Program Outcomes (POs)

Engineering Graduates will be able to:		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences, data and synthesis of the information to provide valid conclusions
PO3	**Design/development of solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO5	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

University Campus
Arang-Kharora Highway,
Raipur -493 441 (C. G.) INDIA

City Information Centre
MATS Tower, Pandri, Raipur (C.G.) 492 002
Tel:+917714078995,4078996 Fax: +917714078997
www.matsuniversity.ac.in

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

Scheme & Syllabus
(I[st] & IInd Semester)
Bachelor of Technology
Mechanical Engineering

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Scheme of Teaching & Examination

B. TECH. I SEMESTER

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT100	Engineering Mathematics – I	3	1	-	70	30	4
2.	BT101	Engineering Physics	3	1	-	70	30	4
3.	BT102	Programming for Logic Building	3	0	-	70	30	3
4.	BT103	Engineering Graphics & Design	2	0	-	70	30	2
5.	BT104	Environmental Sciences	1	0	-	70	30	1
6.	BT105	Technical English	2	0	-	70	30	2
7.	BT106	Engineering Physics Laboratory	-	-	2	30	20	1
8.	BT107	Programming & Soft Skills Laboratory	-	-	2	30	20	1
9.	BT108	Engineering Graphics & Design Laboratory	-	-	4	30	20	2
10.	BT109	Communication Skills laboratory	-	-	2	30	20	1
11	BT 110	Manufacturing Practices – I Lab	-	-	4	30	20	2
Total			**14**	**2**	**14**	**570**	**280**	**23**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   Branch: All Streams of Engineering
Subject: Engineering Mathematics-I   Code: BT 100
Total Lecture + Tutorial Periods: 60   Total Tutorial Periods: 01/week
Total Credits: 04

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT-I

MATRICES

Real vector space, Subspace, Linear span, Linear dependence and linear independence of vectors, Basis, Dimension, Linear transformation, Matrix associated with a linear transformation, Rank and inverse by elementary transformation (Gauss Jordan method), System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT- II

DIFFERENTIAL CALCULUS

Successive differentiation, Lebnitz theorem, Rolle's Theorem, Taylor's theorem with Lagrange's form of remainder, Expansions of functions in Taylor's and McLaurin's series

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UNIT-III

PARTIAL DIFFERENTIATION

Functions of two variables: Limit, continuity and partial derivatives, derivatives of higher order, Euler's theorem on homogeneous functions, Total derivative, Change of variables, Jacobians, Maxima, minima and saddle points of functions of two variables

UNIT-IV

ORDINARY DIFFERENTIAL EQUATION

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation, Legendre polynomials and their properties

UNIT-V

MULTIPLE INTEGRAL

Beta and Gamma functions – elementary properties, Double and triple integrals, change of order of integration, Application to area and volume.

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

NAME OF TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (42th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

NAME OF REFERENCE BOOKS:
1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2.Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3.Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   Branch: All Streams of Engineering
Subject: Engineering Physics   Code: BT101
Total Lecture + Tutorial Periods: 60   Total Tutorial Periods: 01/Week
Total Credits: 04

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

Unit -I

THEORY OF RELATIVITY SPACE

Time and motion, frame of reference, Galilean Transformation Outline of relativity, Michelson-Morley experiment, Special theory of Relativity, transformation of space and time, Time dilation, Doppler effect ,length contraction, addition of velocities, Relativistic mass: variation of mass with velocity, kinetic energy, equivalence of mass and energy, Relation between energy and momentum.

Unit- II

(a) LASERS

Temporal and spatial coherence of light wave Principle of laser, Laser characteristics, components of laser, Principle of Ruby, He-Ne &Nd -YAG lasers, application, basic concepts of Holography (only introductory part, No detail derivation)

(b) FIBRES OPTICS:

Optical fibers: Introduction & advantages, structure & classification, Option of propagation in fiber, attenuation & distortion, acceptance angle and cone, numerical aperture (only introductory part, No detail derivation).

Unit -III

NUCLEAR PHYSICS

Controlled and uncontrolled chain reaction, criteria of critical mass, nuclear reactor and its site selection & numerical ,nuclear forces, Nuclear fusion in stars . Introduction of

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elementary particles. Electron ballistic: Motion of charged particles in electric and magnetic field. Aston and Bainbridge mass spectrograph.

Unit -IV

WAVE OPTICS

Wedge shaped films, Interferences by division of amplitude: Newton's rings and its applications Interference by division of wave front: Fresnel's bi prism, fringe width, diffraction grating, resolving power of grating,

Unit- V

SOLID STATE DEVICES:

Transistor: Input and Output characteristics in CE mode, Transistor as an amplifier, Hartley Oscillator. FET: Input and output characteristics of J-FETs & MOSFETs, Operational amplifiers (Op-Amp).

OUTCOMES:

The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

1. Gaur and Gupta "Engineering Physics"
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Verma H.C.: Concepts of Physics, Part-1 & Part-2, BharatiBhawan (P&D)
4. A.K. Tayal: Engineering Mechanics (Statics and Dynamics)

REFERENCE BOOKS:

• Jenkins and White: "Optics", MeGrew-Hill Book Company.
• Singh R.B.: "Physics of Oscillations and Waves"
• Ghatak A.K.: "Optics"
• Mani and Mehta: "Modern Physics", Affiliated East-West Press Pvt. Ltd, 1998.
• Sanjeev Puri: Modern Physics, narosa Pub. Co.2004.
• Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
• Theraja: B.L., Basic Electronics, S.Chand, 2002.
• Puri: Digital Electronics, Tata McGraw-Hill, 2002.
• Millman, J and Halkias: integrated Electronics, Tata MeGraw-Hill, 2004.
• Tyagrajan and Ghatak: Lasers, Macmillan, 2001. •

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Semester: I B.Tech	Branch: All Streams of Engineering
Subject: Programming For Logic Building	Subject Code: BT 102
Total Theory Periods: 48	Total Tutorial Periods: 00
Total Credits: 03	

COURSE OBJECTIVE:

- To distinguish and recognize low-level and high-level programming languages
- To know fundamental concepts of structured programming
- To understand logic development
- To design pseudo logic for various programming problems.
- To understand the basic structure of a program including sequence, decisions and looping.
- To design solutions to real world problems using C language.
- To use C language for problem solving and numerical computations.
- To apply computer-programming concepts to new problems or situations.

UNIT – I
ELEMENTS OF C LANGUAGE

Tools for Problem Solving: Problem Analysis, Flowchart, Algorithm Development. Top-Down Program Design, Structured Design Approach, Origin of C, Features & Characteristic of C, C Compiler, Character Set, Keywords, Identifiers, Constants, Variables, Input/ Output Statements, Basic Data Types, Operators and Expressions, Basic structure of C programs, A simple C Program.

UNIT – II
CONTROL FLOW CONSTRUCTION

Decision making and branching: Simple if statement, if else statement, Nesting of if-else statement, else - if Ladder, Switch statement, Operator, goto statement, Decision making and looping, While statement, Do-While statement, For statement, Jumps in loops, Break and Continue statement.

UNIT – III
DEFINING AND MANIPULATING ARRAYS

One Dimensional Arrays: Declaration of Arrays, Initialization of Arrays, Reading and Writing of integer, real and Character arrays, sorting and Searching in Arrays, Multi-Dimensional Arrays, Handling of Character Strings.

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UNIT – IV
 USER DEFINED FUNCTIONS
Syntax of Function, Calling functions, Actual & Formal Arguments, Categories of Functions, Function prototype, Scope Rules: Local & Global variables, Recursion, Recursion vs. iteration, Passing Arguments: call by values & call by reference, passing array to function.
Structures: Declaration and initialization of Structure, Array of structures, Array within structure, structure within structure, Structures and functions, Introduction to unions.

UNIT – V
 POINTER DATA TYPE AND ITS APPLICATION
Pointer Operator, Pointer Expression, Initialization of pointers, Pointer Arithmetic, Pointer and Function Arguments, Pointer to function, Pointer and Arrays, Pointers and String, Arrays of Pointers, Pointers to Pointers, Dynamic memory allocation.
Files in C: Defining and Opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, Random access to files.

COURSE OUTCOME:
After completion of the course study, students are going to be in a position to
- Analyze issues and style algorithms in pseudo code.
- Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
- Read, perceive and trace the execution of programs written in C language.
- Develop confidence for self-education and ability for life-long learning needed for Computer language.
- Write down C program for a given algorithm by means of modular approach.

 TEXT BOOKS:
 1. The C programming Language, Dennis M Ritchie and Kernighan, PHI.
 2. Let us C, Yashwant Kanetkar, BPB Publication.
 3. Programming in C, E. Balaguruswamy, TMH.

 REFERENCE BOOKS:
 1. Programming in C, Byron Gottfried, Schaum's series outline TMH.
 2. Programming in C, Ghosh, PHI.
 3. Computer Programming in C, V. Raja Raman, PHI.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   Branch: All Streams of Engineering

Subject: Engineering Graphics and Design   Code: BT 103

Total Theory Periods: 28   Total Tutorial Periods: 00

Total Credits: 02

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

UNIT – I

a) **IMPORTANCE OF ENGINEERING DRAWING**: Scales: Representative Fraction, Type of Scale, Plain and Diagonal Scale.

b) **ENGINEERING CURVES:** Conic section, Ellipse, parabola, hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid and Involutes.

UNIT – II

a) **PROJECTION:** Introduction, Principle of Projection, method of projection, planes of projection, four quadrants, first and third angle projection and reference line symbols for methods of projection, Orthographic projection.

b) **PROJECTION OF POINTS:** Introduction point situated in first, second, third & fourth quadrant. Projection of lines: Introduction, line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to other. Line inclined to both the planes. [Simple problems only]

UNIT – III

a) **PROJECTIONS OF PLANES:** Introduction, types of planes, projection of planes, projection of planes perpendicular to both the reference planes, perpendicular to one plane and parallel to the other plane, perpendicular to one plane and inclined to the other plane.

b) **PROJECTIONS OF SOLIDS:** Introduction, types of solids, projections of solids in simple position, projections of solids with axes inclined to one of the reference planes and   parallel to the other, projections of solids with axes inclined to both H.P. and the V.P., section planes, types of sections, true shape of section, section of solids.

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UNIT – IV

a) DEVELOPMENT OF SURFACES: Introduction, methods of development, development of lateral surfaces of right solids, cube, prisms, cylinders, pyramids & cone.

b) ISOMETRIC PROJECTION: Introduction, Isometric axes, lines & planes, Isometric scale, Isometric projection and Isometric view of simple objects.

UNIT – V

COMPUTER AIDED DRAWING: Introduction to CAD, benefits and limitation of CAD, CAD Software's, AutoCAD introduction, Basic Commands of AutoCAD, Concept of Layers, Dimensioning and text, Creation of two dimensional drawing.

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.

TEXT BOOKS:

(i) Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand

 (ii) George Omura, "Mastering AutoCAD" B.P.B. Publication, New Delhi

REFERENCE BOOKS:

(i) Engineering Graphics – Laxminarayanan V. and VaishWanar, R.S. Jain Brothers, New Delhi

(ii)   Engineering Graphics – Chandra, AM & Chandra Satish 1998.

