, articulated, three axis SCARA robot.

Actuators and sensors in Robot- AC/DC motors, stepper motors and servo motor, direct drive robot, Hydraulic and pneumatic systems.

Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

Robot programming & languages.

Types of End Effectors and Design End effectors, Classification, Force analysis and Gripper design.

Introduction to Mobile robots, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall
2. Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi
4. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd
5. Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

ME653 **Machine Tool Design**

Course Learning Outcome:
After successful completion of the course, student will be able to

- design structure of machine tools such as bed, column, housing etc.
- select the configuration of speed and feed regulation for required application.
- design the components of machine tool like spindle and guide ways.

Syllabus:
Drives and mechanisms of machine tools:
Machine tool drives, general requirement, mechanical and hydraulic transmission, speed and feed regulations, step-less regulations of speed and feed, design of multi speed gearbox.
Design of machine tool structure:
Analysis of Machine tool from strength and rigidity point of view, design of bed, column, housing, saddle and carriages etc.
Design of spindles and spindle supports, design of guide ways, ball screw. Hydraulic bearing, air and gas bearing.
Machine tools testing and alignments.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. N.K. Mehta, Machine Tool Design and Control, Tata McGraw Hill.
2. N. Acherkan, Machine Tool Design Vo.1,2,3,4, Mir Publishers, Moscow
3. S. K. Basu, Design of Machine Tools, Oxford and IBH Publishing co. Pvt. Ltd.
4. N. Ignatyev, Yu Mikheyer, Machine Tool Design, University Press.

ME693 **Failure Analysis**

1. General practice in failure analysis.
2. Failure analysis and fracture mechanics.
3. Failure mechanism and related environmental factors like SCC, LMF, HE, wear failures fatigue failures etc.
4. Failure analysis as applied to different metal working processes like cold formed parts, forging casting, welded and brazed points etc.
5. Failure of manufactured components and assemblies like shafts, bearing, gears etc.

Text/Reference Books:

Metal Failures: Analysis and prevention by Arthur J. McEvily, John Wiley and Sons.

ME613 **Stress Analysis**

Course Learning Outcome:
After successful completion of the course, student will be able to

- relate stress, strain and material behavior.
- evaluate the suitable stress functions.
- evaluate stresses and strains in mechanical structural components.
- select the suitable experimental technique for stress analysis.

Syllabus:
Components of stress and strain; Equilibrium Equations of stress and strain, principal values and invariants of stress and strain, stress and strain transformations, Generalized Hooke's law. General 3-D problems and classical theorems. Plane stress and plane strain. Compatibility conditions, Formulation and solution strategies, boundary conditions, fundamental problem classification, stress and displacement formulations

Airy' s stress function. 2-D problems in rectangular and polar coordinates, Complex variable approach. Complex representation of stresses, displacements and applied boundary loads. solution of 2-d problems for infinite plates with simply connected regions, introduction to finite element analysis and its application to mechanical engineering

Experimental methods of stress analysis. Strain gages. Photoelasticity. Biorefringent coatings. Brittle coatings. Moire frings. X-ray techniques and holography.
Use of finite element method for stress analysis.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. L. S Srinath, Advanced Mechanics of Solids, 3rd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi
2. R. G. Budynas, Advanced Strength and Applied Stress Analysis, 2nd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Martin Sadd, Elasticity: Theory, Application and Numerics, 2nd edition, Elsevier, Reed Elsevier India Pvt. Ltd.
4. S.P. Timoshenko and J.N. Goodier, Theory of Elasticity, 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi
5. J.W. Dally and W.F. Riely , Experimental Stress Analysis, Tata McGraw Hill Education Pvt. Ltd., New Delhi
6. Mushelishvili, Some basic problems of the mathematical theory of elasticity, Noordhoof, Netherlands

ME623 **Hydraulics and Pneumatics**

Course Learning Outcome:
After successful completion of the course, student will be able to

- identify the various components of hydraulic and pneumatic system
- design a preliminary control circuit using hydraulic and pneumatic symbols
- select the appropriate components suitable for the application.

Syllabus:
Introduction – Importance of Hydraulic & Pneumatic control system in industries.
Hydraulic Systems – Pumps and motors - types, characteristics, efficiencies, torque and power; pump circuits and power packs - filtration, accumulators, basic components of hydraulic & control system such as directional control, flow control, pressure control valves and related circuits, linear actuators, rotary actuators, control of rotary motion, hydraulic symbols for circuit components, design and construction of simple circuits, system and pipeline layouts, electrohydraulic circuits, design and analysis.
Pneumatic Systems – Compressed air generation, preparation and distribution, pneumatic working elements, pneumatic control valves, pneumatic symbols for circuit components, design and construction of simple pneumatic circuits, electro-pneumatic circuits
Maintenance and trouble shooting in Hydraulic and Pneumatic circuit, Elementary ideas of application of Microprocessor in hydraulic and pneumatic circuit.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. R. Srinivasan, Hydraulic and Pneumatic Controls, Tata McGraw - Hill Education
Industrial Hydraulics by Vickers Manual, Eaton Hydraulics

SS562 **Law for Engineers**

Course Learning Outcome

By the end of the course, students will be able to

- Understand the Indian Legal System and Basics of different laws.
- Understand, explore, and acquire practical insight of legal system and its application in engineering profession.

Syllabus

Unit I
Introduction to Indian Legal System: Constitution of India, Sources of Law and Judicial system
Unit II
1.Contracts and its Elements: Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency
2.Employment agreement
UNIT 3
1Legal Documentation: Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting
UNIT 4
1.Intellectual Property Rights (IPR): Overview
2.Trademarks, Copy Rights, Patents with special emphasis in Biotechnology Inventions, software, circuits and design
3. Protection in Foreign Countries
UNIT 5
1. Cyber Laws, E-Commerce and E-Governance
UNIT 6 Introduction to Labour Laws
1. Labour Laws: Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract labour
2. Health, Safety and welfare of construction workers.
UNIT 7
Taxation: Income Tax, Service Tax, VAT, Excise Duty
UNIT 8
Alternate Dispute Resolution (ADR) in Domestic and International dealings
UNIT 9
Introduction to Criminal Law
RTI Act

References
1. Karnika Seth, Computer Internet and New Technology Laws, Lexisnexis, First Edition 2013.
2. Prafulla C Pant, The Arbitration And Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.
4. J. Beatson, Anson's Law Of Contract, Oxford University Press.
5. V. S. Datey , Indirect Taxes: Law And Practice, Taxmann Publications (P) Ltd, Latest Edition

6. Dr. Vinod K. Singhania And Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd, Latest Edition.
7. S.C. Srivastava, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd.

CH001 **Air Pollution Control Techniques**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the fundamentals of air pollution, the major collection mechanism and equipments/instruments for a given gaseous or particulate pollutants
- select and apply the most appropriate air pollution control system
- understand the fundamentals of indoor and odour pollution
- understand different methods for controlling emissions from stationary and mobile sources
- apply the concept of air pollution control engineering to the professional society and general public

Syllabus:
Introduction to Air Pollution : Air pollution in India and the world, sources and classification of air pollutants, global concern of air pollutants, effects of air pollutants.
Meteorological Aspects of Air Pollution: Temperature lapse rates and stability, meteorological factors influencing air pollution, plume behavior, dispersion of air pollutants and estimation of plume rise.
Sampling and Measurement of Air Pollution: Types of pollutant sampling and measurement, ambient air sampling, stack sampling, analysis of air pollutants.
Source Correction Methods: Raw material change, process change, equipment modifications.
Particulate Control Techniques: Collection efficiency, particulate control equipments like gravity settling chambers, cyclone separator, filters, electrostatic precipitator, wet scrubbers.
Control Technologies for Gaseous pollutants: Scrubbers, absorption and adsorption, control of specific gaseous pollutants like SO_x, NO_x.
Control of Volatile Organic Compounds: Environmental significance of organic compounds and its control.
Odor and Its Control Techniques: Sources and characteristics of odor, measurement and control of odor.
Indoor Air Pollution: Indoor air pollutants and its effect, factor influencing indoor air quality, control of indoor air pollutants.
Air Pollution Legislation and Regulations: Air quality criteria and emission standards.
Control of Air Pollutants from Various Sources like Stationary and Mobile source
Recent Trends in Air Pollution Control Techniques

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard W. Bouble, Donald L. Fox, D. Bruce Turner, Arthur C. Stern, Fundamentals of Air Pollution, Academic Press.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International.
3. M N Rao, H V N Rao, Air Pollution, Tata McGraw Hill.
4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, I. K. International.
5. S. C. Bhatia, Textbook of Air Pollution and its Control, Atlantic Publishers & Distributors.
6. R. K. Trivedy, P. K. Goel, An Introduction to Air Pollution, BS Publications.

EE002 **Electrical Power Utilization and Safety**

Course Learning Outcome:
After successful completion of this course, students will be able to

- understand the importance of power factor and suggest a suitable method for improving it
- suggest and apply suitable electric heating, welding, refrigeration and air conditioning for a system
- analyze and design illumination scheme, electrification, earthing system and protection system for an application

Syllabus:

Electric Heating and Electric Welding: Advantages of electric heating, Resistance heating, Types of furnaces, Induction heating, Types of induction furnaces, Dielectric heating, Types of welding- arc and resistance.
Refrigeration and Air conditioning: Introduction to refrigeration and air-conditioning, Principles of a refrigerator, Domestic refrigerator, Electrical circuit of refrigerator, Need of voltage regulator, Water cooler, Air conditioner, Thermo-electric refrigeration, Air purification, Central air conditioning systems.
Illumination Scheme: Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, Types of lighting schemes, Design of lighting schemes, Factory lighting, Street lighting, Flood lighting.
Electrical Installation, Estimating and Costing: Types of load, Load assessment, Electrical supply systems, Wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase).
Power Factor: Effects of power factor, Causes of low power factor, Disadvantages of low power factor, Methods of improving power factor.
Electrical Safety Concepts and Criteria: Electrical shock mechanisms, Factors influencing the electric shock, Body current thresholds (tolerable body current limit), Thevenin's concepts and accidental equivalent circuits (step and touch potentials), Protection against electric shock.
Earthing Systems: Purpose of earthing, IS rules for earthing of electrical installations, Factors governing the resistance of earth electrode, Methods of earthing, Measurement of earth resistance, Methods of reducing earth resistance.
Protective Devices: Fuse, Miniature circuit breakers (MCB) and Earth leakage circuit breakers (ELCB).

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.
2. H. Partab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Co.
3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria & Sons, New Delhi.
4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.
5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.
6. N. V. Suyranarayana, Utilisation of Electric Power Including Electric Drives and Electric

Traction, New Age Publishers, New Delhi.
7. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria & Sons, New Delhi.
8. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House.

HS006/2HS006 Element of Marketing Management

Objective: To acquaint the engineering students with the basic concept of marketing management.

Marketing: Concept of marketing, core marketing concepts, importance and scope of marketing, company orientation towards market place

Product: Product and product mix, importance of product, product objective, product strategy planning for new product

Market Environment: Demographic, Economic natural, Technical, Political, legal, social cultural Consumer Buying Behaviour: Influences on buyer behaviour, buying decision process,
Market segmentation – levels, pattern and procedure

Distribution channels : Importance and factors of distribution channels, typs of channels, channels of distribution – consumption good, industrial goods, nature and type of retailers Function and type of wholesalers, selecting distribution, channels

Pricing: Nature and Importance of pricing, objectives of pricing. Considerations in price determination approaches to pricing.

Promotion: Promotion and its elements, objectives of promotion, promotion mix
Market research: Nature and scope, process of market research, uses and limitations

Text/Reference Books:

1. Marketing Management – Philip Kotler, PHI
2. Marketing Management – Rajan Saxena, TMH
3. Organization and management – R.D. Agrawal, TMH

IC004 **Microcontroller and its Applications**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the basic working of microcontrollers
- program the 89CXX controller in C and assembly language
- interface and analyze the 89CXX based circuits
- design and develop systems based on 89CXX microcontrollers

Syllabus:

Architecture of 89CXX series microcontroller: Micro controller Hardware, Input /Output Pins, Ports and Circuits, External Memory, Counter and Timers, Serial Data Input/Output, Interrupts, Basic Assembly Language Programming Concepts

Data Transfer Operations: Addressing Modes, External Memory Read-Only Data Moves, Push and Pop Opcodes, Data Exchanges

Arithmetic & Logical Operations: Flags, Incrementing and Decrementing, addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Byte-Level Logical Operations, Bit-Level Logical Operations, Rotate and Swap Operations

Jump and Call Instructions: Jump and Call Program Range, Jump, Calls and Subroutines, Interrupts and Returns, More Details on Interrupts

C Programming for microcontroller: Data types and time delay in 89CXX Controller, I/O programming, Logic operations, Data conversion programs, Accessing code in ROM space, Data serialization.

The Microcontroller Based Design: A Microcontroller Design, Testing the Design, Timing Subroutines, Lookup Tables for the 8051, Serial Data Transmission Applications Keyboards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts Serial Data Communication Network Configurations, Data Communication Modes

Applications of Microcontroller: Stepper motor control, PMDC motor speed control, RTC interfacing, Relays and alarms interfacing with microcontroller, frequency calculation, pulse width calculation, temperature indication using microcontroller

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study

References:

1. K.J.Ayala, The 8051 Micro controller, Architecture, Programming and Applications, , Penram International Publication.
2. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 8051 Microcontroller and Embedded Systems , Pearson Higher Education Publication.
3. Myke Predko, Programming and Customizing the 8051 Microcontroller, McGraw-Hill Publication

CE006 Operating Systems

Course Learning Outcome (CLO):
At the end of the course, students will be able to -

- understand the components and functionalities of a typical operating system
- identify synchronization needs of various system resources for optimal utilization
- experiment with various control and scheduling activities of operating system components

Syllabus:

Unit I

Introduction: Evolution of operating systems, operating system services, types of operating system, different view of operating system, Review of types of I/O polled, interrupt driven and DMA. Process Scheduling: Concepts of Process, attributes of process, process control block, data structures. Processes and threads, process status, scheduler: long term, medium term, short term scheduler, matrix of evaluation, scheduling algorithms.