(iii) Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill

(iv) A Text book of Engineering Drawing (Plane & Solid Geometry) – N.D. Bhatt & V.M. Panchal, Charotar Publishing House

 (v) The Fundamental of Engineering Drawing and Graphics Technology – French and Vireck, McGraw Hill.

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Semester: I B. Tech	**Branch: All Streams of Engineering**
Subject: Environmental Sciences	**Code: BT 104**
Total Theory Periods: 15	**Total Tutorial Periods: 00**
Total Credits: 01	

OBJECTIVES

- To create and disseminate knowledge to the students about environmental problems at local, regional and global scale.
- To provide practical training on modern instrumentation and analytical techniques for environmental analyses.
- To sensitize students towards environmental concerns, issues, and impacts of climate change and related mitigation strategies.
- To make the students to apply their knowledge for efficient environmental decision-making, management and sustainable development.
- To prepare students for successful career in environmental departments, research institutes, industries, consultancy and NGOs, etc.

UNIT-I:

CONCEPTS OF ENVIRONMENTAL SCIENCES AND NATURAL RESOURCES

Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals. Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative).

UNIT-II:

BIODIVERSITY AND ITS CONSERVATION

Biodiversity at global, national and local levels: India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation.

UNIT-III:

ENVIRONMENTAL POLLUTION

Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with

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case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

UNIT-IV:

ENVIRONMENTAL BIOTECHNOLOGY AND ENVIRONMENTAL MONITORING
Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phyto-remediation, bio-pesticides, bio-fertilizers; Bio-reactors-Design and application. Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques.

UNIT-V:

SOCIAL ISSUES AND ENVIRONMENT

Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics.

OUTCOMES
- After completion of the course, the students have: Acquired fundamental knowledge of different aspects of environment and local, regional and global environmental problems.
- Developed environmental monitoring skills, including conduct of experiments and data analysis.
- Obtained exposure to the environmental pollution control technologies. Acquired the knowledge and skills needed for the environmental design and management.
- Acquired skills in the preparation, planning and implementation of environmental projects.

TEXTBOOKS:

1. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.

2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS:

1. A. K. Chatterji, "Introduction to Environmental Biotechnology", Prentice Hall of India, New Delhi, 2006.

2. R.K. Trivedi,"Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.

3. Nebel B. J., "Environmental Science", Prentice Hall of India, New Delhi, 1987.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech	Branch: All Streams of Engineering
Subject: Technical English	Code: BT 105
Total Theory Periods: 28	Total Tutorial Periods: 00
Total Credits: 02	

OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT-I

Technical vocabulary-meaning in context, sequencing words, articles, prepositions, intensive reading and predicting content-reading and interpretation- process description.

UNIT-II

Phrases/structures indicating use/purpose- nonverbal communication- listening- corelating verbal and nonverbal communication-speaking in group discussion- formal letter writing- writing analytical paragraphs.

UNIT III

Cause and effect expressions- different grammatical forms of the same word- speaking stress and intonation- writing using connectives- report writing- types, structures, data collection, content form recommendation.

UNIT –IV

Numerical adjectives- oral instructions- descriptive writings, letter of application-content, format (c.v./biodata)-imperative forms –checklists, yes/no question forms- e mail communication.

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UNIT-V

Speaking – discussion of problems and solutions- creative and critical thinking, writing a proposal.

OUTCOMES:

Learners should be able to

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.

Listen/view and comprehend different spoken discourses/excerpts in different accents.

BOOKS AND REFERENCES:

1. P.k. dutta, g. Rajeevan and c.l.n.prakash, 'a course in communication skills,. Cambridge university press, india2007

2. Krishna mohan and meerabanerjee, 'developing communication skills' Macmillan india limited

3. Edger thrope, showickthrope, 'objective english' second edition,pearson education,2007

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Semester: I B.Tech.   Branch: All Streams of Engineering
Lab: Engineering Physics Laboratory   Code: BT 106
Total Practical Periods: 28   Total Credit: 01

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EXPERIMENTS (Any ten experiments can be performed)

1. To determine the surface tension by Capillary/Jager's method.
2. To determine the wave length of light by Newton's rings method.
3. To determine the wave length of light by Fresnel's Biprism.
4. To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
5. To determine specific resistance of a wire by Carry Foster's Bridge.
6. To determine the Hall coefficient of semiconductor.
7. To determine e/m by Thomson's method.
8. Study of Photo – Cell and determination of Planck's constant.
9. Determination of wavelength of a spectral line using diffraction grating.
10. Determination of divergence of LASER beam.
11. Determination of grating element of a diffraction grating using LASER beam.
12. To determine the coefficients of viscosity of a liquid by capillary flow/Stoke's method.
13. To determine the frequency of A.C. mains using sonometer.
14. To determine the moment of inertia of flywheel.
15 To determine the forbidden energy gap of semiconductor diode.
16. To determine the mechanical equivalent of heat (J) by Calender&Barne's method.
17. To determine the numerical aperture (NA) of the given fiber cables.
18. To study the characteristics of LDR.

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Semester: I B.Tech.   Branch: All Streams of Engineering
Lab: Programming & Soft Skills laboratory   Code: BT 107
Total Practical Periods: 28   Total Credits: 01

List of Programs:

1   Write a program to take the radius of a sphere as input and print the volume and surface area of that sphere.

2   Write a program to take a 5-digit number as input and calculate the sum of its digits.

3   Write a program to take three sides of a triangle as input and verify whether the triangle is an isosceles, scalene Oran equilateral triangle.

4   Write a program that will take 3 positive integers as input and verify whether or not they form a Pythagorean triplet or not.

5   Write a program to print all the Prime numbers between a given ranges.

6   Write a program to define a function that will take an integer as argument and return the sum of digits of that integer**.**

7   Write a program to define a macro that can calculate the greater of two of its arguments. Use this macro to calculate the greatest of 4 integers.

8   Write a program to define a recursive function that will print the reverse of its integer argument.

9   Write a program to print the sum of first N even numbers using recursive function.

10   Write a program to sort an array using Bubble sort technique.

11   Write a program that will take the elements of two integer arrays of 5 element each, and insert the common elements of both the array into a third array (Set intersection)

12   Write a program to take 5 names as input and print the longest name.

13   Write a program to check whether two given strings are palindrome or not using user defined function.

14   Write a program to find sum of all array elements by passing array as an argument using user define functions.

15   Write a program to convert decimal number to binary number using the function.

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16 Write a program to get the largest and smallest element of an array using the function.

17 Write a program to define a structure Student that will contain the roll number, name and total marks of a student. The program will ask the user to input the details of 5 students and print the details of all the students whose total marks is greater than a given value.

18 Write a program to define a union Contact that will contain the members Mobile no and E-mail id. Now define structure Employee that will contain name, roll number, mode of contact (mob/e-mail) and a variable of type Contact as members. The program will ask the user to give the details of two Employees including mode of contact and the contact num/ E-mail. Print the details of both the Employees.

19 Write a program to count vowels and consonants in a string using pointer.

20 Write a program to swap two numbers using pointers.

21 Write a program to find sum of array elements using Dynamic Memory Allocation.

22 Write a program that will ask the user to input a file name and copy the contents of that file into another file.

23 Write a program that will take any number of integers from the command line as argument and print the sum of all those integers.

24 Write a program to process sequential file for payroll data.

25 Write a program to process random file of library data.

Smart Working with MS-Office

MS-Word

a) Creating, editing, saving and printing text documents

b) Font and paragraph formatting

c) Simple character formatting

d) Inserting tables, smart art, page breaks

e) Using lists and styles

f) Working with images

g) Using Spelling and Grammar check

h) Understanding document properties

i) Mail Merge

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MS-Excel

a) Spreadsheet basics

b) Creating, editing, saving and printing spreadsheets

c) Working with functions & formulas

d) Modifying worksheets with color &auto formats

e) Graphically representing data : Charts & Graphs

f) Speeding data entry : Using Data Forms

g) Analyzing data : Data Menu, Subtotal, Filtering Data

h) Formatting worksheets

i) Securing & Protecting spreadsheets

MS-PowerPoint

a) Opening, viewing, creating, and printing slides

b) Applying auto layouts

c) Adding custom animation

d) Using slide transitions

e) Graphically representing data : Charts & Graphs

f) Creating Professional Slide for Presentation.

LIST OF EQUIPMENT'S / MACHINE REQUIRED:

PCs, C-Compiler, C Online Compiler, Microsoft Office (version 2007 or above)

REFERENCES:

1. Programming in ANSI C – E. Balaguruswamy Tata Mc-Gcraw Hill.

2. Let us C, YashwantKanetkar, BPB Publication

3. C: The Complete Reference, Herbert Schildt, McGraw Hill.

4. Office 2007 for Dummies, Wallace Wang, Wiley Publishing

5. MS-Office 2010 Training Guide, Satish Jain/M.Geeta/Kratika, BPB Publications

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   **Branch: All Streams of Engineering**
Lab: Engineering Graphics and Design Laboratory   **Code: BT 108**
Total Practical Periods: 60   **Total Credits: 02**

LIST OF EXPERIMENTS

Component-1
 Sheet-1: Projection of Solids (4 problems) + Section and Development of solid surfaces (4 problems) Sheet -2: Orthographic projection without section (4 problems).
Sheet -3: Orthographic projection with section (4 problems). Sheet- 4: Isometric Projections (6 problems).

Component -2
One A-3 size sketch book consisting of:-
1) 6 problems each from Projection of Curves, Lines, Planes and Solids.
2) 6 problems from Section and Development of Solids.
3) 4 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

Component - 3
1. An introduction of cad software and its utilities in the engineering software.
2. Study of the basic initial setting and viewing of drafting software interface.
3. Study of various tool bar options and exercises to familiarize all the drawing tools.
4. Use of various modify commands of drafting software.
5. Dimensioning in 2d and 3d entities.
6. Draw different types of 3d modeling entities using viewing commands, to view them (isometric projection).
7. Sectioning of solid primitives and rendering in 3d.
8. Intersection of solid primitives.

MATS School of Engineering &I.T

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   **Branch: All Streams of Engineering**
Lab: Communication & Soft Skills Laboratory   **Code: BT 109**
Total Practical Periods: 28   **Total Credits: 01**

LIST OF TASKS:

1. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.

2. Vocabulary building, Creativity, using Advertisements, Case Studies etc.

3. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking

4. Cross-Cultural Communication: Role-Play/ Non-Verbal Communication.

5. Meetings- making meeting effective, chairing a meeting, decision making, seeking opinions , interrupting and handling interruptions, clarifications, closure- Agenda, Minute writing.

6. Group Discussion – dynamics of group discussion, Lateral thinking, Brainstorming and Negotiation skills

7. Resume writing – CV – structural differences, structure and presentation, planning, defining the career objective

8. Interview Skills – formal & informal interviews, concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing   9. Writing Skills - Business Communication, Essays for competitive examinations.