Unit II

Inter process Communication(IPC):Need of IPC, concurrency, Race conditions, critical section, mutual exclusion problem, solution approaches, algorithmic approaches, critical region, condition for critical region, semaphore : Binary ,counting, the queuing implementation. Monitors, message passing: synchronous vs asynchronous message exchange. Classical IPC Problems: Dinning Philosopher Problem, Sleeping Barber Problem, Reader's & Writer Problem, procedure control.

Unit III

Deadlock - Deadlock problem, deadlock characterization, dealing with dead lock, deadlock prevention, deadlock avoidance. Memory Management - Paging: Principle of operation, page allocation, h/w support for paging, multiprogramming with fixed no. of task, multiprogramming with variable no. of task, segmentation, virtual memory : concept of demand paging, page replacement algorithms, thrashing.

Unit IV

Input Output Management-Principles of input/output: Input / Output devices, device controllers, direct memory access, principles of input/output s/w : goals of the input/output s/w, concepts of interrupt handler and device driver, devices as files, the inode structure and organization.

Unit V

File Systems: file structure, file types, file access, file attributes, file operations, memory mapped files and directories: hierarchical directory system, pathnames, directory operations, contiguous allocation, linked list allocation, linked list using index, Inodes, Concepts of Shared files.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. William Stalling, Operating System – Internals, Prantice Hall
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall
3. Peterson, Operating System Concepts, Addition-Wesley Longman Publishing Co
4. Milan Milenkovic, Operating System – Design & Concepts, Mc Graw Hill
5. Stephen Prata, Advanced Unix - A Programmer's Guide, BPB Publications

6. Yashwant Kanitkar, Unix Shell Programming, BPB Publications
7. Sumitabha Das , Unix System V.4 Concepts & Applications, Pub. TMH
8. Maurice Bach, The Unix Operating System, Prentice Hall.

2IC002 Programmable Logic Controller

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the fundamental principles of Programmable logic controller, I/O modules
- develop the ability to design program using standard programming technique
- develop and design an application orientated project using PLC

Syllabus:

Introduction: Definition, advantages and Importance of PLC, Evolution history of PLC, Architecture and block diagram.

PLC hardware : Types of PLC, CPU unit architecture, Input/Output devices and interfacing, Hand held programming terminals, Industrial computer and monitors,

PLC operation: Ladder logic, Logic functions, Wiring diagaram

PLC Programming: Basic relay instructions, timer-counter instructions, comparison, data handling, input-output instructions, sequencer instruction

PLC applications and case studies.

Self Study:
The self study contents will be declared at the commencement of semester.Around 10% of the questions will be asked from self study

References:

1. Webb and Reis, Programmable Logic Controllers, Principles and Applications.
2. Mitra and Gupta, Programmable Logic Controllers and Industrial Automation an Introduction.

CL002 **Project Management**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand project, management functions, planning, monitoring and controlling techniques
- develop network, calculate project duration and optimize time and cost
- implement resource allocation and control techniques
- identify, analyze and apply suitable planning and management techniques for project management

Syllabus
Introduction to Management: History, concept, need for scientific management, scope, functions, engineer as manager.
Organizational Structure: Need, types, principle, functions of various personnel, organization as resource.
Material Management: Objectives, scope, functions, stages of material management, inventory control.
Personnel Management: Special characteristics, man power planning, recruitment, placement, training and induction, motivation, performance appraisal, industrial relation, aspect of administration, motivation, public relation, welfare measures.
Project Planning and Control: Project life cycle, identification, budget planning, appraisal, negotiation, approval, detailed planning, implementation, monitoring and control, evaluation, planning techniques and their merits and demerits.
Network Analysis: History, Bar chart, CPM and PERT: development of network, time estimates and computation, analysis of network, time-cost trade off, updating and resource allocation.
Accounting and Financial Management: Accounting: Concept, objectives, types, principles. Finance Management: Finance as resource, functions, control, cost analysis. Financial statements: Balance sheet, profit and loss account, fund and cash flow statement. Financial Analysis**:** Financial ratio, types, significance Methods, factors, purpose, financial analysis, cost-benefit ratio. C-V-P analysis: concept, assumption, fixed and variable cost, breakeven point, margin of safety, utility.
Project Information System: Need, components, use of computer, implementation, monitoring, reports, schedule and budget, updating, cost and time control.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Nagarajan, Project Management, New Age International Publishers
2. Harold Kerzner, Project Management: A System Approach to Planning, Scheduling and Controlling, John Wiley and Sons
3. Burke and Rory, Project Management: Planning and Control Techniques, John Wiley and Sons
4. Prasanna Chandra, Financial Management: Theory and Practice, Tata McGraw Hill
5. P Gopalakrishnan, Materials Management, Prentice Hall
6. K. Aswathappa, Human Resource Management: Text and Cases, Tata McGraw Hill

S005/ 2HS005 **Technical Writing**

Course Learning Outcome

After successful completion of the course, student will be able to

- Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
- Understand how to apply technical information and knowledge in practical documents for a variety of a.) professional audiences (including peers and colleagues or management) and b) public audiences.
- Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.

An introduction to technical writing

- Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing.
- Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics.
- Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language.

Memorandum:

- Objectives, difference between memos, letters and emails. Criteria and format for writing and memos.

Technical description:

- Criteria and process.
- Technical instructions for user's manual

Report Writing:

- Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report.

Letter- writing:

- Business letters, Job-applications, Resume.

Business Proposals:

- Types & formats.

Graphic representation of Technical Data

SOP writing

Promotional Writings

- Technical Brochure designing
- Content writing for Websites (For promotional and troubleshooting purposes)
- Writing Fliers and Newsletters

Academic Writing

- Summaries, abstracts and instructions

Case studies on Technical Writing.

Reference Books:

1. Sharon J. Gerson and Steven M. Gerson, , Technical writing – process and product ,Person Education Asia .

2. Andrea J. Ratherford ,Basic Communication Skills for Technology,Person Education Asia
3. Pfeiffer, W.S. and T.V.S. Padmaja. Technical Communication. Pearson
4. Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson

HS001/2HS001 Entrepreneurship Development

Objective:
To acquaint the engineering students with the basic concepts of Entrepreneurship with an effort to develop entrepreneurial skill amongst the students.

Entrepreneurship : Definition and structure. Entrepreneurial culture, the concept of Entrepreneurship. Entrepreneurial Traits: Entrepreneurial Skills, Qualities and Characteristics of an Entrepreneur, Nature and Importance of entrepreneurs. Entrepreneurship as a career choice. Contribution of entrepreneurs to the Development of the Nation.

Entrepreneurial Development : entrepreneurial Environment, Meaning and Process of entrepreneurial Development. Entrepreneurial Development Training, Importance, Objectives and Methods of Training.

Project Management : Search for Business Idea, Concept of Project and classification. Project Identification and Formulation. Project Design & Network Analysis. Project Report, Project Appraisal.

Financial Analysis : Investment Process, Break even analysis, Budget and Planning Process.

Sources of Finance : Sources of Development Finance, Financial Institutions.

Establishing a small scale Industry: Location, Steps of Setting up a Small Scale Industry, Selection of Organization.

Marketing Environment : Marketing Segmentation, Market Research, Market Planning.

Text/Reference Books:

1. A handbook for New entrepreneurs by EDI, Published by Oxford University Press.
2. Dynamics of Entrepreneurial Development and Management – Vasant Desai, Himalaya Publishing House
3. Entrepreneurship Development – Dr. Y.P. Hathi, Dr. Rupesh Vasani, Mahajan Publishing

HS016 **Applied Literature**

Course Learning Outcome

Students completing this subject will:

- be able to explore the importance of textual traditions in shaping responses to other places, peoples, cultures;
- gain a knowledge and understanding of the social, political and intellectual forces contributing to imperial, third world and migrant writing;
- develop a knowledge and appreciation of the subject matter, styles and narrative conventions

Syllabus

Non-fictional Prose Works (Excerpts)

New Branded World by Naomi Klein
From the Gutenberg Elegies: The Fate of Reading in the Electronic Age by Sven Birkets
Decolonising the Mind by Ngugi wa Thiong'o
Idea of India by Sunil Khilnani
Wings of Fire by APJ Kalam

Poems

Night of the Scorpion by Nissim Ezekiel
Little Red-Cap, by Carol Ann Duffy
Hunger by Jayanta Mahapatra
The Dacca Gauzes by Agha Shahid Ali
The Howl by Allen Ginsberg
If you forget me by Pablo Neruda
Still I rise by Maya Angelou
If by Rudyard Kipling
"Hope" is the thing with feathers by Emily Dickinson
All You who Sleep Tonight by Vikram Seth
The Unknown Citizen by W. H Auden
Song of Myself, I, II, VI & LII by Walt Whitman

Short Stories

Short Story: "Seventeen Syllables" by Hisaye Yamamoto
Short Story: "The Gift of the Magi" by O. Henry

Criticism

Towards a Feminist Poetics by Elaine Showalter

Movies

The Prestige
To Sir, With Love
The Namesake
Sherlock – TV series
Troy
Jobs

References:

1. Widdowson, Peter. *Literature.* London: Routledge, 1999.
2. Miller, J. Hillis. *On Literature: Thinking in Action*. London: Routledge, 2002.
3. Mulhern, Francis, *Culture/Metaculture*. London: Routledge, 2000.
4. During, Simon, *The Cultural Studies Reader*. London: Routledge, 1993.
5. Leitch, Vincent B. *The Norton Anthology of Theory and Criticism*. Norton: New York, 2001.
6. Stam, Robert; Alessandra Raengo, *A Companioin to Literature and Film*. Blackwell: Oxford, 2004.

HS014/ 2HS014 **Banking & Finance**

Objective:
To understand the various concepts of banking and financial system

Indian Financial System:
The Financial System, Nature, Evolution and Structure, the Functions of Financial Intermediaries, Financial Instruments, the Role of Financial System in Economic Development, the Indian Financial System. The Origin and Growth of Banking of Banking, Functions of Commercial Banks,, Banking in the New Millennium.

Banker Customer Relationship: Types of Accounts, Types of Relations, KYC Norms, Banker – Customer relationship, Rights and Duties of Banker/ Customer, Importance provisions of NI Act

Sources &Uses of Funds: Bank Balance sheet, Sources & Uses of Funds in a Bank. Form of Balance Sheet of Banking Companies. Different Schedule under Banking Regulation Act. – Provisioning norms of CRR & SLR

Deposit Management: Importance of Deposit, Types of Deposit in India, USA & Europe. NRI Deposits, Cost of Deposit & its impact on Profitability, concepts of Fixed & Floating Rate of Interest, Deposit Insurance.

Cheques: Special Features Negotiability, Validity, Crossing & Endorsement.

Cash Management: Importance of Cash Management issues, Cash at Counter, Vault & Currency Chest.

Lending Activities : Lending activity, Basic requirements for lending.

Credit Policy: Need for Credit Policy, Components of Credit Policy, Credit Policy Pursued by the Government, Bench Marks Exposure Norms, Credit Culture.

Retail Banking: Basics of Retail Banking, Forms of Retail Banking and Emerging issues

Corporate Banking: The nature of corporate banking, Developments in corporate banking, Consortium finance, Multiple banking arrangements, and Loan syndication

Feebased Services: Feebased Services L/C,B/G, Subsidary services, Bancassurance, Demat Account, Safe Deposit Locker , Mutual Funds, Merchant Banking Activities – Management of Public issues, Reasons, Eligibility norms, Regulatory framework, Marketing of issues, Post issue activities

Plastic Money: Different types of plastic money, Concept of a credit card, Distinction between Credit card, Charge card and Debit card, Mechanics of a credit card transaction, Credit card as an augmented retail financial product, Credit card business in India, The merging scenario CRM, (AWB, ATM, Mobile Banking Internet Banking) Delivery Channels (Payment & settlement services)

Reference Books:

1. Management of Banking & Financial Services - Paul, Justin / Suresh, Padmalatha. Pearson – 2007
2. Financial Institutions and Markets, 4th e Bhole, LM. Tata McGraw Hill 2004
3. Indian Financial System, Theory and Practice, 4th e, Khan, M Y. Tata McGraw Hill 2004

CE003 **Data Structures**

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

- understand various data structures and applications associated with them
- analyse efficiency and effectiveness of various data structures
- apply appropriate data structures for time and space optimization

Syllabus:

Unit I

Introduction to Data Structures: Types of Data Structures, Linear & non-linear Data Structures. Linear Data Structures & their sequential storage representation: Storage Structures for arrays, stack definitions & concepts, operations on stacks, double stack, applications of Stacks-Recursion, Polish Expressions and their compilation, Queue-Representation of queue, operations on queue, priority queues, linked list-linked linear list-operation on linear list using singly linked storage structures, circularly linked list, doubly linked linear list, applications of linked linear list-polynomial manipulation.

Unit II

Non Linear Data Structures: Trees-Definitions and concepts, operations on Binary Trees, Storage Representation and Manipulation of Binary Trees-Linked & Threaded, Conversion Of General Trees To Binary Trees, Sequential and other representations of trees, applications of Trees-the Manipulation of Arithmetic Expressions, Multi Linked Structures-Sparse Matrices.

Unit III

Graphs-Matrix: Graphs-Matrix representation of graphs, Breadth First Search, Depth First Search, Spanning Trees. Searching: Searching-Sequential & Binary Searching, Search Trees-Height Balanced, Weight Balance, 2-3 Trees, Tree Structures

Unit IV

Sorting: Sorting-Notation and Concepts, Time and Space Complexity, Asymptotic behavior, Sorting: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Tree Sort, Quick Sort, Shell Sort, Radix Sort, Address Calculation Sort, Summary of Sorting

Unit V

Hashing: Hash Table Methods-Introduction, Hashing Functions, and Collision-Resolution Techniques. File Structure: Definition of Record, File, Blocking, Compaction and Database, introductory overview of Database Management System, Implementation and Traders of Sequential Access, Index Sequential Access, Random Access, B-Trees, Inverted List and Multi list.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill Edition

SYLLABUS

INSTITUTE ELECTIVE for B. Tech Programmes
CIVIL ENGINEERING DEPARTMENT

2CL007 DISASTER RISK MANAGEMENT [3 0 0 3]

Introduction, Concept of Vulnerability and Risk, Concept of Disaster Management (DM), Types of Vulnerability and Risk, Development and Risk, Disasters and Development, Importance and significance of Risk Reduction and DM, Hazards, Climate Change and DM, DM Institutional Framework, Risk Assessment, Disaster Risk Modelling, DM Phases, Mitigation, Preparedness, Prevention, Response, Relief and Recovery, Humanitarian Assistance, Damage and Loss Assessment, Community Based Disaster Management (CBDM), Community Health and Safety, Early Warning and Disaster Monitoring, Disaster Communication, Incident Command System, Disaster Management Plan, Role of GIS and RS in Disaster Risk Management (DRM), Techno-Legal Regime, DRM Programmes & Practices, Role of Engineers (IT, CE, EC, Mechanical, Chemical and Electrical) in DRM and Case Studies.