10. Technical Report Writing/ Project Proposals – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Feasibility, Progress and Project Reports.

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech   Branch: All Streams of Engineering
Lab:Manufacturing Practices -I Laboratory   Code: BT 110
Total Practical Periods: 45+ (15 Instructional Periods)   Total Credits: 02

INSTRUCTIONAL SYLLABUS

Carpentry:
Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards.
Foundry:
Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.
Welding:
Definitions of welding, brazing and soldering processes, and their applications, Oxyacetylene gas welding process, equipment and techniques, type of flames and their applications. Manual met an arc Welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating, Welding positions. Type of weld joint. Common welding defects such ascracks, undercutting slag inclusion, porosity.

LIST OF EXPERIMENTS

1. T-Lap joint and Bridle joint (Carpentry shop)

2. Mould of any pattern (foundry shop)

3. Casting of any simple pattern (foundry shop)

4. (a) Gas welding practice by students on mild steel flat

(b) Lap joint by Gas welding

5. (a) MMA Welding practice by students

(b) Square butt joint by MMA Welding

6. (a) Lap joint by MMA Welding

   (b) Demonstration of brazing

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SCHOOL OF ENGINEERING & I.T.
SCHEME OF TEACHING AND EXAMINATION SESSION 2022-23
B. TECH.II – SEMESTER

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT200	Engineering Mathematics –II	3	1	-	70	30	4
2.	BT201	Engineering Chemistry	3	-	-	70	30	3
3.	BT202	Basic Electrical & Electronics Engineering	3	-	-	70	30	3
4.	BT203	Object Oriented Programming	3	-	-	70	30	3
5.	BT204	Constitution of India, Professional Ethics and Human Rights	1	-	-	70	30	1
6.	BT205	Professional Elective						
	BT2051	Fundamental of Mechanical Engineering (For Aero/Mech/Mining/Civil)	3	-	-	70	30	3
	BT2052	Introduction to Scripting (For CSE/Elex/Electrical)						
7.	BT206	Engineering Chemistry Laboratory	-	-	2	30	20	1
8.	BT207	Basic Electrical & Electronics Engineering Laboratory	-	-	2	30	20	1
9.	BT208	Advance Programming Laboratory	-	-	2	30	20	1
10.	BT209	Professional Elective Laboratory						
	BT2091	Fundamental of Mechanical Engineering Laboratory (For Aero/Mech/Mining/Civil)	-	-	2	30	20	1
	BT2092	Java Script Laboratory (For CSE/Elex/Electrical)						
11.	BT210	Manufacturing Practices – II Laboratory	-	-	4	30	20	2
		Total	**16**	**1**	**12**	**570**	**280**	**23**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessment

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester: II B.Tech	Branch: All Streams of Engineering
Subject: Engineering Mathematics-II	Subject Code: BT 200
Total Lecture + Tutorial Periods: 60	Total Credits: 04

OBJECTIVES:

- To make the scholars perceive the series analysis could be a powerful methodology wherever the formulas square measure integrals and to possess information of increasing periodic functions that explore sort of applications of Fourier series.
- To possess intensive information of PDE those arise in mathematical descriptions of things in engineering. To review a few amount which will take any of a given vary of values that will not be foreseen because it is however can be delineated in terms of their likelihood.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To produce a sound background of advanced analysis to perform an intensive investigation of major theorems of complex analysis and to use these ideas to a large vary of issues that features the analysis of each complex line integrals and real integrals.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I

FOURIER SERIES

Fourier series, Even odd function, Half range sine and cosine series, Parseval's theorem, practical harmonic analysis & Fourier Transform

UNIT II

PARTIAL DIFFERENTIAL EQUATION

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables & application of PDE

UNIT III

COMPLEX ANALYSIS

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue

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UNIT IV

LAPLACE TRANSFORMATION

Definition, Transform of elementary functions, Properties of Laplace transform, of derivatives & integrals, Multiplication by tn, Division by t, Evaluation of integrals, Inverse Laplace function, Convolution theorem, Unit step functions, Unit impulse function, periodic function. Application to solution of ordinary differential equations

UNIT V

VECTOR CALCULUS

Directional derivative, Gradient, Divergence and curl, Line, Surface and Volume integrals, Green's, Gauss's &Stoke's theorem (without proof) and applications

OUTCOMES:

The subject helps the students to develop the fundamentals and basic concepts in vector calculus, PDE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (40th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

REFERENCE BOOKS:

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune

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SCHOOL OF ENGINEERING & I.T

Semester: II B. Tech	**Branch: All Streams of Engineering**
Subject: Engineering Chemistry	**Code: BT 201**
Total Theory Periods: 48	**Total Tutorial Periods: 00**
Total Credits: 03	

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels

UNIT-I:

(a) ELECTROCHEMISTRY AND BATTERY TECHNOLOGY ELECTROCHEMISTRY: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

(b) BATTERY TECHNOLOGY:

Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency; cycle 10 hours life and shelf life. Construction, working and applications of Zinc Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO2 and Li-ion batteries.

(c) FUEL CELLS:

 Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H2SO4 electrolyte.

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UNIT-II:

(a) CORROSION AND METAL FINISHING CORROSION:

Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

(b) METAL FINISHING:

Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levelers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

UNIT-III:

(a)FUELS AND SOLAR ENERGY FUELS:

Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti-knocking agents, power alcohol & biodiesel.

(b)SOLAR ENERGY:

Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (N&P types).

UNIT-IV:

POLYMERS:

Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber.

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Adhesives: Introduction, synthesis, properties and applications of epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of Kevlar. Conducting polymers: Introduction, mechanism of conduction in Poly aniline and applications of conducting poly aniline.

UNIT-V:

WATER TECHNOLOGY AND NANOMATERIALS

(a)WATER TECHNOLOGY:

Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved O_2, CO_2 and $MgCl_2$). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis & electro dialysis (ion selective).

(b)NANO MATERIALS:

Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials- carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, &nano composites.

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXTBOOKS:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah&PushpaIyengar., "Chemistry for Engineering Students", Subhash Publications, Bangalore.

2. R.V.Gadag&A.Nityananda Shetty., "Engineering Chemistry", I K International Publishing House Private Ltd. New Delhi.

3. P.C.Jain& Monica Jain., "Engineering Chemistry", Dhanpat Rai Publications, New Delhi.

REFERENCE BOOKS:

1. O.G.Palanna,"Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.

2. G.A.Ozin& A.C. Arsenault, "Nano chemistry A Chemical Approach to Nanomaterials", RSC publishing, 2005.

3. "Wiley Engineering Chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition.

4. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., "Polymer Science", Wiley-Eastern Ltd.

5. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi

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SCHOOL OF ENGINEERING & I.T

Semester: II B. Tech **Branch: All Streams of Engineering**
Subject: Basic Electrical & Electronics Engineering **Code: BT 202**
Total Theory Periods: 48   **Total Tutorial Periods: 00**
Total Credits: 03

COURSE OBJECTIVES
• Understand the basic concepts of DC and AC circuits.
• Analyse the series, parallel and series, parallel ac circuits.
• Acquire knowledge about working principle, construction and losses of a transformer.
• Understand the working, characteristics and applications of diodes.
• Understand the construction, working, characteristics and applications of a transistor.

Unit – I

D.C. Networks:

Elementary idea about power generation, transmission and distribution. Node voltage and mesh current method. Superposition, Thevenin's and Norton's theorems. Star- delta and Delta- star conversions.

Unit – II

Single Phase A.C. Circuits:

Single phase EMF generation, Effective & Average values of sinusoids and determination of form-factor, Analysis of simple series R-L, R-C and RLC circuits, power and power factor

Unit – III

(a) Three Phase AC circuits:

Introduction, Generation of Three-phase EMF, Phase sequence, Connection of Three-phase Windings - Delta and Star connection: Line and Phase quantities, phasor diagrams, Power equations in balanced conditions.

(b)Magnetic Circuits:

Introduction, Magneto motive force (MMF), Magnetic field strength, Reluctance, B-H curve, Comparison of the Electric and Magnetic Circuits, Series-Parallel Magnetic Circuit, Leakage flux and fringing, Magnetic Hysteresis, Eddy currents.

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Unit – IV

(a)Single phase Transformers:

Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram on no load, Losses, Efficiency calculations.

(b)Direct current machines:

Basic concepts and elementary idea of AC and DC machines, construction and working principal of DC Generator, emf and torque equation dc machine and types of dc motor.

Unit – V

(a)Semiconductor Devices and Applications

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal Amplifier

(b)Digital Electronics

Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to sequential Circuits,

Flip-Flops - Registers and Counters – A/D and D/A Conversion.

COURSE OUTCOMES

• Apply the knowledge of basic laws to electric and magnetic circuits.

• Distinguish between various types of representation of ac quantities.

• Draw the phasor diagrams of an ideal and a practical transformer at no load.

• Analyse and design basic circuits which include diode, LED and seven segment display.

• Analyse and design circuits consisting of transistors.

TEXT BOOKS:

1. V.N. Mittle and Arvind Mittal, "Basic Electrical Engineering", Second Edition, Tata McGraw Hill.
2. 2 Del Torro, Vincent "Electrical Engineering Fundamentals", Second Edition Prentice Hall of India Pvt. Ltd.

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REFERENCE BOOKS:

1. Fitzrald and Higgonbothom, "Basic Electrical Engineering", Fifth Edition, McGraw Hill.

2. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI.

3. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill.

4. Ashfaq Hussain, "Fundamentals of Electrical Engineering", Third Edition, Dhanpat Rai and Co.

5. H. Cotton, "Advance Electrical Technology," ISSAC Pitman, London. 6. Parker Smith S. (Ed. Parker Smith N.N.), "Problems in Electrical Engineering", Tenth edition, Asia publication

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MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech.	**Branch: All Streams of Engineering**
Subject: Object Oriented Programming	**Code: BT 203**
Total Theory Periods: 48	**Total Tutorial Periods: 00**
Total Credits: 03	

COURSE OBJECTIVES
- To learn the object-oriented programming concepts using C++.
- To design and implement C++ programs with the concept of OOP.
- To understand implementation issues related to object-oriented techniques.
- To learn how to build good quality software using object-oriented programming technique.

UNIT-I
INTRODUCTION TO OOP AND C++
Concept of Object Oriented Programming, Procedural programming Vs. Object oriented programming (OOP), Features and Benefits of OOPs, Object Oriented Languages, Introduction to C++, C++ Compiler, C++ Standard library, Basics of a typical C++ environment and C++ program, Pre-processors directives, and illustrative simple C++ programs. Header files and namespaces, library files, Data Types, Keywords, Operators and Expressions, Control Structure, Loops, Arrays, Structures, Functions.

UNIT-II
CLASSES & OBJECT, CONSTRUCTORS&DESTRUCTORS
Introduction to class, class object creation, Access of class members, Scope of class and its member, Nested class, Data hiding & encapsulation, Friend function, Array within a class, Array of object as function argument, Function returning object, Static member. Constructor function, Parameterized multiple constructor, Default constructor, Dynamic memory allocation with new and delete, Copy constructor, Constant and class, Data conversion between objects of different classes, Destructor function.

UNIT- III
INHERITANCE, POINTER, VIRTUAL FUNCTIONS & POLYMORPHISM
Fundamentals of operator overloading, restrictions on operators overloading, operator functions as class members vs. as Friend functions, Overloading, <<, >> Overloading unary operators, overloading binary operators. Introduction to inheritance, Base classes and derived classes, protected members, Casting base class pointers to derived class pointers, Using member functions, Overriding base class members in a derived class, public, protected and private inheritance, Using constructors and destructors in derived classes, Implicit derived class object to base class object conversion, Composition Vs. Inheritance. Introduction to virtual functions, Abstract base classes and concrete classes, new classes and dynamic binding, virtual destructors, polymorphism, dynamic binding.

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UNIT-IV
FILE I/O, TEMPLATES& EXCEPTION HANDLING

Files and streams, Creating a sequential access file, Reading data from a sequential access file, Updating sequential access files, Random access files, creating a random access file, Writing data randomly to a random access file, reading data sequentially from a random access file. Stream Input/output classes and objects, Stream output, Stream input, Unformatted I/O (with read and write), Stream manipulators. Function templates, Overloading template functions, Class template, Class templates and non-type parameters, Templates and inheritance, Templates and friends, Templates and static members. Basics of C++ Exception handling: Try Throw, Catch, Throwing an exception, catching an exception, rethrowing an exception, Exception specifications, processing unexpected exceptions.

UNIT-V
OOPS CONCEPTS WITH PYTHON

Python Basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types. Creating classes and objects, inheritance in python.

COURSE OUTCOME:
After completion of the course study, students will be able to
1. Explain the basics of Object Oriented Programming concepts.
2. Design and develop a C++ program with concept of Object Oriented Programming.
3. Apply the object initialization and destroy concept using constructors and destructors.
4. Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
5. Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
6. Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
7. Use I/O operations and file streams in programs.
8. Make an application/project using C++.

TEXT BOOKS:
1. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Python 3 Object-Oriented Programming - Third Edition

REFERENCE BOOKS:
1. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
2. Let Us C++, YashavantKanetkar, BPB Publication.
3. Programming with C++, John R. Hubbard, Schaum's Outlines, McGraw Hill Education.
4. Programming with C++, D. Ravichandran, McGraw Hill Education.
5. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

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MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: All Streams of Engineering
Subject: Constitution of India, Professional Ethics and Human Rights   Code: BT 204
Total Theory Periods: 15   Total Tutorial Periods: 00
Total Credits: 01

COURSE OBJECTIVES
• To assimilate and get familiarized with basic information about Indian constitution and provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.
• To identify their individual roles and ethical responsibilities towards society.
• To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/ values and its implications in their life.

UNIT-I: CONSTITUTION OF INDIA

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

UNIT-II: FUNDAMENTAL DUTIES AND UNION EXECUTIVES

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India

UNIT-III: STATE LEGISLATURE AND ELECTORAL PROCESS

State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.

UNIT-IV: HUMAN RIGHTS

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights-Working of National Human Rights Commission in India ,Powers and functions of Municipalities, Panchyats and Co - Operative Societies..

UNIT-V: PROFESIONAL ETHICS

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

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COURSE OUTCOMES

At the end of the course students will be able to...
- Understand the meaning and importance of Constitution
- Explain about making of Indian Constitution - contribution of Constituent assembly on it.
- Describe the Salient (Outstanding) features of Indian Constitution.
- Describe the importance of Preamble of the Indian Constitution and its significance.

TEXTBOOKS:

1. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001

2. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics" Thompson Asia, 2003-08-05.

REFERENCE BOOKS:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004

3. Brij Kishore Sharma,"Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: Aero., Aero (Hons) Civil, Mining and Mechanical Engg.
Subject: Fundamentals of Mechanical Engineering   Code: BT 2051
Total Theory Periods: 48   Total Tutorial Periods: 00
Total Credits: 03

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT – I:

RESULTANT AND EQUILIBRIUM ANALYSIS:

Basic concepts and laws of mechanics, system of forces, free body diagram, Resultant and equilibrium of concurrent, parallel and non-concurrent co-planar force system.   General numerical applications.

UNIT – II :

(a) ANALYSIS OF PLANE TRUSSES Perfect truss, basic assumptions for perfect truss, analysis of axial forces in the members by method of joint and method of sections. General numerical applications.

(b) FRICTION Static, dynamic and limiting friction, Law of limiting friction, Angle of friction,

Angle of Repose, Cone of Friction, Wedge friction. General numerical applications

UNIT –III :

PROPERTIES OF SURFACES Centre of Gravity, Second moment of area, determination of second moment of area by integration, polar moment of inertia, radius of gyration of area, Parallel axis theorem, Moment of inertia of composite areas, and determination of Product of inertia by integration.

UNIT –IV :

KINETICS OF PARTICLES

(a) D'Alembert's principle applied to bodies having rectilinear motion.

(b) Principle of work and Energy: General numerical applications

(c) Principle of Impulse and momentum: General numerical applications

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UNIT – V :

 LAWS OF THERMODYNAMICS

(a) Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application.

(b)First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

OUTCOMES:

(a)Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
(b)Ability to analyses the forces in any structures.
(c) Ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Engineering Mechanics (Statics and Dynamics) ; A. K. Tayal ,Umesh Pub., Delhi .

2. Engineering Mechanics : S. Timoshenko and D.H. Young,TMH

3. Engineering Thermodynamics: P.K.Nag, TMH

4. Engineering Thermodynamics: C.P.Arora, TMH

 REFERENCE BOOKS:

1. Engineering Mechanics (Statics and Dynamics): R.C.Hibbeler, Pearson

2. Engineering Mechanics:Meriam and Kreige ,John Wiley and sons

3. Thermodynamics: Cengel and Boles, TMH

4. Essentials of Engg Mechanics: S.Rajasekharan&G.ShankaraSubramaniyam, Vikas Publications

5. Engineering Mechanics: BasudebBhatytacharya , Oxford

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: Comp. Sci. and Engg. and CSE(Hons)
Subject: **Introduction to Scripting**   Code: BT 2052
Total Theory Periods: 48   Total Tutorial Periods: 00
Total Credits: 03

COURSE OBJECTIVE:
1. Design and develop static and dynamic web pages.
2. Familiarize with Client-Side Programming,
3. Learn web page validations.
4. To design and implement web page scripts.
5. To learn how to build good interactive web pages using HTML and Javascript.

UNIT I – INTRODUCTION TO SCRIPTING LANGUAGES
Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT II - HTML BASICS
HTML basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags, Frames, Images. Cascading style sheets: Adding CSS, CSS and page layout. JavaScript: Introduction, Variables, Literals, Operators, Control structure, Conditional statements, Arrays, Functions, Objects, Predefined objects, Object hierarchy, Accessing objects.

UNIT III - JAVASCRIPT PROGRAMMING OF REACTIVE WEB PAGES ELEMENTS
Events, Event handlers, multiple windows and Frames, Form object and Element, Advanced JavaScript and HTML, Data entry and Validation, Tables and Forms. Introduction to Python Programming: History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation, Types - Integers, Strings, Booleans.

UNIT IV - OPERATORS AND EXPRESSIONS
Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.

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UNIT V - CONTROL FLOW

if, if-else, for, while, break, continue, pass Functions - Defining Functions, Calling Functions, Passing Arguments, Default Arguments, Variable-length arguments, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Development of sample scripts and web applications. Client Side Scripting, Server-Side Scripting, Managing data with SQL, Cookies, use the cookies, advantages of the cookies and how to create cookies. Introduction to Node.js.

COURSE OUTCOME:

After completion of the course study, students will be able to
1. Explain the basics of websites and WebPages concepts.
2. Design and develop a Web Page with DOM Elements.
3. Apply the validation and verification of data at client end.

TEXT BOOKS:
1. Beginning PERL, Curtis Poe, Wrox Publication
2. Sams Teach Yourself HTML, CSS and Java Script, Julie C, Meloni.
3. Javascript by Example, Ellie Quigley, Prentice Hall.
4. Programming Python, Mark Lutz, O'Reilly.

REFERENCE BOOKS:
1. Learning Perl: Making Easy Things Easy and Hard Things Possible 7th Edition, O'Reilly
2. Mastering HTML, CSS &Javascript Web Publishing, Laura Lemay, Rafey Colburn, BPB Publications.
3. Eloquent Javascript, MarjinHaverbeke
4. Programming Javascript Applications, Eric Elliott, O'Reilly Media.

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Semester: II B. Tech   Branch: All Streams of Engineering
Subject: **Engineering Chemistry Laboratory**   Code: BT 206
Total Theory Periods: 28   Total Tutorial Periods: 00
Total Credits: 01

COURSE OBJECTIVE:
1. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
1. Acid-base titration (estimation of commercial caustic soda)

2. Redox titration (estimation of iron using permanganometry)

3. Complexometric titration (estimation of hardness of water using EDTA titration).

4. Preparation and analysis of metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).

5. Chemical kinetics (determination of relative rates of reaction of iodide with H2O2 at room temperature (Clock reaction).

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).

7. Detection of functional groups in organic compounds.

8. Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds

9. Conduct metric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

10. Determine the amount of oxalic Acid and sulphuric Acid/Hydrochloric Acid in one liter of solution given standard Sodium Hydroxide and Potassium Permangate.

11. To determine the Carbonate, Bicarbonate and Chloride contents in irrigation water.

12. Determination of dissolved Oxygen in given sample of water.

13. Determination of calorific value of fuel by Bomb Calorimeter.

14. Determination of Flash Point and Fine Point of Lubricant by Abels and Pensky Martin apparatus.

COURSE OUTCOME:
1. The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: All Streams of Engineering

Subject: Basic Electrical & Electronics Engineering Laboratory   Code: BT 207

Total Theory Periods: 28   Total Tutorial Periods: 00

Total Credits: 01

List of Experiments (To perform minimum 10 experiments)

1. To verify Thevenin's theorem and Norton's theorem.

2. To verify Superposition theorem.

3. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.

4. To verify Maximum Power Transfer theorem

5. To determine V– I characteristics of Incandescent lamp.

6. To study B-H curve.

7. To measure current, power, voltage and power factor of series RLC circuit.

8. To measure current, power, voltage of parallel RLC circuit.

9. To measure current, power, voltage of series parallel RLC circuit.

10. To measure R and L of choke coil.

11. To study construction of transformer.

12. To perform ratio test and polarity test of single phase transformer.

13. To calculate efficiency of single phase transformer by direct loading.

14. To study construction of D.C. machine.

15. To study charging and discharging of a capacitor.

16. To study the Wattmeter and Energy meter.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: All Streams of Engineering
Subject: **Advance Programming Laboratory**   Code: BT 208
Total Theory Periods: 28   **Total Tutorial Periods: 00**
Total Credits: 01

1   Write a program to check whether a given number is Prime or not.

2   Write a program to read number and to display the largest value between two, three or four numbers by using switch-Case statements.