Text Books:

1. Introduction to Disaster Management by Satish Modh
2. Disaster Relief: Rehabilitation and Emergency Humanitarian Assistance by Prabhas C.Sinha
3. Earthquake Protection by Andrew Coburn and Robin Spence

CE002/2CE003 Internet and Web Technologies

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

- understand the architecture of web based applications and underlying technologies
- design an efficient web based applications using appropriate web technologies
- develop web based application using appropriate scripting languages

Syllabus:

Unit I

Internet Structure, Protocols and Access: Internet Protocol Model overview, Internet Addresses, Internet Protocol, Transport Layer, Upper layer Protocols, Internet Access, Internet Applications, About World Wide Web ,Future of Internet and Internet related applications WWW and Web Servers, IIS Configurations and settings, Apache Configuration, Introduction to PWS, Planning a Website. XHTML: Introduction, Forms, Internal Linking, Image Maps, meta, frameset

Unit II

Cascaded Style Sheet: Inline styles, Embedded Style Sheets, Linking Style Sheets, Text Flow and Box Model. JavaScript: Introduction, Control Structures, Functions, Arrays, Objects.

Unit III

Dynamic HTML: Object Model and Collection, Event Model, Filters and Transitions, Data binding and Tabular Data Control. XML: XML namespaces, DTDs and schemas, DOM , SAX, XSL, SOAP.

Unit IV

ASP: Introduction, ASP Objects, FSO, Data Access Object. Building Interactive Animation: Working with Flash and Dream Weaver

Unit V

Wireless Internet and m-business: Introduction to Wireless Internet, WAP, m-business. e- business and e-commerce. E- Business Models, Building an e-business Application, e-marketing, Security

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. Deitel Deitel Nieto, Internet and World Wide Web: How to Program, Pearson Education
2. Minoli, Internet and Intranet Engineering, McGraw Hill Education

HS003/2HS003 Introduction to Accounting

Objective

To understand the various concepts of financial and cost accounting

Financial Accounts :

Accounting equation, Journal, Cash book, Ledger, Trial Balance, Profit & Loss Account, balance Sheet

Cost Accounts :

Cost classification (direct cost, indirect cost, variable cost, fixed cost) Prime cost, conversion cost, full cost, Cost - Volume – Profit Analysis, Absorption costing, activity based costing, budgetary control, standard costing.

Reference Books:

Accounting for Managers by Jawaharlal TMH
Accounting Principles by Anthony & bn Reece, AITB

ME701 **Computer Aided Design**

Course Learning Outcome:

After successful completion of the course, student will be able to

- determine specification of input and output devices for computer systems and CAD/CAM/CAE software for mechanical engineering requirements.
- apply knowledge of mathematical concepts for geometry manipulation, modeling of curves, surface solids.
- evaluate geometric modelling and finite element formulation

Syllabus:

CAD Hardware and Software

CAD/CAM/CAE application, Input and output devices of computer systems, selection of specification of computer systems, features of CAD/CAM/CAE software, evaluation of software, selection of CAD/CAM/CAE software

Geometric Modelling

2d and 3d Transformation, mathematical representation of plane curves and space curves, parametric representations, interpolated, Bezier and B spline curve, mathematical representation of surfaces, types of surfaces

Fundamental of solid modelling, Boundary Representation and Constructive Solid geometry scheme properties and validity of solid models, CSG Tree, Booolean operation

Graphics standards, features of GKS, other graphics standards, PHIGS, IGES, PDES, STEP data exchange standards

Finite Element Analysis

Introduction to Finite Element Method, derivation of various governing equations and matrices for finite element procedure, solution of problems based on governing equations.

Optimization

Design optimization. Introduction, design synthesis, Engineering vs Optimum Design, Objectives of Optimization, Classification of Optimization problems and their procedure, techniques of optimization, optimum design of machine components

Computer Aided Design and Analysis of Mechanism and Machine Elements, CAD and FEA software

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory Work will be based on topics covered under the above syllabus.

References:

1. Ibrahim Zeid, CAD/CAM: Theory and Practice, Tata McGraw-Hill Publishing Company Ltd.
2. David F. Rogers and J. Alan Adams, Mathematical Elements for Computer Graphics, Tata McGraw Hill Publishing Company Ltd.
3. P. Seshu, Textbook of Finite Element Analysis, PHI Learning
4. Daryl L. Logan, First Course in Finite Element Method, Cengage Learning
5. S.S. Rao, Optimization Methods, New Age International Publications
6. Jasbir. S. Arora, Introduction to Optimum Design, Academic Press

ME702 **Machine Design - II**

Course Learning Outcome:
After successful completion of the course, student will be able to

- prepare assembly drawing after design the components and preparation of manufacturing drawings for the same.
- apply rigidity concepts for design of various components of machine tools
- evaluate spur, helical, bevel and worm gears on the endurance strength basis
- design material handling equipments
- design various components of IC engine and selection of bearings

Syllabus:

Design of gears

Classification of gears, selection of types of gears,law of gearing, standard systems of gear tooth, force analysis of spur gear, gear tooth failures, design of spur gear based on beam strength, design of spur gear based on wear strength, Force analysis of helical gears, design of helical gears based on beam strength and wear strength, Force analysis of bevel gears, design of bevel gears based on beam strength and wear strength, terminology of worm gears, force analysis of worm gears, friction in worm gears, strength rating of worm gears, wear rating of worm gears, thermal consideration on worm gear design

Design of machine tools

Design of multi speed gearbox, design ofmachine tool spindle, design and selection of lead screw andguide ways, design of machine tool structure.

Design of reciprocating machines

Design of IC engine cylinder, design of piston and associated component, design of connecting rod, design of crankshaft, design of valve gear mechanism.

Design of sliding contact bearings

Basic modes of lubrication, Petroff's equation and Mackee's investigation, Raymondi and Boyd Method, Selection of parameters for bearing design.

Selection of rolling element bearings

Selection of bearing type for various application, static and dynamic load carrying capacity, equivalent bearing load calculation, load life relationship, selection of bearing from manufacturer's catalogue, design for cyclic loads and speeds

Design of material handling equipment

Selection of wire ropes, design of hooks, design of sheaves.

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work: Laboratory Work will be based on topics covered under the above syllabus.

References:

1. V. B. Bhandari, Design of Machine Element, Tata McGraw Hill Education
2. N K Mehta, Machine Tools Design and Numerical Control, Tata McGraw Hill Education
3. R C Juvinall, K M Marshek, Fundamentals of Machine Component Design, Wiley India
4. R G Budynas, J K Nisbett, Shigley's Mechanical Engineering Design,McGraw Hill Education
5. R L Norton, Machine Design an Integrated Approach, Pearson Education

6. J. M. Apple, Material Handling System Design, John-Willley and Sons Publication, NewYork.
7. J.E. Shigley, Mechanical Engineering Design, Tata McGraw Hill Education

ME703 **Production and Industrial Management**

Course Learning Outcomes:

After successful completion of the course, student will be able to

- understand principles of production and industrial management.
- analyze and apply the concept of quality assurance and quality management techniques.
- formulate and solve problems related to production and industrial management.
- deploy effectively various management techniques.

Syllabus

Introduction - Organization structure, Production planning and control, Quality assurance and control, Purchase and store management, Sales and marketing, Human resource management

Plant Location and Layout – Location, concept and factors governing plant, location merits and demerits of city, suburb, rural areas, plant building design, need for facility layout, types, relative merits & demerits.

Plant maintenance – Maintenance objectives and importance of plant management, duties, functions and responsibilities of plant maintenance department, types, maintenance schedule, plant safety.

Costing– Concept of costing and cost accounting, need of costing, types of costs, concept of overheads, types of overheads and allocation of overheads. Introduction to Activity Based Costing, Break even analysis.

Production Planning and Control – Types of production systems and their characteristics, functions and objectives of PPC. Routing and estimation, loading and scheduling, dispatching, progress report and evaluation.

Sales Forecasting – Importance of consumer opinions, distribution surveys, executive opinions and marketing trends in sales forecasting, Different forecasting techniques and Time series analysis.

Inventory Control and Management – Cost elements, inventory carrying cost, ordering cost, shortage cost, basic inventory models, aggregate planning and selective control techniques.

Quality Assuranceand Quality Management– Inspection, Function, types, objective and benefits, quality control, principle, statistical quality control, concepts of variables and attribute. Normal distribution curves and its property. Control charts for variable and attributes, their application and interpretation (analysis), process capability, acceptance sampling, sampling plans, OC curves and AOQ curves. Quality Management systems.

Introduction to Supply Chain Management, Lean Manufacturing and Value Engineering.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Elwood S. Buffa, Rakesh K. Sarin, Modern Production / Operations Management, John Wiley & Sons, Inc.
2. Heizer, Render, Operations Management: Strategies and Tactics , Pearson Education.
3. R. Paneerselvam, Production and Operations Management, Prentice-Hall of India Pvt.Ltd.
4. Samuel Eilon, Elements of Production Planning and Control, Universal Publishing Corporation.
5. B Mahadevan, Operation Management: Theory and Practice, Prentice-Hall of India Pvt.Ltd.
6. Douglas C. Montgomery, Introduction to Statistical Quality Control, Wiley Publications.
7. Kumar Pravin, Industrial Engineering and Management, Pearson Publications.

ME704 **Computer Aided Manufacturing**

Course Learning Outcome:
After successful completion of the course, student will be able to

- apply the concept of FMS and Robotics for a given problem
- integrate the computers in managing shop floor
- create and optimize a part program using programming concepts for practical applications

Syllabus:
Numerical Control: Merits and demerits, NC, CNC, DNC, NC machine tools, classification, axes, types of controls, components, their functions and features, tooling for NC machines.
NC part programming: ISO code, formats, manual and computer assisted programming, part programs for lathe, milling machine etc.
Computer Aided Production Management: Problems with traditional PPC, use of computer in PPC, such as CAPP, Material Requirements Planning.
Group Technology: Part families, part classification and coding, machining cells, benefits of group technology.
Flexible Manufacturing System and Computer Integrated Manufacturing: Introduction, types of CIM, manufacturing cells, CIM benefits, and FMS material handling equipment, pallets and automatic guided vehicles.
Introduction to robotics: Robot elements and controls, programming and teaching robots, specification, application and safety aspects.
CAD-CAM integration: Activities involved in CAD-CAM integration process, commonly used readymade software packages and their uses in area of CAD/CAM/CAE.
Artificial Intelligence & Expert System: Knowledge representation & inference process, AI in manufacturing.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. T. K. Kundra, P. N. Rao and N.K. Tewari, Numerical Control and Computer Aided Manufacturing, Tata McGraw-Hill Publishing Company Ltd.
2. Mikell P. Groover, Emory W. Zimmers, CAD/CAM: Computer-Aided Design and Manufacturing, Pearson Education Asia Pte. Ltd.
3. Mikell P. Groover, Automation, Production Systems, and Computer Integrated Manufacturing, Prentice-Hall

2ME410 Production and Operation Management

Production Planning and Control: Types of production systems and their characteristics, functions and objectives of PPC. Routing and estimation, loading and scheduling, PERT and CPM dispatching, progress report and evaluation.

Product design and development: Factors affecting product design, elements of product development, standardization, simplification and specialization.

Sales Forecasting: Importance of consumer opinions, customer opinions, distribution surveys, executive opinions, marketing trends and Time series analysis.

Process Planning: Production planning, process planning, aggregate planning, economic batch quantity, economics of machine tool selections.

Inspection, and Quality Control: Inspection, Function, types, objective and benefits, quality control, principle, statistical quality control, concepts of variables and attribute. Normal distribution curves and its property. Charts for variable and attributes and their application and interpretation (analysis), process capability, acceptance sampling, sampling plans, OC curves and AOQ curves.

Value Engineering and Analysis: Value, its types, approach and analysis, including techniques, procedures, advantages and application of value engineering and value control.

Sales and Marketing: Functions and organization, marketing concepts Vs selling concepts, market research, advertising, sales promotion distribution channels.

Inventory Control and Management: Cost elements, inventory carrying cost, ordering cost, shortage cost, basic inventory models and selective control techniques.

Text/Reference Books:

1. PPC and Industrial Management by K C Jain & L N Agrawal.
2. Industrial Engineering and Management by O P Khanna.
3. Operation Research by Hira and Gupta.
4. Statistical Quality Control by Mahajan.
5. Production system, Planning, Analysis and Control by J L Riggs.

ME774 Refrigeration Engineering

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand desirable properties of refrigerant and VCR system and its components.
- comprehend and analyse multipresure and vapour absorption systems.
- understand low temperature and unconventional refrigeration systems.
- estimate cooling load in refrigeration system.

Syllabus:
Refrigerants– Primary and secondary refrigerants, designation, desirable properties.
Vapour Compression Refrigeration – Actual cycle, clearance and total volumetric efficiency, calculation of principal dimensions of compressor.
Compound compression systems – Need, analysis of cycles with flash chamber, water cooler and flash inter cooler.
Multiple evaporator systems – Application, analysis of evaporators with individual expansion valve with and without flash inter cooling.
Absorption system – Practical NH_3-H_2O and LiBr-H_2O, to h-x charts, various processes on h-x charts, calculation of heat transferred.
Low Temperature Refrigeration – Inversion temperature, Joule Thomson expansion, ideal, simple Linde–Hampson, Claude Cycles**,** Cascade system, analysis on p-h chart, manufacture of dry ice.
Refrigeration Equipments – Construction and working of reciprocating, centrifugal, scroll, screw and rotary compressor, air cooled and water cooled condenser, shell and coil condenser, **,** bare tube and plate type finned evaporator, liquid chillers, shell and coil, shell and tube and DX chiller, flooded evaporator, construction, working and application of externally and internally equalized thermostatic expansion valve, automatic expansion valve, and capillary tube, Drier, filter, sight glass, shut off valve, check valve, service valve, compound gauge manifold, oil separator and accumulator.
Defrosting – Natural and hot gas.
Air Refrigeration – Air cycles for aircraft
Unconventional Refrigeration Systems – Steam Jet, Vortex and Thermo electric systems.
Cooling Load Estimation – Cooling load for cold storage, domestic refrigerators, water cooler, bottle cooler, deep freezer and ice plant
Controls – Solenoid valve, HP–LP cutout, oil pressure cutout, thermostate

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions in the examination will be asked from self study contents.