3   Write a program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by   using

   a. for loop   b. while loop   c. do-while loop

4   Write a program to find sum of the following series using function:

   Sum= $x-(x)^3/3!+(x)^5/5!-………..(x)^n/n!$

5   Write a program to read the elements of two matrices & to perform the matrix multiplication.

6   Write a program to swap the contents of two variable by using

   a. call by value   b. Call by reference

7   Write a program to perform the following arithmetic operations on complex numbers using structure

   a. Addition of the two complex numbers   b. Subtraction of two complex numbers

   c. Multiplication of two complex numbers   d. Division of two complex numbers

8   Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

9   Write an object-oriented program (OOP) using C++ to exchange the private data members of two different functions using friend functions.

10 Write an OOP using C++ to count how many times a particular member function of a class is called by:

   a. A particular object   b. Any objects

11 Write an OOP using C++ to define a constructor for a "Date" class that initializes the Date objects with initial values. In case initial values are not provided, it should initialize the objects with default values.

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12 Write an OOP using C++ to overload:

a. + Operator   b. = operator   c. >> operator   d. ++ operator

13 Write a C++ program to demonstrate how ambiguity is avoided using scope resolution operator in the following:

a. Single Inheritance   b. Multiple Inheritance

14 Write a C++ Program to demonstrate function overloading for swapping of two variables of the various data types (integer, floating-point number and character type).

15 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

16 Write a C++ program to access the private data of a class by non-member function through friend function where the friend function is declared:

a. in the location of public category   b. in the location of private category

c. within the scope of a class definition itself   d. defined with inline code subtraction

17 Write a C++ program to demonstrate how a pure virtual function is defined, declared and invoked from the object of derived class through the pointer of the base class.

18 Write a C++ program to open a file and count the number of characters, number of vowels and number of newline characters present in the file.

19 Write a program to copy the contents of one text file to another and display both the files using a text Menu.

20 Create a database of 10 students. The database should contain the name, marks of 5 subjects, aggregate marks, aggregate percentage and division according to the following conditions:

a. Percentage greater or equal to 60 – First division

b. Percentage between 50 and less than 60 – Second division

c. Percentage between 40 and less than 50 – Third division

d. Percentage below 40 – Improvement required

Display the above database of every student in a tabulated form. Implement the above program using Structures, Text-Menu and File I/O operations.

21 Write an OOP using a class template to read any five parameterized data type such as float and integer, and print the average.

22 Write a program for sorting of numbers with Bubble Sort using template function.

23 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

24 Write a C++ program to read two numbers and find the division of these two numbers using exception handling.

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25   Write a C++ program to create a function which take a parameter, if the value of parameter is > 0 then throw integer type, if parameter is = 0, then throw character type, if parameter is < 0 then throws float type exception but for all design use only one catch block.

26   Write a python program for finding biggest number among 3 numbers.

27   Implement Python Script to generate prime numbers series up to n

28   Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.

29   Write a python program to work with classes and objects.

30   Write a python program that makes use of function to display all such numbers, which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

LIST OF EQUIPMENT/ MACHINE REQUIRED

PCs, Turbo C++ compiler, Online C++ Compiler, Python 3/Python IDE, Online python compiler

REFERENCES:

1.   Programming with C++, D. Ravichandran, McGraw Hill Education.

2.   Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.

3.   Mastering C++, K. R. Venugopal, Mcgraw Hill Education.

4.   The Complete Reference C++, Herbert Schildt, McGraw Hill Education.

5.   Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.

6.   Let Us C++, YashavantKanetkar, BPB Publication.

7.   Head-First Python: A Brain-Friendly Guide (2nd Edition), Paul Barry, Oreilly.

8.   Python Programming: An Introduction to Computer Science (3rd Edition), John Zelle,

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech   Branch: Aero., Aero. (Hons.) Civil, Mining and Mechanical Engg.
Lab: Fundamentals of Mechanical Engineering Laboratory   Code: BT 2091
Total Practical Periods: 28   Total Credits: 01

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

LIST OF EXPERIMENTS

1. To verify law of triangle of forces.

2. To verify the Lami's theorem.

3. To verify the law of polygon of forces.

4. To verify the law of lever. 5. To determine the support reactions of a simply supported beam subjected to point loads.

6. To draw the variation of bending moment at a given section in a simply supported beam under a moving point load.

7. To find the coefficient of friction between surfaces of wooden plane and following blocks: i) Aluminum ii) Tin iii) Glass iv) Asbestos v) Teak ply vi) Sand paper vii) card board .

8. To determine the coefficient of friction between (i) Belt and pulley (ii) Rope and pulley.

9. To study simple jib crane and to determine the internal forces in members of jib crane.

10. To determine the stiffness of helical compression spring.

11. To study lifting machine.

12. To study the lifting machine "second order pulley system" and to draw the following characteristic diagram: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

13 To study the lifting machine "Wheel and Differential axle" and to draw the following characteristic diagram: (i). Load-effort diagram (ii) Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.

14. To study the lifting machine "Worm and worm wheel" and to draw the following characteristic diagram: (i). Load-effort diagram (ii). Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.

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15. To study the lifting machine "Simple screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii). Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

16. To study the lifting machine "Modified screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

17. To study the lifting machine "Geared Jib crane" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

18. To study the lifting machine "Single Purchase Winch crab" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram

(iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

19. To study the lifting machine "Double Purchase Winch crab" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

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Semester: II B. Tech   **Branch: Comp. Sci. and Engg. and CSE(Hons)**
Lab: Java Script Laboratory   **Code: BT 2092**
Total Practical Periods: 28   **Total Credits: 01**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

1. Design a HTML page describing your profile in one paragraph. Design in such a way that it has a heading, a horizontal rule, three links and your photo also write three HTML documents for the links.
2. Design HTML page describing your academic career. The page will tell about the degrees, Institutions and your hobbies. Add some lists too.
3. Design HTML page demonstrating concept of Internal Hyper-link
4. Design HTML page which gives the list of grocery Items by using Ordered List , List consist of Roman no, A,B…. and so on.
5. Design HTML page which gives the list of grocery Items by using Unordered List bullets are of form disc, square and circle.
6. Design a HTML page for partitioning browser window in frames display the different pages in partitioned windows.
7. Design HTML page to partition window, Design in such a way that link clicked in on page can display the corresponding pages in other window.
8. Write a Java script to prompt for users name and display it on the screen.
9. Write a java script program to test the first character of a string is uppercase or not.
10. Write a java script program for pattern that matches e-mail addresses.
11. Write a java script program to check whether a given number is Prime or not.
12. Write a java script function to print an integer with commas as thousands separators.
13. Write a java script program to sort a list of elements using any sorting algorithm.
14. Write a java script for loop that will iterate from 0 to 15. For each iteration, it will check if the current number is odd or even, and display a message to the screen.
15. Write a java script program which compute, the average marks of the following students then this average is used to determine the corresponding grade.
16. Write a java script program to sum the multiple s of 3 and 5 under 1000.
17. To design the scientific calculator and make event for each button using java script.
18. Write a java script program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using
   a. for loop   b. while loop   c. do-while loop
19. Write a java script program to find sum of the following series using function:
   Sum= $x - (x)^3/3! + (x)^5/5! - \ldots\ldots(x)^n/n!$

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20 Design HTML form for keeping student record and validate it using Java script.
21 Write programs using Java script for Web Page to display browsers information.

List of Equipment/ Machine Required

PCs, Java script supported Browser, Node.js

References:

1. Mastering HTML, CSS & JavaScript Web Publishing, Laura Lemay, Rafey Colburn, BPB Publications.
2. Head First JavaScript programming, Eric Pressman & Elizabeth Robson, O'Reilly.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech	Branch: All Streams of Engineering
Manufacturing Practices– II Laboratory	Code: BT 210
Total Practical Periods: 45 + (15 Instructional Periods)	Total Credits: 02

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

Course Objective:
1. To make the student acquire practical skills in the machining, fitting and forging operations.

Instructional Syllabus
Machining:
Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning parting, chamfering and facing. Quick return mechanism of shaper. Difference between drilling and boring. Files-material and classification.
Fitting:
Need of fitting, different types of instruments used in fitting shop.
Forging:
Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.
List of Experiments
1. Job on lathe with one step turning and chamfering operations

2. Job on shaper for finishing two sides of a job

3. (a) Drilling two holes of size 5 and 12 mm diameter on job used/to be used for shaping.

(b) Grinding a corner of above job on bench grinder
4. Finishing of two sides of a square piece of filling

5. Tin smithy for making mechanical joint and soldering of joints

6. Perform step cutting on mild steel plate.

Course Outcome:
1. The students will be conversant with hands-on knowledge in the machining, fitting and forging operations.

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Scheme & Syllabus
(III Semester)
Bachelor of Technology
Mechanical Engineering

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Scheme of Teaching & Examination

III - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT300	Engineering Mathematics III	3	3	0	-	70	30
2	BT311	Engineering Thermodynamics	4	3	1	-	70	30
3	BT312	Mechanics of Solids I	4	3	1	-	70	30
4	BT313	Kinematics Of Machine	3	3	0	-	70	30
5	BT314	Machine Drawing	3	3	0	-	70	30
6	BT305	Universal Human Values	1	1	0	-	70	30
7	BT316	Kinematics Of Machine Laboratory	1	-	-	2	30	20
8	BT317	Thermodynamics Laboratory	1	-	-	2	30	20
9	BT318	Machine Drawing Laboratory	1	-	-	2	30	20
10	BT319	Advanced Manufacturing Practice Laboratory	1	-	-	2	30	20
Total			**22**	**16**	**2**	**8**	**540**	**260**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Engineering Mathematics-III
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 300

COURSE OBJECTIVE:
- To provide required skills to apply different statistical tools to analyze Engineering problems
- To provide the necessary basic concepts of a few numerical methods
- To provide procedures for solving numerically different kinds of problems occurring in the field of Engineering and Technology.

UNIT-I STATISTICS
Random variables, Discrete and continuous probability distributions, Expectation, Mean and Standard Deviation, Moments and moment generating function, Distributions Binomial, Poisson and Normal distributions.

UNIT-II NUMERICAL SOLUTIONS OF ALGEBRAIC, TRANSCENDENTAL AND SIMULTANEOUS LINEAR EQUATIONS
Errors in numerical computation, Error type, Bisection Method, Regula–Falsi Method, Secant Method, Newton Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan &Crout'sTriangularisation Method, Iterative Methods: Jacobi, Gauss-Seidel & Relaxation Methods.

UNIT-III INTERPOLATION AND CURVE FITTING
Finite differences, Forward, Backward & Central Difference Interpolation, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-IVNUMERICAL DIFFERENTIATION AND INTEGRATION
Derivatives using Forward, Backward and Central Difference methods, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.

UNIT-V NUMERICAL SOLUTION OF ODE & PDE
Numerical solution of ODE's by Taylor's series method, Picard's method, Euler's method, Euler's modified method, Runge–Kutta methods, Predictor-corrector methods-Milne's method, Adams-Bash forth method.
Numerical solution of PDE's , Classifications of second order PDE, Elliptic equations , solution of Laplace equations, solution of poisons equation, Solution of elliptic equation by relaxation method, Parabolic equations, Solution of one dimensional and 2-D heat equations, Hyperbolic equation, Wave equations.

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COURSE OUTCOME:

- Solve statistics problems that arise during the study of Engineering
- Use various interpolation techniques for solving problems in Engineering. Use numerical methods to solve problems involving numerical differentiation and integration.
- Solve initial value problems numerically that arise in Science and Engineering.
- Solve boundary value problems that encounter in different fields of engineering study.

TEXT BOOK

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. B. V. Ramana, "Higher Engineering Mathematics" Tata McGraw Hill 2007.
3. N. P. Bali, and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Engineering Thermodynamics
Total Theory Periods	:	60
Total Tutorial Periods	:	01
Total Credits	:	03
Code	:	BT 311

COURSE OBJECTIVES:
- To provide a mature approach to the basic principle of classical thermodynamics and to apply it to system surroundings interactions; involving work and heat transfer with associated property changes.
- To Use classical thermodynamics principles to develop algebraic relationships among key physical parameters and variable based on analysis of a specified system
- Use references that provide tabulated physical data that are useful to mechanical engineers.
- Familiarity with construction and performance parameters of Boilers

UNIT – I First Lawof Thermodynamics:
Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application. First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

UNIT - II Second law of thermodynamics:
Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, PMM of Second kind, reversibility and irreversibility, causes of irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale. Entropy: Clasius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes.

UNIT - III Properties of Pure substances:
Thermodynamic properties of pure substances in solid,liquid and vapour phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s, h-s diagrams, P-V-T surfaces,– Properties and processes in ideal vapour, use of steam tables and Mollier's diagram in determination of steam properties, energy interaction and entropy calculations.

UNIT - IV Availability and Irreversibility:
Available energy, availability of a closed system, availability function of a closed system availability of steady flow system, availability function of open system, Helmholtz function , Gibbs functions, Irreversibility for closed and open system, Second law efficiency.

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UNIT V Thermodynamic Relationships:

Maxwell's equations, T-ds equations, difference in heat capacities, coefficient of Volume expansion and isothermal compressibility, adiabatic compressibility, ratio of specific heat, energy equations, Joule-Kelvin effect, Clausius-Clapeyron equation.

COURSE OUTCOMES:

* Apply k n o w l e d g e of classical thermodynamics for formulating and solving engineering problems.
* Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems.
* Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS:

1. Thermodynamics- An Engineering Approach – Cengal& Boles – McGraw Hill
2. Engineering Thermodynamics – P.K. Nag – TMH Publishers

REFERENCE BOOKS:

1. Fundamental of engineering thermodynamics- R.Yadav ,CPH, Allahabad
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria& Sons
3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag,Wiley,Delhi
4. An Introduction to Thermodynamics-Y.V.C.Rao University Prass, Hyderabad
5. Thermodynamics – C.P. Arora – TMH Pub.

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School of Engineering & I.T.

Semester   :   III B.Tech
Branch   :   Mechanical Engineering
Subject   :   Mechanics of Solids – I
Total Theory Periods :   60
Total Tutorial Periods :   01
Total Credits   :   03
Code   :   BT 312

COURSE OBJECTIVES:

- To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- To study engineering properties of materials, force-deformation and stress-strain relationship
- To learn fundamental principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures
- To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces, bending moments, slopes and deflection.
- To determine stress, strain, and deformation of bars, beams and springs.
- To be able to perform structural analysis by hand computations and design axial and torsional members.

UNIT – I Introduction
Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke's law, stresses in the components subjected to multi-axial forces, temperature stresses, statically indeterminate systems.

UNIT – II Bending of Beams
Bending of Beams with symmetric section, boundary conditions, pure bending, bending equations, Transverse shear stress distribution in circular / hollow circular / I & T section.

UNIT – III Deflection of Beams
Relation between slope deflection & radius of curvature, solution of beam deflection, problems by Macaulay's Method, Direct integration method, Moment Area method, Method of Super position.

UNIT – IV Torsion
Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft.
Springs: Closed & Open Coil Helical Springs subjected to Axial Load, Springs in parallel & series.

UNIT – V Principal Stress & Strain
Transformation of plane stress, principal stresses, maximum shear stress, Mohr's Circle for Plane Stress,Plane Strain and its Mohr's circle representation, Principal Strains, Maximum Shear Strain.
Combined Loading
Components subjected to bending, torsion & axial load, Theories of failure.

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COURSE OUTCOMES:

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS

1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
2. Elements of Strength of Material – Timo Shenko& Young – EWP Press
3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS

1. Strength of Material – Rider – ELBS
2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
3. Mechanics of Material – J.M. Gera & Time Shenko – CBS Publishers
4. Introduction to Solid Mechanics – I. H. Shames – PHI
5. Engineering Mechanics of Solids – E.P. Popov – PHI
6. Strength of Material – Shaums Outline Series – McGraw Hill

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Kinematics of Machine
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 313

COURSE OBJECTIVES:
- The knowledge of this subject is very essential for an engineer in designing the various parts of a machine
- To understand the dynamics of mechanism
- To develop the understanding of friction force, gear and cam mechanisms.

UNIT- I
Relative velocity: Elements, pairs, Mechanism, four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous center method.

UNIT-II
Relative Acceleration: Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.

UNIT- III
Cams: Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion,Synthesis of cam profile by graphical approach, Considerations of pressure angle. Cams with specified contours: Circular arc cam & tangent cam.

UNIT-IV
Gear: Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference.
Gear trains: Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.

UNIT-V
Friction: Applications of friction, Pivot and collar friction, Thrust bearing.
Belt-Drives: Ratio of tensions for flat belt & V-belt, Centrifugal tension, condition for maximum power transmission.
Brakes and dynamometer: Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake, Absorption dynamometer, Transmission dynamometer.

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COURSE OUTCOMES:
- Understand the basic law of equilibrium and application of the on a mechanism
- Knew about the Design and working principles of gear and cam.

Text Books:
1. Theory of Machine – S. S. Ratan-Tata McGraw Hill.
2. The Theory of Machine – Thomas Beven – CBS Publishers.

Reference Books:
1. Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2. Theory of Machine – Shigley, JE
3. Theory of Machine Jagdish Lal
4. Theory of machine – J.E. Singh – McGraw Hill.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Machine Drawing
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 314

COURSE OBJECTIVES:
- Understand the different steps in producing drawings according to bureau of Indian standards (B.I.S.) as per SP:46 (1988)
- Understand the application of industry standards and techniques applied in Machine Drawing
- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views
- Apply auxiliary or sectional views to most practically represent engineered parts
- Assemble important parts used in major mechanical engineering applications.

UNIT- I Machine Drawing Conventions
(a) Conventional representation of machine components-leaf spring, leaf spring with eyes, coil spring (tension and compression), disc spring, spiral spring, splined shaft, serrated shaft, square end of shaft, ball and roller bearing, spur gearing, bevel gearing, worm and worm wheel, straight knurling, diamond knurling, internal and external thread, method of designating and dimensioning metric thread.
(b) Representation of geometrical and dimensional tolerance-Straightness, flatness, circularity, cylindricity, parallelism, perpendicularity, angularity, concentricity and coaxially, symmetry, radial run out and axial run out. Representation of dimensional tolerance of hole, shaft and fits. Representation of surface roughness and direction of lay of machining.
(c) Representation of welded joints- representation of form, location and size of welds

UNIT-II Projection And Sectional View
(a) Conversion of pictorial views into orthographic views-First angle projection and third angle projection.
(b) Sectional view Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web, rib, shaft, pipes, different types of holes, hatching or section lines, conventions of section lines for different metals and materials.

UNIT- III Screwed Fasteners
(a) Screwed Fasteners Drawing hexagonal nut and square nut, hexagonal headed bolt, square headed bolt and washer.
(b) Riveted Joint Form and properties of snap or cup head rivet, dimensions of rivet joint, Type of riveted joints, single riveted lap joint, double riveted (chain) lap joint, double riveted (zigzag) lap joint, single riveted (single strap) butt joint, single riveted (double straps) butt joint.

UNIT-IV Assembly Drawing

Preparation of assembly drawing and bill of materials of following assemblies from its disassembled views: (i) Cotter joint- Sleeve & Cotter Joint, Spigot and Cotter joint (ii) Pin Joint or Knuckle joint (iii) Coupling-Flange coupling, Flexible coupling (iv)Pulley-Fast and loose pulley (v)Bearing-Bushed bearing, Plummer block (vi) Valves-Steam stop valve, Blow-off cock, Lever safety valve

UNIT-V Gear Drawing

Gear terminology such as pitch, pitch circle diameter, module, addendum, root circle diameter, hole depth, blank diameter etc., Construction of cycloidal, involutes teeth-profiles, Pinion and rack meshing, spur gear meshing.

COURSE OUTCOMES:
- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections of solids and development of surfaces. Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.

Text Books:
1. Machine Drawing, N.D. Bhatt, Charotar Book Stall, Anand
2. A Text Book of Machine Drawing, P.S.Gill, S.K.Kataria, Delhi
3. Machine Drawing, R.K.Dhawan,S,Chand,Delhi

Reference Books:
1. Textbook of Machine Drawing, K.C. John,PHI,Delhi
2. Machine Drawing, N.Sidheswar,P. Kannaiah, &V.V.S. Sastry, TMH,Delhi
3. Machine Drawing With Autocad,, Pohit, Goutam & Ghosh, Goutam,Pearson,Delhi

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Universal Human Values
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 305

COURSE OBJECTIVE:
- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I: COURSE INTRODUCTION: NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION
Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration what is it? - and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility-the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels, Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II: UNDERSTANDING HARMONY IN THE HUMAN BEING: HARMONY IN MYSELF
Understanding human being as a co-existence of the sentient 'I' and the material 'body', Understanding the needs of Self ('I') and 'Body': Happiness and Physical facility, Understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health, Include practice sessions to discuss the role others have played in making, Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY: HARMONY IN HUMAN-HUMAN RELATIONSHIP
Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intentions and competence, Understanding the meaning of Respect, Difference between respect and

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differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships, Discussion.
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UNIT-IV: UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE: WHOLE EXISTENCE AS COEXISTENCE

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence, include practice sessions to discuss human being as cause of imbalance and role of technology etc.

UNIT-V: IMPLICATIONS OF HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. **Competence in professional ethics:** Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems. **Strategy for transition from the present state to Universal Human Order: At the level of individual:** as socially and ecologically responsible engineers, technologists and managers, **At the level of society:** as mutually enriching institutions and organizations, Summary, include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g., to discuss the conduct as an engineer or scientist etc.