References:

1. Refrigeration and Air-conditioning by Stoecker, TMH Publication
2. Principles of Refrigeration by R. J. Dossat, Prentice Hall Publication
3. Refrigeration and Air-conditioning by Jordan and Priester, McGraw Hill
4. Refrigeration & Air Conditioning by C. P. Arora, TMH Publication
5. Refrigeration & Air Conditioning by Balleney, Khanna Publication

ME622 **Operation Research**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand managerial issues related to resource utilization
- acquire knowledge for quantitative analysis.
- develop mathematical models and analyse Operations Research problems.
- apply Operation Research approaches in solving real life problems.

Syllabus:

Introduction to Operation Research

History of Operations Research, definition and characteristics of Operation Research, scope and areas of application of Operations Research,

Linear Programming

Formulation and Graphical Solution: Structure of linear programming problem, mathematical formulation of linear programming problem, graphical solution of linear programming problem, special cases in linear programming problem.

Simplex method: Standard and other forms of linear programming problems, simplex algorithms for solution of maximization and minimization type of problem, Two-phase method, Big-M method, Duality in linear programming problem, dual problem and its construction, interpretation and properties, introduction of sensitivity analysis.

Transportation Techniques: Mathematical model of transportation problem, methods for obtaining initial basic feasible solution and optimal solutions of transportation problem, special cases of transportation problem, production scheduling and inventory control problems.

Assignment Techniques: Mathematical model of assignment problem, solution methods of assignment problem, special cases of assignment problem

Replacement Theory:

Replacement policy for equipment which deteriorate gradually and become obsolete, replacement of items do not degenerate but fail suddenly, replacement by alternative equipment, capacity correction in alternative equipment, replacement with salvage value considered, group replacement policy.

PERT and CPM

Elements of PERT and CPM, PERT and CPM networks, Numbering the events of PERT and CPM networks, PERT computations, CPM computations, concept of slack and floats, project time-cost trade-off procedure, cost analysis and crashing the network.

Queuing Theory

Structure of a queuing system, Input process, queue discipline, service mechanism, inter arrival times, service time, Kendall's notations for representing queuing model, study and solution for basic queuing models.

Self Study: The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Hamdy A Taha, Operations Research: An Introduction, PHI
2. J K Sharma, Operation Research: Theory and application, Trinity Press
3. N D Vohra, Quantitative Techniques in Management, TMH
4. Frederick S. Hillier & Gerald J. Lieberman, Operations Research: Concepts and Cases, TMH

SS701 Organizational Behaviour

Course Learning Outcomes (CLO):

After studying the course the students will be able to:

- Analyze and evaluate performance behavior at individual, group and organizational levels.
- Develop the ability to lead and motivate others to succeed.
- Develop critical analytical skills that will help them diagnose situations pertaining to human behavior and generate effective solutions for the same.
- Understand and apply principles of organizational dynamics relating to systems, culture, structure and change processes

Syllabus

I. Introduction to Organizational Behaviour

- Concept of Organizational Behaviour (OB)
- History , Nature and scope of OB
- Key elements in OB
- Inter-disciplinary contribution to OB
- Managerial Roles

II. Individual Behaviour, Values & Personality

- Concept of Individual Differences
- Values commonly studied across culture
- Fundamentals and Determinants of Personality
- Big Five Dimensions
- Personality Traits

III. Learning & Perception

- Fundamentals of Learning
- Learning Theories - Classical Conditioning Theory, Operant Conditioning Theory, Social Learning Theory
- Behavior Modification
- Definition of Perception, Perceptual Process, Common Perceptual Errors

IV. Motivation

- Basic concept of Motivation
- Theories of Motivation – Maslow,Herzberg's Two Factor Theory, ERG, McClelland , Equity and Vroom's Expectancy Theory

V. Leadership

- Introduction
- Leadership Theories - Trait Theories, Behavioral Theories and Situational Theories

VI. Group Dynamics

- Defining and classifying groups
- Stages of group development
- Group Properties – Roles, Norms, Status, Size and Cohesiveness
- Group Decision making

VII. Managing Change in Organization

1. Definition, Forces of Change,
2. Causes for Resistance to Change, Overcoming Resistance to change
3. Lewin's Change Model

VIII Organizational Culture

5. Meaning, Strong Culture vs. Weak Culture
6. Creating & sustaining Culture
7. Socialization

IX. Conflict, Power & Politics

- Nature & types of conflict, Causes and outcome of conflict
- Responses to conflict
- Bases of Individual Power
- Organizational Politics

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Robbins, S.P.Judge, T.A. &, Sanghi, Seema. (2010). *Organizational Behavior*, Pearson.
2. Pareek, U.(2011).*Understanding Organizational Behavior*, Oxford University Press.
3. Luthans,F.(2006).*Organizational Behaviour*, Tata McGraw Hill.
4. Sekaran,U. (1989).*Organizational Behaviour: Text and Cases*, Tata Mc Graw Hill
5. Kreitner, R. &Kinicki, A.(2012). *Organizational Behavior*, McGrawHill/Irwin
6. Davis,K. &Newstorm, J.W. (1989).*Organizational Behaviour*, Tata McGraw Hill
7. Slocum,J.W&Hellreigal, D. (2010).*Fundamentals of Organizational Behaviour*, Cengage Learning.

ME642 **Maintenance Engineering**

Introduction: Objectives, Quality, Reliability & Maintainability (QRM).

Maintenance Jobs and Technologies: Dismantling, Assembling, Inspection & Adjustment, Lubrication, Maintenance Welding and Hard facing, Metal stitching and Maintenance Cleaning.

Defect / Failure Analysis & Maintenance Types / Systems: Defect generation, Types of failures, Failure Analysis, Breakdown analysis, Maintenance systems: Planned and Unplanned Maintenance, Breakdown maintenance, Corrective maintenance, Routine maintenance, Preventive maintenance, Predictive maintenance, Condition based maintenance systems, Design out maintenance, Selection of maintenance systems.

Condition Monitoring: Types of monitoring, Selection of condition monitoring techniques, Benefits of condition monitoring.

Maintenance planning and scheduling: Job planning, Job scheduling: techniques, charts and networks.

Systematic Maintenance: Codification & Cataloguing, Drawing codification, Instruction manual and Work instruction, Maintenance manual and Departmental manual.

Computer Managed Maintenance System: Objectives, Approach towards computerization, Selection and scope of computerization.

Total Production Maintenance (TPM): Development and scope of concept, Basic systems of TPM, Procedure and steps of TPM, Benefits of TPM, Productivity Circles.

Text/Reference Books:

1. Industrial Maintenance Management by Shushil Kumar Srivastava.
2. Maintenance & Spare Parts Management by P. Gopal Krishanan, A. K. Benerji
3. Maintenance Manual.

ME662 **Air Conditioning Engineering**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the basics of psychometric process and human comfort.
- estimate the cooling load of a space to be air conditioned.
- design air distribution and air handling systems for air conditioning system.
- understand the principle, construction and working of humidifiers and dehumidifiers.
- comprehend the working of various air conditioning control systems.

Syllabus:

Psychometric Process – Room, outside air and total load, RSHF and GSHF.

Air and Human Comfort – Body temperature regulation, ventilation requirements and IS standard, comfort chart.

Load analysis – Design condition, instantaneous heat gain and instantaneous cooling load, heat transmission through sunlit and shaded glass, total equivalent temperature difference, cooling load due to sunlit and shaded walls, infiltration and ventilation load, miscellaneous loads.

Duct Design – Economic factors influencing duct layout, velocity reduction, equal friction and static regain method, use of friction chart, equivalent diameter, dynamic losses, insulation, noise reduction.

Air Distribution – Requirements, important terms, types of outlet and their placement, factors affecting outlet performance.

Air Conditioning Systems – Window, split, package and central system, AHU and FCU.

Fans – static, dynamic and total pressure, classification of fan, construction and characteristics of axial flow, forward and backward fans.

Filters – Types, level of filtration, construction, working and applications of viscous impingement, dry types, moving curtain, dry media, and electronic filters.

Humidifiers – evaporative cooling, desert cooler, air washer, construction, working, testing and maintenance.

Dehumidifiers – Construction, working and application of absorption, adsorption (silica gel type), chemical and refrigerated dehumidifier

Cooling Coils – Construction and working of direct expansion and water coils.

Sound and Vibration Controls – Terminology, sources of noise and its transmission, method of assessing noise, Noise criterion curves, sound insulation method.

Air Conditioning Controls – Temperature, humidity, face and bypass control, control of cooling coil, controls for air conditioned building, DDC controllers.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Refrigeration & Air Conditioning by C. P. Arora, TMH Publication
2. Air Conditioning Principles and Systems by Pita, Pearson Education
3. ASHRAE Handbook, HVAC Systems and Equipments, ASHRAE

ME714 Alternative Energy Sources

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the importance of Alternative Energy Sources in the present era.
- describe various methods for power generation by using different type of Non-conventional energy sources.
- apply the knowledge of converting energy resources like solar, wind , biomass, tidal, wave, ocean thermal, and geothermal energy for power generation.
- appreciate the working and applications of fuel cells.

Syllabus:

Energy scenario of India and World, need for Alternative Energy Sources

Solar energy: extra terrestrial and terrestrial radiations, radiation geometry, variation of insolation and its measurement, computation of solar radiation on horizontal and tilted surfaces, solar flat plate collectors, theirconfiguration, material of construction and general characteristics, design and performance, estimation of losses, concentrating collectors, receiver systems, heliostat, optical losses, types of solar energy storage, solarenergy applications, Solar Photo-Voltaic (SPV) technology: theory and applications.

Wind energy: analysis of wind speeds, different types of wind turbines, use of meteorological data for site selection, materials of construction, performance characteristics and applications.

Biomass:energy plantation, biomass gasifiers, types, design and construction of biogas plants, scope and future.

Tidal, wave and ocean thermal energyconversion plants, geothermal plants, magneto hydrodynamic plants, use of non conventional fuels and their applications. Small Hydro plants.

Fuel cells: working principle, types and applications.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1 S P Sukhatme and J K Nayak, Solar Energy ,Tata McGraw Hill
2 G.D.Rai, Non-conventional Energy Sources, Dhanpat rai Publication
3 B.H.Khan, Non-conventional Energy Sources, Tata McGraw Hill
4 John Twidell & Tony Weir, Renewable Energy Resources, Taylor & Francis

ME794 **Automobile Engineering**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the various forces acting on automobiles and apply the related basic principles of engineering to it.
- comprehend the application, working and construction details of various automobile systems/subsystems.
- apply the knowledge of automobile systems/subsystems for troubleshooting and remedy.
- appreciate various air pollution control techniques used in automobiles and basic automobile laws.

Syllabus:
Vehicle Performance – Forces acting on vehicle, tractive force with uniform speed and with acceleration, traction characteristic, stability of a vehicle in motion around a curve
Chassis and body – Engine location, arrangement of clutch assembly, gear box, propeller shaft, front and rear axles, front or rear wheel drive
Power Transmission:
Clutch – Constructional features, design of a single and multiple plate clutch, effect of misalignment of components
Gearbox – Sliding, constant mesh and synchromesh type of gearbox, automatic gear transmission, fluid coupling, torque converter, over speed drive
Propeller shaft – Universal, slip and constant velocity joints, whirling, Hotch-kiss & Torque tube drive.
Final drive and axles – Types of final drive, differential, rear axle and forces acting on it, types, construction and components of front axle
Transfer gearbox and front driving axle – detailed arrangement of wheel drive.
Frame – Types and construction of frames, sub-frames
Suspension – types, front and rear suspension, its arrangement and components
Wheels & Tyres – Wheel assembly, rims, construction and properties of tyres, wheel balance.
Steering – Layout, types of steering gears, linkages and mechanism, under and over steering, power assisted steering.
Brakes – Types, braking distance, braking efficiency, weight transfer, self energizing effect, braking torque capacity, adjustment and maintenance.
Electrical Systems – Battery: Construction, working, rating, faults, charging methods, tests for battery, construction and working of generator, current, voltage and cut out regulator, alternators, types and construction of starting motors, fuel and temperature gauge, speedometer and odometer, horn wipers, Head lamp, signaling system
Servicing and troubleshooting – Garaging & its types, equipments, services, necessity and types of servicing, troubleshooting and remedy.
Air Pollution and Control – Treatment of exhaust gas, catalytic converter, control of NOX and total emission control package, standards for emissions
Automobile Law – Motor Vehicle Act, registration of motor vehicles, driving license, control of traffic, insurance against third party, claims for compensation.
Silencers – Mufflers, baffle, wave cancellation, resonance, absorber and combined resonance and absorber type, their construction and capacity to damp frequency waves.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Crouse and Anglin, Automotive Mechanics, Mc Graw Hill Publishing Co.
2. Kripal Singh, Automobile Engineering Vol 1, Standard Publishers

ME744 **Heat Exchangers**

Course Learning Outcome:
After successful completion of the course, student will be able to

- comprehend laws of thermodynamics, heat transfer and fluid mechanics and apply it to thermal design of heat exchanger.
- apply basic concepts related to selection and rating of heat exchanger.
- design heat exchangers considering the concepts of pressure drop calculations.
- evaluate the effect of fouling on performance of heat exchanger

Syllabus:
Geometry and construction of tubular heat exchangers, plate exchanger, extended surface heat exchanger, heat transfer mechanism, flow arrangements, application and selection.
Basic design methods of heat exchangers: Arrangement of flow path, basic equations in design, LMTD method for parallel, counter, cross and multipass flow, use of charts, effectiveness, NTU method for heat exchanger analysis, heat exchanger design calculations, variable overall heat transfer coefficient, heat exchanger design methodology.
Forced convection correlations for single-phase side of heat exchangers: Correlations for different flow regimes through different geometries under natural and forced convection.
Heat exchanger pressure drop and pumping power: Tube side pressure drop, non circular cross section pipes, pressure drop in tube bundles in cross flow, pressure drop in helical and spiral coils, pressure drop in fittings.
Fouling of heat exchangers: Basic considerations, effects, cost, categories, prediction, resistance, cleaning factor, percentage over surface, techniques to control fouling.
Design correlations for condenser and evaporators: Film and drop wise condensation, use of equations for determination of heat transfer coefficients for laminar and turbulent film condensation on vertical surfaces, simple rod and bank of tubes, nucleate and film boiling, calculation of heat transfer coefficients.
Shell and tube type heat exchanger: Basic components, standards, preliminary estimation of unit size, shell side and tube side heat transfer coefficients, estimation of number of passes, number of tubes, arrangement, pressure drop estimation.
Compact heat exchangers: Heat transfer enhancement, construction of plate type heat exchangers, heat transfer and pressure drop.
Condenser and evaporators: Construction of different types of condensers and evaporators, thermal design of shell and tube condensers for power plants, process industries and refrigeration and air conditioning systems.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Compact Heat Exchangers by Kays W. M. & London, A.L., McGraw Hill
2. Heat Exchanger Selection, Rating and Thermal Design by Sadik, Kakac, CRC Pres
3. Process Heat Transfer by Donald Q Kern, McGraw Hill

ME692 **Introduction to Aircraft Systems**

Course Learning Outcomes:

After successful completion of the course, the student will be able to

- appreciate the Aerospace Industry and its evolution.
- understand the basic Principles of Flight.
- apply the basic laws of Fluid Mechanics and elementary Thermodynamics for aircraft applications
- comprehend the working of Aircraft Systems/sub-systems.