COURSE OUTCOME:
- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Text Book:
1. Human Values and Professional Ethics by R. R. Gaur, R.Sangal, G. P.Bagaria, Excel Books, New Delhi, 2010

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Reference Books:

1. Jeevan Vidya: EkParichaya,A. Nagaraj,JeevanVidyaPrakashan,Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Kinematics of Machine Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT316

COURSE OBJECTIVES:
- Analysis of mechanisms,
- Drawing displacement diagrams for followers with various types of motions,
- Cam profile drawing for various followers,
- Estimation of transmission of power by belts and application of various gears and gear trains.

LIST OF EXPERIMENTS
1. To determine the jump phenomena of cam follower apparatus.
2. To draw displacement, velocity and acceleration curve of cam motion.
3. To find out the load carrying capacity of bearing.
4. To find out the Coefficient of friction of bearing.
5. To find out the frictional horse power of bearing.
6. To find out the Pressure around the bearing by journal bearing apparatus.
7. To measure co-efficient of friction, power transmitted with varied belt tension by slip & creep apparatus.
8. To find out the percentage slip at fixed belt tension by varying load with slip & creep apparatus.
9. To find out belt slip and creep by slip and creep measurement apparatus.
10. To verify the coriolli's component of acceleration with theoretical and practical results.
11. To find the speed and torque of different gear in an epicyclic gear train.
12. To find the speed and torque of different gear in a simple, compound and reverted gear train.
13. To Study and analysis of Pantograph.
14. To study Four-bar mechanism and its inversions.
15. To study internal expanding and external contracting shoe brakes. 16. To study rope brake dynamometer and calculation of torque and power.

COURSE OUTCOMES:
- Designing a suitable mechanism depending on application
- Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,
- Drawing velocity and acceleration diagrams for different mechanisms,

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Thermodynamics Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT317

COURSE OBJECTIVES:

- To provide a mature approach to the basic principle of classical thermodynamics and to apply it to system surroundings interactions; involving work and heat transfer with associated property changes.
- To Use classical thermodynamics principles to develop algebraic relationships among key physical parameters and variable based on analysis of a specified system
- Use references that provide tabulated physical data that are useful to mechanical engineers.
- Familiarity with construction and performance parameters of Boilers

LIST OF EXPERIMENTS

1. To study Mountings & Accessories of a Boiler.
2. To study the Cochran Boiler and its Accessories and Mountings.
3. To study the Lancashire and it's Accessories and Mountings.
4. To study the Babcock Wilcox and it's Accessories and Mountings.
5. To study a Simple Steam Engine.
6. To study a Simple Steam Engine With D-Slide Valve.
7. To study a Compound Steam Engine.
8. To study Meyer's Expansion Valve of Steam Engine.
9. To study Drop Valve of Steam Engine.
10. To study Two Stroke Petrol Engine.
11. To study Four Stroke Petrol Engine.
12. Determination of vacuum efficiency and condenser efficiency of a surface steam condenser.
13. Performance and testing of steam jet condenser.
14. Study of Steam Turbines
15. Study of Reciprocating Compressor

COURSE OUTCOMES:

- Apply knowledge of classical thermodynamics for formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems.
- To continue the study of the applied thermodynamics.

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Machine Drawing Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 318

COURSE OBJECTIVES:

- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
- Apply auxiliary or sectional views to most practically represent engineered parts.
- Assemble important parts used in major mechanical engineering applications.

LIST OF EXPERIMENTS

1. General introduction of GUI
2. Setting up the drawing environment: Drawing aids, setting drawing units, setting grid, setting limits, function keys, object snap.
3. Using co-ordinate system-Cartesian coordinate, polar coordinate (Absolute and relative co-ordinate, direct distance entry methods).
4. Drawing Object-Use of various draw tools with illustrative exercise.
5. Modifying Objects- Use of various modify tools with illustrative exercise.
6. Creating texts and tables
7. Basic dimensioning, Geometric dimensioning and tolerancing
8. Adding constraints to sketches
9. Advance options for making complicated drawings –Layers, Blocks, View port.
10. Exercise problems on conversion of pictorial view to orthographic view
11. Exercise problems on conversion of pictorial view to orthographic sectional view
12. Assembly drawing of machine components.

COURSE OUTCOMES:

- Perform free hand sketching of basic geometrical constructions and multiple views of objects. Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces. Perspective sections of simple solids.
- Demonstrate computer aided drafting.

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Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Advanced Manufacturing Practices Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT319

COURSE OBJECTIVE:

- To make students acquaint the ability to measure and inspect to precise tolerances.
- To study the working drawings, understand operational symbols and execute machining operations.
- To study the performance of machine tools viz lathe etc.

LIST OF EXPERIMENTS

LATHE OPERATIONS

1. To Perform Plain turning in lathe machine
2. To Perform Taper turning in lathe machine
3. To Perform Step turning in lathe machine
4. To Perform Thread cutting in lathe machine
5. To Perform Facing in lathe machine
6. To Perform Knurling in lathe machine
7. To Perform Drilling in lathe machine
8. To Perform Boring in lathe machine

DRILLING OPERATIONS

1. Preparation of model with two or three different sizes holes for different materials.
2. Preparation models of different holes by maintain minimum distance between them.

SHAPING OPERATIONS

1. Hexagon on a round bar, key ways, grooves splines.
2. Shaping step block cut dovetail to angles 60, 90, 120 degrees.

GRINDING OPERATIONS

1. Grinding flat surface on a surface grinder.
2. Grinding Cutting tools to the required angles.

COURSE OUTCOME:

- Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
- Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.
- Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.
- Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and Gear cutting and estimate cutting time.

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Scheme & Syllabus
(IV Semester)
Bachelor of Technology
Mechanical Engineering

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MATS UNIVERSITY
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Scheme of Teaching & Examination

IV - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT410	Material Science & Metallurgy	3	3	0	-	70	30
2	BT411	Fluid Mechanics & Machinery	3	3	0	-	70	30
3	BT412	Mechanics of Solids- II	3	3	0	-	70	30
4	BT413	Dynamics of Machines	3	3	0	-	70	30
5	BT414	Fluid Mechanics & Machinery Laboratory	1	-	-	2	30	20
6	BT415	Dynamics of Machines Laboratory	1	-	-	2	30	20
7	BT416	Material Testing Laboratory	1	-	-	2	30	20
8	BT417	Material Science and Metrology Laboratory	1	-	-	2	30	20
9	BTP1XX	Professional Elective I	3	3	0	-	70	30
10	BTOXX	Open Elective I	3	3	0		70	30
		Total	22	18	0	8	540	260

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Material Science & Metallurgy
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 410

COURSE OBJECTIVES:

- To understand various mechanical properties of materials.
- To understand how and why the properties of materials are controlled by its structure at the microscopic and macroscopic levels.
- To understand how and why the structure and composition of a material may be controlled by processing.
- To understand the inter-relationship between composition, structure and properties of engineering materials.
- Get knowledge about different materials, their properties and application.

UNIT– I
Solidification of Metals and Alloys: Mechanism of solidification, nucleus formation and crystal growth, Homogeneous and Heterogeneous nucleation, Metal ingot structure-dendrite and columnar grains, grain boundaries, grain growth, solidification process, effect of grain size on properties of metals.

UNIT– II
Mechanical Properties of Materials: Elastic and Plastic behavior of solids, Material properties – Elasticity, Plasticity, Ductility, Malleability, Brittleness, Toughness, Stiffness, Yield strength, Resilience, Hardness, Hardenability, fatigue, creep, and Tensile strength. Deformation of Metals: Elastic deformation: Elastic after effect, Plastic deformation: Deformation by Slip (shear deformation)- Critical Resolved Shear Stress, Deformation by twinning, Differences between slip and twinning. Dislocation theory-Edge dislocation, Screw dislocation. Imperfection in crystal structure: Point defects – Interstitial Defect, Frankel Defect and Schottky defect; Line defects- Edge dislocations, Screw dislocation; Surface defects – Tilt boundary, Twin boundary and Stacking fault; Volume defects. Strain hardening, Seasons cracking, Baushinger effect, Cold and Hot working processes, effect on properties like recovery, recrystallization, grain growth and grain size.

UNIT–III
Phase Diagrams: Phase and phase equilibrium: solidification of pure metals and alloys, Gibb's phase rule, Hume-Rothery's rule, Types of Phase Equilibrium diagrams: Isomorphous- Lever rule, Monotectic, Eutectic-Hyper, hypoeutectic, EutectoidHyper, hypoeutectoid, Peritectic and Peritectoid system. Allotrophy of iron and Fe-C diagram.

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UNIT– IV

Heat Treatment of carbon and alloy steels: Introduction, purpose and advantages of heat treatment, defects due to faulty heat treatment, T-T-T curve and micro constituents in steel heat treatment processes like Annealing-stress relief, spheroidising, Process and Full annealing; Normalising, Hardening, Tempering- Austempering, Martempering, Surface hardening-Flame, Induction and Case hardening: Carbuising- Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-Nitriding.

UNIT– V

Engineering Materials: Composition, Properties and Application of the following Engg. Materials:- Ferrous Metals: Cast Iron & Steel, Cast Iron-Grey Cast Iron, White Cast Iron, Malleable Cast Iron, Nodular Cast Iron, Chilled CI, Alloy CI, Mechanite CI, Steels- Unalloyed steels or Plain carbon steels- Low, Medium, High carbon steels. Alloy steelsStainless steel, Martensitic stainless steel, Ferritic stainless steel, High Speed Steel, Heat resisting alloys; spring steel. NonFerrous Metals & Alloys - Copper Alloys: Brasses – Muntz metal, Cartridge brass, Admiralty brass, Naval Brass, Bronzes – Gun Metal, Phospher Bronze, Aluminium Bronze, Copper-Nickels alloys. Bearing metals- Babbit, Copper lead alloys, Bronze bearing alloys. Light metal alloys: Aluminium alloys- Duralumin, Cast Aluminium alloys, Aluminium Silicon Alloys. Sintered Carbide.

COURSE OUTCOMES:

- Acquire knowledge and hands-on competence in applying the concepts of material science in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering .
- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS

1. Engineering Physical Metallurgy – Lakhtin – CBS Publishers & Distributors
2. Materials Science- Narang – CBS Publishers & Distributors

REFERENCE BOOKS

1. Physical Metallurgy - Clark & Varney, East West Edn., New Delhi
2. Engineering Materials - Woulf series.
3. Material Science & Engg. – A first course – V. Raghavan – PHI (P) Ltd., Delhi, 2003
4. A Text Book of Material Science & Metallurgy – O.P. Khanna – Dhanpat Rai & Sons – New Delhi

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Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Fluid Mechanics and Machinery
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 411

COURSE OBJECTIVES:

- Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- The ability to formulate basic equations for Fluid Engineering problems
- The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
- The ability to perform dimensional analysis and identify important parameters

UNIT I Properties of fluid
Fluid,-ideal and real fluid, properties of fluid, mass density, weight density, specific volume, gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Newtonian and non-Newtonian fluids
Fluid Statics
Pressure, Pascal's law, hydrostatic law, pressure measurement, hydrostatic force on submerged plane and curved surface, Buoyancy.

UNIT – II
Fluid Kinematics
Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function.
Fluid Dynamics
Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle ,
Pitot tube. Impulse momentum equation, Momentum of Momentum equation. Vortex flow.