Syllabus:

Aircraft Industry Overview; Evolution and History of Flight, Types of Aerospace Industry, Key Players in Aerospace Industry, Aerospace Manufacturing, Industry Supply Chain, Aerospace Industry Trends, Advances in Engineering/CAD/CAM/CAE Tools and Materials technology, Global and Indian Aircraft Scenario

Introduction to Aircrafts: Basic components of an Aircraft, Structural members, Aircraft Axis System, Aircraft Motions, Control surfaces and High lift Devices. Types of Aircrafts - Lighter than Air/Heavier than Air Aircrafts Conventional Design Configurations based on Power Plant Location, Wing vertical location, intake location, Tail Unit Arrangements, Landing Gear Arrangements. Unconventional Configurations-Biplane, Variable Sweep, Canard Layout, Twin Boom Layouts, Span loaders, Blended Body Wing Layout, STOL and STOVL Aircraft, Stealth Aircraft. Advantages and disadvantages of these Configurations.

Introduction to Aircraft Systems: Types of Aircraft Systems. Mechanical Systems. Electrical and Electronic Systems. Auxiliary systems. Mechanical Systems: Environmental control systems (ECS), Pneumatic systems, Hydraulic systems, Fuel systems, Landing gear systems, Engine Control Systems, Ice and rain protection systems, Cabin Pressurization and Air Conditioning Systems, Steering and Brakes Systems Auxiliary Power Unit, Electrical systems: Avionics, Flight controls, Autopilot and Flight Management Systems, Navigation Systems, Communication, Information systems, Radar System

Basic Principles of Flight: Significance of speed of Sound, Air speed and Ground Speed, Properties of Atmosphere, Bernoulli's Equation, Forces on the airplane, Airflow over wing section, Pressure Distribution over a wing section, Generation of Lift, Drag, Pitching moments, Types of Drag, Lift curve, Drag Curve, Lift/Drag Ratio Curve, Factors affecting Lift and Drag, Center of Pressure and its effects. Aerofoil Nomenclature, Types of Aerofoil, Wing Section- Aerodynamic Center, Aspect Ratio, Effects of lift, Drag, speed, Air density on drag,

Basics of Flight Mechanics: Mach Waves, Mach Angles, Sonic and Supersonic Flight and its effects

Stability and Control **:** Degree of Stability- Lateral, Longitudinal and Directional Stability and controls of Aircraft. Effects of Flaps and Slats on Lift Coefficients, Control Tabs, Stalling, Landing, Gliding Turning, Speed of Sound, Mach Numbers, Shock Waves

Aircraft Performance and Manoeuvres : Power Curves, Maximum and minimum speeds of horizontal flight, Effects of Changes of Engine Power, Effects of Altitude on Power Curves, Forces acting on a Aeroplane during a Turn, Loads during a Turn, Correct and incorrect Angles of Bank, Aerobatics, Inverted Manoeuvres, Manoeuvrability.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions in the examination will be asked from self study contents.

References:

1. Flight without Formulae by A.C Kermode, Pearson Education
2. Mechanics of Flight by A.C Kermode, Pearson Education
3. Fundamentals of Flight, Richard Shevell, Pearson Education
4. Introduction to Flight by John D Anderson, McGraw Hill
5. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration by Ian Moir, Allan
   Seabridge, Wiley
6. Fundamentals of Aerodynamics, John D Anderson, McGraw Hill

ME754 Introduction to Computational Fluid Dynamics

Course Learning Outcomes:
After successful completion of the course, the student will be able to

- review the required underlying basic concepts in mathematics and fluid mechanics.
- understand the basic concepts of Finite Difference and Finite Volume Methods.
- comprehend the methodology and algorithms of CFD analysis.
- apply concepts of CFD for problem solving

Syllabus:
Mathematics & Fluid Mechanics Review: Vector calculus, Vector algebra, Ordinary differential equations and Partial differential equations with engineering applications.

Integral and differential form of conservation equations, Viscous and inviscid flows, Laminar and turbulent flows, Euler and Navier Stokes equations, Velocity and thermal boundary layers.

Finite Difference Method**,** Finite Volume Methods, Upwind and downwind schemes, higher order methods, Implicit and Explicit methods, steady and transient solutions, consistency, convergence and stability, tridiagonal matrix algorithm; discretization; discretization error. Grid generation methods; adaptive grids. QUICK and SIMPLE algorithm. Introduction to CFD - software and applications.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions in the examination will be asked from self study contents.

References:

1. Computational Fluid Dynamics: The Basics with Applications by John D Anderson, Mc Graw Hill Book Company.
2. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Versteeg, H. K. & W. Malalasekera, W., Addison Wesley- Longman Publications.
3. Numerical Heat Transfer and Fluid Flow, Suhas Patankar, Hemisphere Publishing

ME764 **Internal Combustion Engines**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand various aspects of combustion in SI and CI engines.
- comprehend the related theories, working and construction details of various systems/subsytems of IC engines.
- apply basic engineering principles in solving IC engines related problems.
- evaluate engine emissions and its control techniques, alternate fuels, performance tests for IC engines and advancements in IC Engines.

Syllabus:

Comparison of SI and CI Engines – Comparison of performance characteristics, thermodynamic and operating variables

Air capacity of four stroke engines – Volumetric efficiency, actual induction process

Supercharging – Its limits in SI and CI engines, turbo charging methods

Two stroke engines – scavenging processes, different scavenging systems, supercharging

Fuel Supply in SI Engines- Carburation principle and mixture requirments. The concept of multipoint fuel injection system (MPFI).

Combustion of SI Engines – Stages of combustion, detonation or knock, its effects and controls

Ignition in SI engines – Ignition timing and its advance, vacuum and centrifugal advance, electronic ignition systems, energy requirements of the ignition systems.

Combustion in CI engines – Stages of combustion, diesel knock, CI engines combustion

chamber requirements and its types

Fuel injection system in CI engines – Pattern of heat release, nozzles, quantity of fuel per cycle, calculation of diameter and stroke of plunger, size of nozzle orifice, atomization

Governing of CI Engines – Quality, Quantity and hit and miss governing.

Performance – Testing of engines as per Indian Standard Specification 10001, governing tests for SI and CI engines

Emission – Emission and its measurement and control, comparison of petrol and diesel emission

Alternative Fuels – Methanol, Ethanol, vegetable oils, biogas, comparison of their properties with diesel and petrol

Advancements in IC Engines- Stratified charged, low heat rejection engine, four/three valve engine, OHC Engine, VVT, cam less engine, CRDI system.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Sharma and Mathur, Internal Combustion Engines, Dhanpat Rai Publication
2. John Heywood, Internal Combustion Engines: Fundamentals, Tata Mc Graw Hill
3. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Publication

ME705 **Minor Project**

Course Learning Outcome:

After successful completion of the course, student will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- report project related activities effectively to peers and mentors

Syllabus:

The student(s) shall carry out project based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit project report based on the work

2ME447 ADVANCED WELDING TECHNOLOGY

Physics of welding and weld design: Analysis of heat sources for material joining, welding metallurgy, parameters in welding and their control, general concepts of weld design, analysis of stresses in welded structures, permissible stresses, standards, calculation of the size of welds for static and dynamic loading, location and orientation of welds in an assembly, residual stresses, distortion and their control, weldability.

Modern welding processes: Pulsed current and synergic welding techniques; resistance welding-monitoring and control, diffusion, solid phase and high energy density welding processes-EBW, LBW and their process parameters. Welding of ceramics, plastics, composites.

Welding symbols & Estimation of welding cost: Welding symbols-American welding symbols, costing procedure – consumable cost – power cost.

Inspection & Testing of Welding: Inspection during & after welding – visual inspection, NDT of welds-Magnetic, Xray, Gamma ray, ultra sonic, destruction tests.

Protection & Safety in welding: Protection of body, physical hazards- radiation, heat, toxic hazards, noise, fire.

Advances in other joining methods.

Text/Reference Books:

1. Welding and its Application by Rossi B. E.
2. Manufacturing Science by Ghosh and Mallik.
3. Welding Engineering and Technology by R.S. Parmar, Khanna Publishers.
4. Welding for Engineers by Udin, Wulf and Funk, Wiley, NY1954.
5. Metallurgy of welding, brazing and soldering by Lancaster J.F., George Allen & Unwin, London,1985.

ME801 **Major Project** **[0 0 30 23]**

Course Learning Outcome:
After successful completion of the course, student will be able to

- use various tools and techniques to study existing systems
- critically analyse existing systems, thereby select and justify parameters to be improved
- start and manipulate proposed engineering solution as per industry / research / societal need
- achieve precision in uses of the tools related to their experiments/fabrication
- reorganize and refine various components of technology to optimize the resources at large
- appraise the potential of technology for scalability and wide spectrum of applications
- report project related activities effectively to peers, mentors and society
- follow and value health, safety and ethical practices during project

Syllabus:

The major project shall be based on the recent trends in technology, system/process analysis, construction/fabrication/production techniques, design methodologies etc. The student(s) shall carry out a comprehensive project at relevant Academic/R&D/Industrial organisation based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit comprehensive project report based on the work.

UEIP007 **Advanced Instrumental Techniques**

Scope:

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives:

Upon completion of the course, the student shall be able to-

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. Recall the fundamental theory of different spectroscopic techniques. E
2. Recognize the fundamentals, instrumentation and application of various chromatographic methods S-17
3. Discuss the instrumentation and application of various spectroscopic techniques S-19
4. Describe various X-ray methods E-1
5. Apply the knowledge of chromatographic techniques for the separation of the component. ENT-13

Syllabus: **Teaching hours**: **45 Hours**

UNIT I **10 Hours**

- **Spectroscopic Techniques**
  UV-Visible spectrophotometry: Theory of electronic spectroscopy absorption by organic molecules, choice of solvent and solvent effect, applications of UV-Visible spectroscopy.
- **Infra-red spectrophotometry:** Absorption in the infrared region, factors influencing molecular vibrations, applications, interpretation of infra-red spectra, FTIR- Theory, Instrumentation.

UNIT II **10 Hours**

- **Nuclear Magnetic Resonance Spectroscopy:** Basic principles, the theory of PMR spectroscopy, Instrumentation, Chemical shift, spin-spin coupling, factors affecting chemical shift and spin coupling, applications, ^{13}C NMR spectroscopy, interpretation of NMR spectra.
- **Mass spectroscopy:** Basic principles, ion formation and types, Fragmentation rules,

recognition of molecular ion peak, interpretation of spectra and applications.

UNIT III **10 Hours**

- **Raman Spectroscopy**:
- **Atomic absorption and atomic emission spectroscopy**: instrumentation, applications.
- **X-ray diffraction methods:** Introduction, Bragg's law, X-ray absorption and X-ray diffraction methods and applications.

UNIT IV **15 Hours**

- **Separation techniques**
  Classification of chromatographic methods based upon the mechanism of separation and mode of separation with its fundamental principle, instrumentation and application **High-Pressure Liquid Chromatography**
  Gas chromatography
  High-Performance Thin Layer Chromatography

Suggested Readings: (Latest edition)

1. Silverstein, R. M., Bassler, G. C., & Morrill, T. C. Spectrometric Identification of Organic Compounds, John Wiley& Sons. Inc., New York.
2. Kalsi, P. S., Spectroscopy of organic compounds. Place of publication not identified: New Age International Pvt
3. Skoog, D. A. H., James, F., & Nieman, T. A. Principles of Instrumental Analysis. Eastern press.
4. Lindsay, S. High performance liquid chromatography. Chichester: Wiley.

UEIP001 **Cosmetic Technology**

Learning Outcomes:

After successful completion of the course student will be able to :

- Acquire comprehensive knowledge about the various raw materials used in cosmetic formulations
- Create and develop cosmetic formulations
- Analyze the cosmetic formulations for evaluating its efficacy and safety
- Understand the regulatory guidelines related to cosmetic formulations

Theory (Detailed Syllabus)

1. Introduction: The scope, historical background and present status of herbal cosmetics.
2. Classification of Cosmetics.
3. Raw materials used for formulation of skin care and hair care cosmetics: Source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.
4. Formulation and analysis of cosmetics: hair care, skin care and oral care products.
5. In vitro and in vivo models for efficacy testing for various cosmetic products.
6. Regulatory guidelines: Complaince of Drug & Cosmetic Act 1940 with reference to provisions for packaging and labelling (Rule 150 A, schedule S), permitted colors, flavors etc. BIS guidelines for cosmetic products and raw materials.

Total Lectures: **45**

Books Recommended:

1. Sagarin Edward, Cosmetic Science and Technology Vol. I, II, III , Wiley India Pvt. Ltd., Canada, 1992
2. Sharma P.P., Cosmetic Formulation, Management and Quality Control, Vandana Publications Pvt. Ltd., Vandana Publications, Delhi, 2010
3. Paye M, Barel A.O., Maibach H.I., Handbook of Cosmetic Sciences, Informa Press, Tylor and Fransis, LLC, 2006
4. Panda H., Herbal Cosmetics Handbook, Asia pacific Business press, 2004
5. Veermeer B.J., Cosmeceuticals: Drugs vs. Cosmetics, Marcel Dekker, Editors: Peter Elsener, Howard I. Maibach, Marcel Dekker Inc., New York, 2000.

NIRMA UNIVERSITY
Institute of Pharmacy

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Course Code	UEIP007
Course Title	Drug Discovery and Development

Course Learning Outcomes (CLO):

After successful completion of the course, student will be able to –

1. Understand the overall process for drug discovery and development.
2. Describe various methods of drug discovery.
3. Discuss different techniques of drug design and molecular modeling.
4. Explain the role of combinatorial chemistry in rational drug design.
5. Use bioinformatics, cheminformatics, genomic and proteomics knowledge for drug discovery.

Syllabus: **Teaching hours: 45 Hours**

UNIT I **10 Hours**

Introduction to Drug Discovery and Development

- Historical development, drug development pipelines, various stages and their importance, improvement of existing drugs, pre-marketing development of drugs, synthetic screening including extensive screening, random screening of intermediates and final leads, source of new drug discovery.

UNIT II **10 Hours**

Methods in Drug Discovery

- Introduction, structure activity relationships and quantitative structure activity relationships, structure toxicity relationships, various physiological properties, mathematical models, experimental and theoretical approaches of physicochemical parameters, parameter inter-dependence, case studies.

UNIT III **10 Hours**

Drug Design and Molecular Modeling

- General introduction, pharmacophore model, primary biological targets, structural determination of primary targets, introduction to docking, molecular docking, *in silico* prediction by molecular docking, methodologies with suitable case studies.

UNIT IV **10 Hours**

Combinatorial Chemistry in Drug Design

- Introduction, principle of combinatorial chemistry, synthetic methodologies including solid phase synthesis (SPS) and solution phase chemistry, high throughput screening, library preparation.

UNIT V **05 Hours**

Bioinformatics, Cheminformatics, Genomic and Proteomics

- Introduction, application, significances in new drug discovery, suitable case studies in each topic.

Suggested Readings^: (Latest edition)

1. Robert, G.C.K. ed. *Drug Action at the Molecular Level*. University Prak Press Baltimore.
2. Cohen N. C. *A Guidebook on Molecular Modeling and Drug Design*. Elsevier Publications.
3. Wilson, C. O., Beale, J. M., & Block, J. H. Wilson and Gisvold. *A textbook of organic medicinal and pharmaceutical chemistry*. Lippincott Williams & Wilkins.
4. Foye, W. O. *Foye's principles of medicinal chemistry*. Lippincott Williams & Wilkins..
5. Koro l.A. Burckhalter J.H. *Essentials of Medicinal* Chemistry. Wiley Interscience
6. Burger, A., & Abraham, D. J. *Burger's medicinal chemistry and drug discovery* (Vol. I–IV). Wiley.
7. Krogasgaard, P. *A textbook of Drug Design and Development*. Harwood Academics.
8. Smith, H. J., & Williams, H. (2016). *Introduction to the principles of drug design*. Elsevier.
9. Silverman, R. B., & Holladay, M. W. (2014). *The organic chemistry of drug design and drug action*. Academic press.

L= Lecture, T= Tutorial, P= Practical, C= Credit

^ this is not an exhaustive list

UEIM004 **Elements of Management**

Course Objectives

- To familiarize the students with the Management Discipline.
- To understand the role of a manager in managing people and organizational activities.

Learning Outcomes

At the end of the course, students will be able to:

1. Understand the major functions of management viz. Planning, Organizing, Leading and Controlling,
2. Describe the interrelationship among the various functions of Management
3. Develop a general management perspective, and

Syllabus

Module 1: NATURE & EVOLUTION OF MANAGEMENT

- Meaning & Scope of Management
- Management a Science and/or Art?
- Management Vs Administration
- Management as a Profession
- Evolution of Management Thought
- Early Classical Approaches – Scientific Management, Administrative Management, Bureaucracy
- Neo-Classical Approaches – Human Relations Movement, Behavioural Approaches
- Modern Approaches – Quantitative Approach; Systems Approach; Contingency Approach
- Management Process
- Functional Areas of Management
- Global Applications
- Management Practices in India

Module 2: MANAGERIAL ROLE & EXTERNAL ENVIRONMENT

- Role of Managers
- Mintzberg's Ten Managerial Roles
- Functions of Various Levels of Management
- Managerial Skills
- External Environment of the Organization & Its Impact on Organizational Operations
- Globalization and Business Environment

Module 3: PLANNING AND ORGANIZING

Planning

- Planning: Meaning, Need & Importance
- Planning Process
- Types of Plans; Objectives,Policies, Procedures and Methods
- Nature and Type of Policies
- Types of Planning; Advantages & Limitations
- Forecasting: Need & Techniques

Organizing

- Division of Work
- Departmentation; Definition; Departmentation by Function, Territory, Product/Service, Customer Group; Matrix Organization
- Line & Staff; Span of Control
- Authority; Delegation of Authority; Centralization & Decentralization; Formal and Informal Organizations

Module 4: Coordination and Control

Coordination

- Need for Coordination
- Types and Techniques or Coordination
- Coordination Process
- Coordination Characteristics
- Coordination: Advantages and Limitations
- Distinction between Coordination and Co-operation

Controlling

- Concept of Controlling
- Types of Controls
- Design of Control Process
- Control Methods – Financial; Budgetary; Operational; Quality; Information Systems & Control
- Responsibilities of Managers

Module 5:Current Trends in Management

- Managing Diversity
- Technology Management
- Capability Development
- Management of Family Owned Businesses
- Relevance of Management to Modern Industries and Government
- Management Lessons from Indian Ethos

Suggested Readings

1. Stoner, J. A. F. & Freeman, R. E. Management, (6th Ed). Prentice Hall, 1995.
2. Prasad, L. M. Principles and Practice of Management. (7th Ed). Delhi: Sultan Chand & Sons. 2008.
3. Drucker, P. The Practice of Management. Elsevier Ltd. 1955, Reprint 2007.
4. Hampton, D. R. Contemporary Management. (2nd Ed). McGraw Hill. 1981, Reprint 2008.
5. Tripathi, P. C. & Pandey, P. N. Principles of Management . (5th Ed). New Delhi: Tata McGraw Hill. 2012.
6. Koontz,H., Weihrich, H. & Aryasri, R. Principles of Management. Tata McGraw Hill. 2004.

UEIM007 **Financial Management**

Course Objectives

- To provide students with the basic understanding of financial management in an organizational context
- To help them understand the working of financial markets
- To enable them to use spreadsheets to perform financial analysis

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the significance of financial management to firm performance
2. Identify the variables important to making financial decisions
3. Perform primary investment decision analysis
4. Describe sources of funds and their costs
5. Perform basic financial analysis using spreadsheets

Syllabus

Module 1: Basics of Financial Management

- Introduction to Financial Management
- Role and Functions of the Finance function
- Time Value of Money
- Basics of Risk and Return

Module 2: Financial Markets and Instruments

- The Financial System
- Introduction to Financial Markets and Instruments
- Sources and Cost of Capital

Module 3: Major Financial Decisions

- The Investment Decision
- The Funding Decision
- The Distribution of Profit Decision
- Introduction to Working Capital Management
- Managing Risk

Module 4: Using Spreadsheets in Finance

- Introduction to Financial functions in Spreadsheets
- Spreadsheet Application Exercises

Suggested Readings

1. Chandra, P. (2010). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
2. Khan, M. Y. & Jain, P. K. (2012). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.

3. Pandey, I. M. (2011). Essentials of Financial Management. New Delhi: Vikas Publishing House.
4. Ross, S., Westerfield, R. & Jordan, B. (2012). Fundamentals of Corporate Finance. New Delhi: Tata McGraw Hill.
5. Rustagi, R. P. (2011). Financial Management: Problems & Solutions. New Delhi: Taxmann.
6. Wachowicz J. M. & Van Horne, J. C. (2009). Fundamentals of Financial Management. New Delhi: PHI Learning

UEIL007 **Forensic Science and Law**

Teaching Hours: 45 Credit: 3

I INTRODUCTION:

The functioning of a criminal justice system depends on the principle of proving the guilt beyond reasonable doubt. It is believed that punishment should be awarded only when there is substantial proof that the person being convicted has an established guilt in the matter concerned. For this purpose, evidence is generated that provides for the involvement of a person in a particular act. Evidence is the arena wherein the concept of forensic science comes into play. Forensic science is that branch of science which provides practical application of scientific technology to investigate criminal or legal matters. The Indian Criminal Justice system is an adversarial system which means there are two parties, and both of them present their cases and the court decides the case on the basis of evidence provided by the parties. Forensic science is resorted to for the purpose of attaining a lead as to involvement of the person in question or for that matter identification of any other person who may have been involved. This course tries to analyse involvement of forensic science in criminal justice system with relate to Quality in Forensic Science, Importance of crime scene, Preservation of crime scene. Issue of admissibility, the increasing role of scientific technique, admissibility standards for expert evidence, to name a few.

II COURSE LEARNING OUTCOME:

After the completion of the course the students will be able to:

1 Understand and describe the underlining concepts of forensic science

2 Identify and articulate the emerging issues in forensic evidence.

3 Analyse the benefit and cost of using new scientific technique in criminal investigation.

4 Evaluate the issues relating to admissibility of forensic evidence in a court of law.

III SYLLABUS:

Scene of crime and sight of Law

This unit examines a number of critical issues associated with the collection of forensic evidence at the crime scene such as quality in Forensic Science, importance of crime scene, preservation of crime scene. Exploring these areas by keeping in mind that the crime scene is one of the most crucial aspects of an investigation and that the scene of the crime is where collection of forensic evidence begins.

Proved beyond doubt? Scientific Technique in Criminal Investigation

This unit examines the science of DNA identification, Brain finger printing, Lie Detector Test, Narco Analysis Test and its use during criminal investigations and in criminal proceedings, including criminal trials, appeals and post-conviction proceedings. This unit try to analyse the main benefits and costs of the increasing role of scientific technique in the criminal justice system with special emphasis to India and the challenges of these technologies in future.

Scientific Evidence in Court of Law

Development of scientific and technical expert testimony in the complex and technical issues has flooded the judicial system, the question of its reliability and admissibility has also plagued the courts and engendered much debate. This unit try to analyse the issue of admissibility which has attracted the attention of countless commentators and the offered arguments supporting greater or lesser barriers to the admissibility of scientific expert evidence.

Need for caution: Problematizing Pitfalls

This unit discusses *Daubert*in a new context, using the Indian case of *State of Maharashtra v. Sharma* as an example of how unreliable, questionable evidence can penetrate the courtroom when admissibility standards for expert evidence do not keep it at bay. This unit also analyses *Daubert* against the backdrop of rapidly emerging technologies and highlights the fact that courts can expect to confront increasing amounts of technical expert evidence in the future.

Scientific race and legal pace: struggle of catching up

In addition to the conventional areas of study mentioned in the above units, this unit tries to explore the field of forensic science which constantly expands to include many additional areas of expertise include analyses of bloodstain pattern interpretation, forensic engineering, forensic cyber technology, and criminal personality profiling, forensic economics, forensic photography, forensic radiology, and forensic accounting. Further this unit also tries to understand emerging specialty known as forensic security with which today's loss prevention manager must become quite familiar if he or she is to successfully respond to the growing challenge of premises liability for negligent security litigation facing today's businesses, corporations, and commercial/ residential landlords from a broader perspective.

IV REFERENCES:

1. Henry C. Lee, *Forensic Science and the Law*, 25 CONNECTICUTLAW REVI*EW* (1117-1125) (1993).
2. Michael J. Saks & Jonathan Koehler, *The Individualization Fallacy in Forensic Science Evidence*, 61, VANDERBILT LAW REVIEW(pp199-219) (2008).
3. John I. Thornton, *Uses and Abuses of Forensic Science*, Vol. 69 AMERICAN BAR ASSOCIATION JOURNAL(pp 289-292) (1983).
4. Foster William L, *Expert Testimony- Prevalent Complaints and Proposed Remedies*, 11(3), HARVARD LAW REVIEW(pp169-186) (1897)
5. Alldrige Peter, *Forensic Science and Expert Evidence*, 21(1), JOURNAL OF LAW AND SOCIETY(pp 136-150) (1994).
6. Brigham John C., *What is Forensic Psychology, Anyway*? 23(3), LAW AND HUMAN BEHAVIOUR(pp 273-298) (1999).
7. Diamond Bernard L., *Inherent Problems in the Use of Pre-trial Hypnosis on a Prospective Witness,* 68(2), CALIFORNIA LAW REVIEW (pp 313-349) (1980).
8. Tovino Stacey A., *Imaging Body Structure and Mapping Brain Function: A Historical Approach*, Vol.33, AMERICAN JOURNAL OF LAW AND MEDICINE (pp 193-228) (2007).
9. Lyndia D., Johnson, *Guilty or Innocent-Just Take a Look at My Brain: Analysing the Nexus between Traumatic Brain Injury and Criminal Responsibility.* Vol. 37 (1): SOUTHERN UNIVERSITY LAW REVIEW. (pp 25-40) (2009).

10. Danielle, Andrewartha , *Lie Detection in Litigation: Science or Prejudice (article).* Vol.15(1): PSYCHIATRY PSYCHOLOGY AND LAW.(pp 88-104) (2008).
11. Robbert L. Collins, *Improved Crime Scene Investigation*, ,JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLITICAL SCIENCE.
12. Whitman Glen, Koppl Roger, *Rational Bias in Forensic Science*, 9, OXFORD JOURNAL: LAW, PROBABILITY & RISK. (pp 69-90) (2010)
13. Williams John F, *Trace Evidence*. 49, THE JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLICE SCIENCE. (pp 285-288) (1958).
14. Kingston Charles R., *Application of Probability Theory in Criminalistics*, 60, JOURNAL OF AMERICAN STATISTICAL ASSOCIATION. (pp 70-80) (1965).
15. Rao Dr. G.V., *DNA Testing: Mere match is not conclusive proof unless statistics corroborate*, 118, CRIMINAL LAW JOURNAL (October 2012)
16. Gupta Mohit, *Digital Forensics, Hacking and its Role in Crime Investigations,* MEDICO LEGAL UPDATE (pp98-100)
17. Celine Weyermann, Olivier Ribaux, *Situating forensic traces in time*, JOURNAL OF THE FORENSIC SCIENCE SOCIETY SCIENCE AND JUSTICE, 52, (pp68-75) (June 2012).
18. John W. Bond, *The value of fingerprint evidence in detecting the crime,* INTERNATIONAL JOURNAL OF POLITICAL SCIENCE AND MANAGEMENT Vol.11 (77-82)
19. Stan Brown and Sheila Willis, *Complexity in Forensic Science*, Vol.(1:4), FORENSIC SCIENCE POLICY AND MANAGEMENT: AN INTERNATIONAL JOURNAL (pp 192-198) (2010).
20. Roach Kent, *Forensic Science and Miscarriage of Justice: Some lessons from Comparative Experience*, Vol.50, JURIMETRICS, (pp 67-92) (2009)

Reference Books:-

1. MAHENDRA SINGH ADIL, SCENE OF CRIME- CRITICAL ROLE AND USAGE OF SCENE OF OCCURRENCE IN TRIAL,(Capital Publishing House, Delhi.)
2. GROSS'S CRIMINAL INVESTIGATION, (5th Edition, Universal Law Publishing Co. 3rd Indian Reprint, Delhi) (2008).
3. SHARMA B.R., SCIENTIFIC CRIMINAL INVESTIGATION, (Universal Law Publishing Co., Delhi) (2006).
4. K. MATHIHARAN AND AMRIT K PATNAIK, MODI'S MEDICAL JURISPRUDENCE AND TOXICOLOGY, (23rd Edition, Lexis NexisButterworths).
5. EDWARD HUESLE, .FIREARMS AND FINGERPRINTS, ESSENTIALS OF FORENSIC SCIENCE, (1st Indian Edition, Viva Books Private Limited, New Delhi) (2007)
6. MAX M HOUCK, TRACE EVIDENCE, ESSENTIALS OF FORENSIC SCIENCE-(1st Indian Edition, Viva Books Private Limited, New Delhi) (2007).
7. JYOTIRMOY ADHIKARY, DNA TECHNOLOGY IN ADMINISTRATION OF JUSTICE (Lexis NexisButterworths, New Delhi) (2007)

UEIM003 Fundamental of International Business

Course Objectives

- To introduce the students various concepts and issues in international business and related activities.
- To evaluate global business opportunities and develop skills to deal with various issues involved in cross-border transaction of goods, services and other resources between two or more nations.

Learning Outcomes

At the end of the course, students shall be able to:

1. understand and evaluate the basis of international trade and business.
2. explain the various methods of entry into foreign markets and assess the suitable mode for international business.
3. understand the concept of globalization and discuss the implications of GATT/WTO in international business.
4. understand the India's institutional and policy framework for international business.

Syllabus

Module 1: AN OVERVIEW TO INTERNATIONAL BUSINESS

Introduction

- Evolution Of International Business
- Stages Of Internationalization
- International Business Approaches
- Importance Of Cross Cultural Differences In International Business
- Modes Of Entry Into International Markets
- Advantages And Problems Of International Business

Module 2: CONCEPTUAL FRAMEWORK: INTERNATIONAL TRADE, INVESTMENT, BALANCE OF PAYMENT AND TERMS OF PAYMENT

- Mercantilism
- Theory Of Absolute Cost And Comparative Cost Advantage
- Relative Factor Endowment Theory
- Product Life Cycle Theory
- Porter's National Competitive Advantage Theory
- Foreign Collaboration/Technology Transfer Related Issues
- Factors Influencing FDI
- Reasons And Cost And Benefits Of FDI
- Concept Of Balance Of Payments And Its Components
- Terms Of Payment

Module 3: GLOBALISATION, WORLD TRADE ORGANISATION AND REGIONAL ECONOMIC INTEGRATION

- Concept Of Globalization
- Drivers Of Globalization
- Globalization Of Markets, Production, Investment, Technology
- Advantages And Disadvantages Of Globalization
- General Agreement Of Tariff And Trade
- Uruguay; Round, Establishment Of WTO And Various Agreement Of WTO
- GATS - Trade In Services
- Concept Of Regional Integrations And Regional Blocks

Module 4: INDIA'S INSTITUTIONAL AND POLICY FRAMEWORK FOR INTERNATIONAL BUSINESS

- Policy And Service Support Organizations
- Commodity Specialization
- Training And Research Institutions
- Trading / Service Corporations
- Risk Covering Institutions
- Financial Institutions
- Institutions Especially For SSIs and State Participation
- An Overview Of India's Foreign Trade Policy And Procedure

Suggested Readings

- Carbaugh J. R.International Economics. Bangalore: Thompson South-Western, Latest Edition.
- Chugan, P. K. International Technology Transfer. Mumbai: Himalaya Publishing House.
- Czinkota R.M., Ronkained I.A. and Moffet, M.H. International Business. Bangalore: Thompson South-Western. Latest Edition.
- Foreign Trade Policy and Handbook of Procedures. New Delhi: Centax Publications. Latest Edition.
- Francis C. International Business Environment. New Delhi: Prentice-Hall India, Latest Edition
- Joshi, R. M. International Business. New Delhi: Oxford University Press. Latest Edition.

- Mithani, D.M. International Economics. Mumbai: Himalaya Publishing House. Latest Edition.
- Paras R. Export – What, Where and How. New Delhi: Anupam Publications. Latest Edition.
- Paul, Justin. International Business. New Delhi: PHI Learning Pvt. Ltd. Latest Edition
- Rao, S. P. International Business; Text and Cases. Mumbai: Himalaya Publishing House. Latest Edition.

UEIA001 GIS And Remote Sensing

Course Learning Outcomes (CLO):

At the end of the course Students will be able to -

- Develop understanding about database management.
- Display data in maps.
- Acquire fundamental knowledge of Remote Sensing through Satellite imageries.
- Gain insights on application of GIS and Remote Sensing in Planning.

Teaching hours: 60

Syllabus:

Unit 1: Database Management and Data Analysis Hours: 12

- Fundamental concpets of Database Management System
- Query Building
- Understanding the usage of ArcTool Box
- Creating Charts and graphs
- Statistics Summary
- Using Field Calculator
- Calculate Geometry
- Buffering or Proximity Analysis
- Overlay Analysis
- 3D, spatial and statistical analysis
- Land Matrix
- Land Utilization
- Cloud Computing
- Crowd Sourcing

Unit 2: Displaying Data in Maps and Map Elements Hours: 16

- Symbology
- Labeling and Annotation
- Creating Map Layout
- Inserting Map Scale; Legend Map; Title; North Symbol; Creating Grids; Other map Elements and Saving a Layout.
- Conducting a Land Suitability Analysis using GIS, Introduction to new concepts like cloud computing, crowdsourcing etc.

Unit 3: Remote Sensing and Photo Interpretation Hours: 16

- Remote Sensing -Definition, Aerial and Satellite Remote Sensing; Aerial Photo-Interpretation, Qualitative and Quantitative Elements of Photo- Interpretation
- Satellite Remote sensing, Geo-Stationary and Sun-Synchronous Satellites, Principles of Electro-Magnetic Radiations, Resolutions
- Introduction to Digital Image Processing
- Salient Features of Popular Remote Sensing Satellites; Applications in Planning
- Laboratory Exercises

Unit 4: Photogrammetry Hours: 08

- Limitations of Traditional Surveys for Planning
- Photogrammetry as an Alternative Tool for Surveying
- Arial Photographs, Classification
- Principles of Stereoscopic Vision
- Basic instruments -Stereopair, Pocket and Mirror Stereoscopes, Parallax Bars
- Principles of Photogrammetry, Measurement of Heights and Depths
- Introduction to Digital Photogrammetry

Unit 5: Planning Information Systems in India Hours: 08

- Introduction to Spatial Data Infrastructure, NNRMS, NUIS, National Urban Observatory, Municipal Information Systems, Land Information Systems, Cadastre Systems
- Applications and Limitations
- Tools for Spatial Data Handling,
- BHUVAN
- Agencies responsible for generating spatial data.

Suggested Readings:

- "National Atlas and Thematic Mapping Organisation" (NATMO) Publications
- Andrew Skidmore et al, "*Environmental Modelling with GIS and Remote Sensing*", CRC Press
- Basdudeb Bhatta, "*Remote Sensing and GIS*", Oxford University Press
- David J Maguire et al, "*GIS, Spatial Analysis, and Modelling*", ESRI Press
- Mesfin T Bekalo et al, "*Landuse Change Detection using GIS, Remote Sensing and Spatial Matrices*", Lap Lambert Academic Publications
- Mezenzia Mengist, Vdm Verlag, "*Lans Sustainability Evaluation using GIS and Remote Sensing Technology*",
- Netzband, "*Applied Remote Sensing in Urban Planning, Governance and Sustainability*", Springer, India
- PA Longley et al, "*Geographic Information Systems and Science*", John Wiley and Sons Ltd.
- Qihao Weng, "*Remote Sensing and GIS Integration: Theories, Methods and Applications*", McGraw Hill Professional
- Satheesh Gopi, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson
- Thomas M Lillesand et al, "*Remote Sensing and Image Interpretation*", John Wiley and Sons Ltd.

UEIP013 **Health and Nutrition**

After successful completion of the course student will be able to:

1. Remember the fundamentals of health and nutrition
2. Cite examples of food labelling
3. Describe significance of macronutrients and micronutrients
4. Discuss importance of functional foods
5. Explain indicators of nutritional status

1. Introduction to the basic concepts of health and nutrition

2. Nutrition
   - Macronutrients: Carbohydrates (including dietary fibers), fats and proteins
   - Micronutrients: Vitamins, minerals, anti-oxidants, gut flora
   - Significance of macronutrients and micronutrients for optimal health

3. Meal Planning

   - Functional foods: Definition of functional foods, Role of functional ingredients and food in nutrition, Health attributes of functional foods
   - Health attributes of nutrition: Diet and disease, Diet with respect to special population (elderly, pediatric and pregnant women),
   - Indicators for maintenance of nutritional status: Nutrition Balance Indicator, Satiety Index, Fullness factor, Glycemic index and insulin index

4. Food Labelling (Food service management)

   - Nutrition Facts Panel
   - Serving Size
   - Calories
   - Ingredients list
   - Quantitative indications
   - Food additives
   - The percent daily value
   - Allergan labelling

Total Lectures **45**

Books Recommended

1. Nutritional Sciences: From fundamental to food. By Michelle McGuireand Kathy Beerman. Publisher: Yolanda Cassio. ISBN-13: 978-0840058201
2. Pressman, Alan H., Sheila Buff, and Gary Null. The Complete Idiot's Guide to Vitamins and Minerals. New York: Alpha Books.

3. Focus on Pathophysiology, Barbara A. Bullock and Reet L. Henze Lippincott Williams & Wilkins, Philadelphia
4. Lehninger Principles of Biochemistry, 3rd ed London : Macmillan Press Ltd.
5. Tortora G.J. and Anagnodokos, N.P. Principles of Anatomy and Physiology (Harper and Colling Publishers, New York)
6. Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism By: Carolyn D. Berdanier, Lynnette A. Berdanier, Janos Zempleni. Publisher: CRC Press. ISBN 9781420055528
7. Functional Foods and Nutraceuticals By: Aluko, Rotimi E. Publisher: Springer
8. B. Srilakshmi. Food science. India, New Age International (P) Limited.
9. Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri . Textbook of Nutrition and Dietetics. India, Elite Publishers.
10. C.Gopalan. Nutritive Value of Indian Foods, India, ICMR publications.

UEIM006 **Human Resource Management**

Course Objectives

- To introduce the students to human resource management function.
- To understand the people management role in organizations.

Learning Outcomes

At the end of the course, students will:

1. acquire an insight into the role and responsibilities of the HRM function.
2. learn about the different systems within HRM viz. Recruitment and Selection, Performance Management, Compensation Management, Employee Relationship Management and recognize their strategic contribution to business and organizations
3. carry out job and role analysis and write job descriptions.

Syllabus

Module I: Introduction

- An Introduction to Human Resource Management
- Skills and Competencies of a Human Resource Manager
- Corporate Strategy and Human Resource Management

Module II: Manpower Planning and Talent Acquisition

- Manpower Planning and Deployment
- Job Analysis, Design and Redesign of Jobs
- Recruitment & Selection

Module III: Managing and Rewarding Employee Performance

- Performance Management
- Compensation Management
- Learning & Development

Module IV: Managing Employee Relations

- Employee Relationship Management
- Industrial Disputes & Conflicts
- Labour Legislation
- Managing Employee Exit and Separations

Module V: Contemporary issues in Human Resource Management

Suggested Readings

- Dessler, G. Varkkey, B. (2011. Human Resource Management. (12th Edition). New Delhi: Pearson Education.
- Bernardin, J. H. (2007). Human Resource Management – An Experiential Approach. New Delhi: Tata McGraw Hill Publishing Company Limited.

- Singh B.D. (2004). Industrial Relations, Emerging Paradigms. New Delhi: Excel Books.
- Varkkey, B., Dutta, R. and Rao, G. P. (Eds). (2000). Value Creation: The Challenge of HR in the New Millennium. New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Ramaswamy, E.A. (2000). Managing Human Resources: A Contemporary Text. New Delhi: Oxford University Press.
- Pande, S. and Basak, S. (2012). Human Resource Management. (1st Edition). New Delhi: Pearson Education.

UEIM001 **Indian Economy**

Course Objectives:

- To introduce the students to the various dimensions of the Indian Economy
- To provide a historical and current analysis of how the Indian Economy has reached its current state of affairs

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the various aspects of India's economy
2. Develop a perspective on the different problems and approaches to economic planning and development in India
3. Understand the role of the Indian Economy in the global context, and how different factors have affected this process

Syllabus

Module 1: STRUCTURE OF THE INDIAN ECONOMY

- India As A Developing Economy; Indian Economy On The Eve Of Independence; National Income Of India: Trends And Levels
- Human Resources And Economic Development; Human Development In India; Occupational Structure And Economic Development
- Natural Resources, Economic Development And Environmental Degradation
- Infrastructure In The Indian Economy; Social Infrastructure And Social Sector

Module 2: PLANNING AND ECONOMIC DEVELOPMENT

- Objectives And Strategy Of Economic Planning In India;
- Approach To The Ongoing Five Year Plan
- Regional Planning In India
- Financing Of The Plans
- Economic Reforms In India – Main Features And Achievements.

Module 3: DOMESTIC SECTOR

- Institutional And Technological Reforms In Indian Agriculture
- Agricultural Finance And Marketing
- Agricultural Prices And Policy
- Industrial Policy
- Sources Of Industrial Finance; Role Of Small Scale And Cottage Industries In Indian Economy.

Module 4: EXTERNAL SECTOR OF THE ECONOMY

- India's Balance Of Payments – Problems And Solutions
- Trends, Composition And Direction Of India's Foreign Trade
- New Trade Policy
- WTO And Indian Economy
- Foreign Investment Inflows
- India's Exchange Rate Policy

Module 5: ISSUES AND CHALLENGES OF INDIAN ECONOMY

- Problems Of Poverty
- Inequality
- Unemployment And Inflation - Strategy And Policy Of The Government
- Food Security And Public Distribution System
- Salient Features Of The Relevant Union Budget

Suggested Readings

- Datt, R and Sundharam, K.P.M. Indian Economy. New Delhi: S. Chand & Company Ltd. (Latest Edition).
- Jalan, B. The Indian Economy: Problems and Prospects. Penguin Books.
- Misra, S.K. and Puri, V.K. Indian Economy. Himalaya Publishing House.
- Agrawal, A.N. Indian Economy: Problems of Development and Planning. New Age International Publishers.
- Economic Survey. Government of India (Latest Issue).
- Relevant Business Newspapers.

UEIL002 **Information Technology and Cyber Law**

Teaching Hours: 45 Credit: 3

I Introduction

The rapid growth of computer technology makes our life easier and attracts us to make every transaction by using electronic sources. All of us use computer every day through personal computer, laptop, mobile phone, notebook, *etc*. On the other hand unemployed persons are attracted to involve in unethical and unsocial activities, even in some of the cases, it extend to criminal activities. This course will disseminate the knowledge of computer technology which use cyberspace to transact the text, photo, documents, videos, money, etc. The course will also develop their ability to link internet technology with legal principles in fixing the tortious liabilities of the wrongdoer to compensate the victim and criminal liabilities of the offenders after following the due process of law. The Course will create ability among the students to apply Indian Information Technology Act in regulating E-Commerce, E-Governance, E-Banking and cybercrimes.

II Course Learning Outcome:

After the completion of the course the students will be able to:

1. Understand the information technology with technical & social perspectives.
2. Analyses the critical issues in developing cyber jurisprudence & policy.

III Syllabus

Module 1: Information Technology

What is Networking and Internet? What are various Computer Technologies used in Networking? What is relation between Computer Web Technology? , Types of networks; Intra-net and internet, Understanding Internet, www, Computer Memory and Storage, What is relationship between Cyberspace, Technology and Law, Defining the Scope of Information Communication Technology

Module 2: Stakeholders in cyber world

Defining the expansion of Cyber World & IT Industry, Who are Users (subscribers), Service Providers, Intermediaries, Cyber Cafe and other stakeholders. What kind of Agreements are Regulating Stakeholders Relationships: Click Wrap, Shrink Wrap, EDI. Discussing Electronic Contracts regulations in Indian & Cross Border Contracts (Reference to IT Act 2000 & UNCITRAL Model Law)

Module 3: Issues related to Software and Web designing

What are various IPR Issues in Cyber Space?, What is Domain Name Dispute, Cyber Squatting, What is Meta-Tagging, Framing and linking issue, Understanding Issues related to copyright, trade name

and trademark infringement in IPR Law, Issues relating to Biotechnology and ICT related to software copyright, software privacy, open source software.

Module 4: Regulating Information Technology

How Authentication of electronic Records is done?, what digital signature? & how it is different from electronic signature?, what are regulatory powers of Controller and Certifying authorities?, Understanding, E-governance, E-commerce, E-banking including mobile banking, What are Civil liabilities under IT Act, Who is Adjudicating officer & What is Cyber Regulation Appellate Tribunal.

Module 5: Cyber Crimes

What is Cyber Crimes & what are its various classifications?, Appraisal of Crimes targeting Commuters, Social crimes committed through internet, Cyber pornography and stalking, Personal crimes, Economic offenses and Social Networking, Terrorist activities through internet. What are various measures taken by government to prevent cybercrimes?

Module 6: Investigation of cyber crimes

How investigation of cybercrime is done? Who is responsible for Cyber Crime Investigation? What are Territorial powers and issues, Confiscation of the computer and other e-devices? What is Computer and cyber forensics, discussing the Admissibility of E-Evidence in court of Law?

Module 7: Issues and challenges to cyber law

Discussing the Relevance of Data Protection Laws & Cyber Security, Legal recognition of Digital Evidence**,** Recognition of liability in the digital world, deciphering the Jurisdiction Issues in Transnational Crimes**,** What is Cloud Computing & what is its regulatory structure, Issue of Communication Convergence, Relevance of Online Dispute Resolution in India.

Reference :

1. Surya Prakash Tripathi, Ritendra Goel And Praveen Kumar Shukla, Introduction To Information Security And Cyber Laws,Wiley India Private Limited, 2014 (Technical Approach)
2. Apar Gupta,Commentary On Information Technology Act,Lexis Nexis India; (2nd Ed.) (2011).
3. Pavan Duggal, Cyber Law - An Exhaustive Section Wise Commentary On The Information Technology Act Along With Rules, Regulations, Polices, Notifications Etc., Universal Law Publishing Co. Pvt Ltd., (2014)
4. Cyber Laws, Justice Yatindra Singh, Universal Law Publishing Co., (2010).
5. Pavan Duggal, Textbook On Cyber Law, Universal Law Publishing Co. Pvt Ltd., (2014)
6. Ajit Narayanan And Bennum (Ed.): Law, Computer Science And Artificial Intelligence.
7. Linda Brennan And Victoria Johnson, Social, Ethical And Policy Implication Of Information Technology.
8. Karnika Seth, Computer Internet And New Technology Laws, Lexisnexis, (1st Edition) (2013).
9. Kamath Nandan, Law Relating To Computers Internet & E-Commerce (A Guide To Cyber Laws & The Information Technology Act, 2000 With Rules & Notification), (5th Edn., Universal Book Traders), (Reprint 2004).
10. Arvind Singhal And Everett Rogers, India's Communication Revolution : From Bullock Carts To Cyber Marts.
11. Mike Godwin, Cyber Rights Defencing Free Speech In The Digital Age

Additional Sources :

1. Talwant Singh Addl. Distt. & Sessions Judge, Delhi, *Cyber Law & Information Technology*http://delhicourts.nic.in/CYBER%20LAW.pdf
2. *New Crimes Under The Information Technology (Amendment) Act*http://www.ijlt.in/archive/volume7/5_Mohanty.pdf
3. *A to Z of cyber crime by Asian School of cyber laws* available at http://ensaiosjuridicos.files.wordpress.com/2013/06/122592201-cybercrime.pdf)
4. Louise Ellison and Yaman Akdeniz, I*nvestigating Cyber Law and Cyber Ethics: Issues, Impacts, and Practices, Cyber-stalking: the Regulation of Harassment on the Internet*http://www.cyber-rights.org/documents/stalking_article.pdf
5. Cyber Crimes and Information Technology http://www.nalsar.ac.in/pdf/Journals/Nalsar%20Law%20Review-Vol.%204.pdf
6. *A Study of the Privacy Policies of Indian Service Providers and the 43A Rules*
7. http://cis-india.org/internet-governance/blog/a-study-of-the-privacy-policies-of-indian-service-providers-and-the-43a-rules
8. *Relationship Between Privacy and Confidentiality*
9. http://cis-india.org/internet-governance/blog/relationship-between-privacy-and-confidentiality
10. *Availability and Accessibility of Government Information in Public Domain*
11. http://cis-india.org/accessibility/blog/availability-and-accessibility-of-government-information-in-public-domain
12. *Cloud Computing in India: The current Legal regime and the main Issues and Challenges* :http://www.indialawjournal.com/volume7/issue-1/article3.html

Appendix-A
(Noti-No-NU-466
AC mtg - - 17-4-17)

NIRMA UNIVERSITY
INSTITUTE OF LAW
University Elective Course
Academic Year 2017-18

L	T	PW	C
3	-	-	3

Course Code	
Course Title	Intellectual Property Rights

Course Learning Outcomes:

At the end of this course the student will able to:

1. Understand on various facets of IPR including Trade Mark, Patent, Copyright and Design Law
2. Identify various issues and challenges related to IPR.

Syllabus **Teaching Hours: 45**

Unit 1 Introduction **6 Hours**

1.1 Concept of Property
1.2 Concept of Intellectual Property
1.3 Various Justification of Property
1.4 Introduction to TRIPS Agreement

Unit 2 Patent Law **9 Hours**

2.1 Concept and basis of protection
2.2 Criteria of Patentability
2.3 Novelty, Utility and Non-obviousness
2.4 Non Patentable Inventions
2.5 Procedure for patent registration
2.6 Rights of Patentee and Infringement procedure
2.7 Green Patents
2.8 Leverage of Patents

Unit 3 Copyrights Law **8 Hours**

3.1 Introduction and justification
3.2 Subject-Matter of Copyright
3.3 Literary, Dramatic, Musical, Artistic, Cinematograph Films and Sound Recordings
3.4 Copyright and related rights
3.5. Fair use

1

3.6 Rights covered under copyright & remedies for infringement

Unit 4 Trademarks Law **8 Hours**

4.1 Concept and justification of trademarks protection

4.2 Types of marks - Distinctiveness, Descriptive marks, Generic marks and Well-Known Trademarks

4.3 Grounds of Refusal of Registration

4.4 Procedure for Registration

4.5 Rights of trademark owner and Infringement – passing off of trademarks

4.6 Trademarks and Geographical indication

Unit 5. Design Law **8 Hours**

5.1 Basics of Design & Justifications for protecting designs

5.2 Features of Shape, Configuration, Pattern, or Ornament or Composition of Lines or Colour

5.3 Excluded Subject-Matter

5.4 Rights of Design owner and protection against Infringements

Unit 6. Traditional Knowledge and Biodiversity **6 Hours**

6.1. Concept of Traditional knowledge

6.2 Bio-piracy and bio-prospecting

6.3 Access and benefit sharing under CBD

Suggested Readings:

- Ahuja V K. Intellectual Property Rights. Lexis Nexis- Butterworths, New Delhi. 2015
- B.L. Wadhera, Law on Intellectual Property Rights, Universal Publication, 2014
- Cornish, W R, Cases and Materials on Intellectual Property, 3rd Ed. London: Sweet & Maxwell, 1999.
- Verkey Elizabeth, Law of Patents, Second Edition, Eastern Book Company, Lucknow, 2012

NIRMA UNIVERSITY
INSTITUTE OF LAW
Academic Year: 2016-17
University Elective
Introduction to the Indian Constitution

Credit: 3
Hours: 45

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Introduction:

India is a democracy and her Constitution seeks to establish its fundamental organs of government and administration, describe their structure, composition, powers and principal functions, define democracy through relationship of the organs with one another and with the people. The Constitution also guarantees certain Fundamental Rights to its citizens that are not to be infringed by the Government. A good understanding of the Constitution and the law, which has developed through constitutional amendments, judicial decisions, constitutional practice and conventions is, therefore, absolutely necessary for a student of law.

The purpose of teaching constitutional law is to highlight its never-ending growth. Constitutional interpretation is bound to be influenced by one's social, economic or political predilections. A student must, therefore, learn how various interpretations of the constitution are possible and why a significant interpretation was adopted in a particular situation. Such a critical approach is necessary requirement in the study of Constitutional law.

Course Learning Outcomes:

After the completion of the course the students will be able:

1. To understand the nature, scope and extent of the Fundamental rights
2. To understand the Composition, Role and Functions of Executive, Legislature and Judiciary.
3. To analyze and critic the interrelationship between the different organs of the Government i.e. Executive, Legislature and Judiciary.
4. To apply the knowledge of the constitutional provisions in solving the emerging challenges posed to the constitution

Unit I: Introduction to Indian Legal System

- Constitution, Constitutionalism, Constitutional Law, Constitutional Conventions

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- Historical evolution of the Constitution of India during British Raj
- Formation of Çonstituent Assembly
- Working of Constituent Assembly
- Salient Features of Indian Constitution

Unit II: Goal, Values, Ideals & Aspirations from the Constitution

- Objectives Resolution
- Preamble to Indian Constitution
- 42nd Amendment Act & the Preamble

Unit III: Nature of Indian Union

- Indian Union
- Formation, Creation and Establishment of new States under the Union
- Citizenship

Unit IV: Fundamental Rights

- Definition of State
- Definition of Law
- Right to Equality
- Fundamental Freedoms
- Right to Life & Personal Liberty
- Right against Exploitation
- Right to Religion
- Right to Constitutional Remedies

Unit V: Organs of the Government

- Union Executive
- Union Parliament
- Union Judiciary

Unit VI: Emergency Provisions

- National Emergency
- State Emergency
- Financial Emergency

Unit VII: Amendment to the Constitution

- Need for Amendment
- Types of Amendment
- Procedure for Amendment

Unit VIII: Constitutional Bodies

- Comptroller & Auditor General of India

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- Finance Commission of India
- Election Commission of India

Unit IX: Panchayati Raj Institutions

- Committees
- 73rd & 74th Amendment Act
- Rural Local Bodies
- Urban Local Bodies
- PESA Act

Text Book:

1. M. P. Jain, Constitutional Law, 6th Edition Lexis Nexis Butterworths.
2. V. N. Shukla's, Constitution of India, 12th Edition, Eastern Book Company
3. J.N. Pandey, The Constitutional Law of India, 50th Edition, Central Law Agency

Reference:

1. H.M. Seervai, Constitutional Law of India (4th ed., Vol 1 (1991), Vol. 2 (1993), Vol.3 (1996)
2. D.D. Basu, Shorter Constitution of India (14th ed., 2009)
3. V.D. Sebastian, Indian Federalism the Legislative Conflicts (1985).
4. B. Shiva Rao, The Framing of India's Constitution – Select Documents (1967)
5. Granville Austin, Indian Constitution: Corner stone of the nation (1966)
6. Granville Austin, Working a Democratic Constitution - A History of the Indian Experience (1999)

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