UNIT – III
Laminar Flow
Reynolds's experiment, shear stress and pressure gradient relationship, flow of viscous fluids in circular pipe and between two parallel plates.
Boundary Layer Theory
Boundary layer definition and characteristics, momentum equation, Laminar and turbulent, boundary Layer, Total drag, separation and control.

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UNIT – IV

Impulse Turbine

Classification of turbine, impulse turbine, Pelton wheel, Construction working, work done, head efficiency and Cavitations in turbines Design aspects, governing of impulse turbine.

Reaction Turbine

Radial flow reaction turbine, Francis turbine: construction, working, work done, efficiency, design aspect, advantages& disadvantages over pelton wheel.

UNIT-V

Axial flow reaction turbine

Propeller and Kaplan turbine, draft tube, specific speed, unit quantities, cavitations, degree of reaction, performance characteristics, surge tanks, governing of reaction turbine.

Centrifugal Pumps

Classification of Pumps-Centrifugal pump, Construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel, specific speed, characteristic, net positive suction head, cavitations.

COURSE OUTCOMES:

- Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application. As well as with multidisciplinary designs.
- Develop fundamentals to continue the study of the advance subject fluid machinery, Heat and mass transfer etc.

TEXT BOOKS

1. Mechanics of Fluids by Massey BS; Van Nostrand Reinhold Co
2. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som & G. Biswas – TMH
3. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd.

REFERENCE BOOKS

1. Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Poitman
2. Fluid Mechanics by Streetes VL and Wylie EB; Mcgraw Hill Book Co

MATS School of Engineering &I.T

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester   :   IV B.Tech
Branch   :   Mechanical Engineering
Subject   :   Mechanics of Solids – II
Total Theory Periods   :   48
Total Tutorial Periods   :   00
Total Credits   :   03
Code   :   BT 412

COURSE OBJECTIVES:
- To analyze solid mechanics problems using energy methods
- To analyze fixed beams and continuous beams.
- To solve for stresses and deflections of beams under unsymmetrical loading;
- To analyze column
- To analyze thin and thick pressure vessels

UNIT-I
Energy Methods:
Introduction, principles of superposition, strain energy, reciprocal relations, Maxwell Betti theorem, elastic strain energy relation in tension and compression, strain energy in beams subjected to bending and shaft to torsion. impact loading in tension and bending, first theorem of Castigliano and its applications

UNIT- II

Fixed Beams
Fixed beam subjected to different types of loads and couples, calculations of fixing moments and reactions at supports, deflection, effect of sinking of support.
Continuous beams
Continuous beams subjected to different type of loads and couples, beams with overhang, beams with one end fixed, Clapeyron's theorem, effect of sinking of supports

UNIT-III
Bending of curved bars
Bending of curved bars in plane of loading, Winkler Bech theory, crane hooks, chain links,bending of curved beams built in its initial plane, bending of circular bars subjected to symmetric loading, bending of circular rings, stresses in circular rings

UNIT-IV
Unsymmetrical Bending
Introduction to unsymmetrical bending, stresses due to unsymmetrical bending, deflection of beam due to unsymmetrical bending, shear center for angle, channel, and I-sections
Columns
Short Column (Strut), Eccentric loading on Strut, Stability of columns, Euler's formula for different end conditions, equivalent load, eccentric loading, Rankine's formula.

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UNIT – V
Pressure Vessels
Thin Pressure Vessels circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure, Stresses in thick and compound cylinders.

COURSE OUTCOMES:
- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS
1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
2. Elements of Strength of Material – Timo Shenko & Young – EWP Press
3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS
1. Strength of Material – Rider – ELBS
2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
3. Mechanics of Material – J.M. Gera & Time Shenko – CBS Publishers
4. Introduction to Solid Mechanics – I. H. Shames – PHI
5. Engineering Mechanics of Solids – E.P. Popov – PHI
6. Strength of Material – Shaums Outline Series – McGraw Hill

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Dynamics of Machines
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 413

COURSE OBJECTIVES:
- To synthesis, both graphically and analytically, multilink mechanisms.
- To perform mechanism analyses to find the position, velocity, acceleration, and dynamics and equilibrium of multi-bar mechanisms.
- To synthesis mechanism to perform certain prescribed task/motion
- To analyze mechanical systems.

UNIT- I
Static & Dynamic Force Analysis
Static equilibrium of two/three force members, Static equilibrium of member with twoforces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalentoffset inertia force, Dynamic force analysis of four link mechanism and slider crankmechanism, Engine force analysis-Piston and crank effort

Turning Moment & Flywheel
Turning moment on crankshaft, Turning moment diagrams-single cylinder double actingsteam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation ofenergy, Flywheel

UNIT- II
Balancing of Machines
Static and dynamic balancing, Balancing of several masses in the same plane anddifferent planes, Balancing of reciprocating masses, Balancing of primary force inreciprocatingengine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple,hammer blow

UNIT- III
Governors
Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter &Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, Stability,Hunting, Isochronism, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors

UNIT- IV
Gyroscopic Motion
Principles, Gyroscopic torque, Effect of gyroscopic couple on the stability of aero planes & automobiles
Mechanical Vibrations: Types of vibrations, Degrees of freedom, Single degree free & damped vibrations,Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft

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UNIT-V
Inertia force analysis
Effective force and inertia force of a link, Inertia forces in the reciprocating engine, Inertia forces in four bar chain.
Turning moment diagram for single and multi cylinder internal combustion engine, coefficient fluctuation of speed, coefficient of fluctuation of energy, flywheel.

COURSE OUTCOMES:
- Apply knowledge of Dynamics of machines for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts dynamics of machine in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering
- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS:
1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines - S.S. Rattan

REFERENCES BOOKS AND:
1. Theory of Machines – R.K. Bansal
2. Mechanics of Machines – V. Ramamurti
3. Theory of Machines – Khurmi & Gupta
4. Theory of Machines – P.L. Ballaney
5. Theory of Machines – V. P. Singh

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester   : IV B.Tech
Branch   : Mechanical Engineering
Subject   : Fluid Mechanics and Machinery Lab
Total Theory Periods   : 28
Total Tutorial Periods   : 00
Total Credits   : 01
Code   : BT 414

COURSE OBJECTIVES:
- Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- The ability to formulate basic equations for Fluid Engineering problems
- The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
- The ability to perform dimensional analysis and identify important parameters

LIST OF EXPERIMENTS
1. To determine the meta-centric height of a ship model.
2. To verify Bernoulli's Theorem.
3. To verify Impulse Momentum Principle.
4. To calibrate a Venturimeter and study the variation of coefficient of   discharge.
5. To calibrate an orifice-meter.
6. Performance characteristics of Pelton wheel turbine.
7. Performance characteristics of Francis turbine.
8. Performance characteristics of Kaplan turbine.
9. Performance characteristics of variable speed centrifugal pump.
10. Performance characteristics of rated speed centrifugal pump.
11. Performance characteristics of multistage centrifugal pump.

COURSE OUTCOMES:
- Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- Acquire knowledge of fluid mechanics for the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

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Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Dynamics of Machines Lab
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 415

COURSE OBJECTIVES:

- To synthesis, both graphically and analytically, multilink mechanisms.
- To perform mechanism analyses to find the position, velocity, acceleration, and dynamics and equilibrium of multi-bar mechanisms.
- To synthesis mechanism to perform certain prescribed task/motion
- To analyze mechanical systems.

LIST OF EXPERIMENTS

1. To find out the oscillations of simple pendulum with universal vibration apparatus.
2. To find out the oscillations of Compound pendulum with universal vibration apparatus.
3. To find out the radius of gyration of bi-filler suspension with universal vibration apparatus.
4. To find out undamped torsional vibrations of single rotor system with universal vibration apparatus.
5. To find out the frequency of damped torsional vibration of single rotor system with universal vibration vibration apparatus.
6. To measure the frequency of torsional vibrations of single rotor system with universal vibration apparatus.
7. To measure the frequency of torsional vibrations of double rotor system with universal vibration apparatus.
8. To find out free vibration of helical coiled spring with universal vibration apparatus.
9. To study forced damped vibration of a spring mass system and simple supported beam with universal vibration apparatus.
10. To find out the Gyroscopic couple and prove the Gyroscopic law with Gyroscope apparatus.
11. To find out the Power and effort of Proel, Porter & Hartnell Governor with Governor Apparatus.
12. To find out the critical speed for different diameters of shaft by whirling of shaft apparatus.
13. To verify the static and dynamic balancing for different planes and masses by balancing apparatus.

COURSE OUTCOMES:

- Apply knowledge of Dynamics of machines for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts dynamics of machine in the design and development of mechanical systems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

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Semester   :   IV B.Tech
Branch   :   Mechanical Engineering
Subject   :   Material Testing Lab
Total Theory Periods   :   28
Total Tutorial Periods :   00
Total Credits   :   01
Code   :   BT 416

COURSE OBJECTIVES:
- To analyze solid mechanics problems using energy methods
- To analyze fixed beams and continuous beams.
- To solve for stresses and deflections of beams under unsymmetrical loading;
- To analyze column
- To analyze thin and thick pressure vessels

LIST OF EXPERIMENTS
1. To study the Universal Testing Machine.
2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.
3. To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain.
4. To determine shear strength of Mild Steel on U.T.M.
5. To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M.
6. To study the Impact Testing Machine and test specimen of Izod and Charpy.
7. To determine Izod and Charpy Value of the given mild steel specimen.
8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.
9. To study the Spring Testing Machine.
10. 10.To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine.
11. To study the Torsion Testing Machine
12. To determine ultimate shear stress and modulus of rigidity under Torsion.
13. To study the Cupping Test Machine and to determine Erichsen value of Mild Steel sheet.
14. To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material.
15. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
16. To study the Vickers Hardness Machine and to conduct a test on the machine.
17. Buckling of column

COURSE OUTCOMES:
- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

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Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Material Science and Metrology Lab
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 417

COURSE OBJECTIVES:
- To provide the students with basic knowledge of materials science, so that they would be able to understand and distinguish between variety of materials based on their structure and properties
- The student can learn the measurements with and calibration of instruments. They also understand the machine tool alignment test.
- Material Science and Metrology lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

LIST OF EXPERIMENTS
1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Determination of tensile properties of composite
3. Determination of compressive properties and shear properties of unidirectional lamina
4. Determination of interlaminar shear strength, interlaminar tensile strength, interlaminar fracture toughness.
5. Preparation and study of the micro structure of Mild steel and Low carbon steel.
6. Preparation and study of the micro structure of High carbon steel and Stainless steel.
7. Preparation and study of the micro structure of Grey cast iron and White cast Iron.
8. Preparation and study of the micro structure of Malleable cast iron and Spheroidal cast iron.
9. Find out the hardness of various treated and untreated steels.
10. Machine tool alignment test on the lathe.
11. Machine tool alignment test on drilling machine.
12. Machine tool alignment test on milling machine.
13. Angle and taper measurements with bevel protractor, Sine bars, rollers and balls.
14. Use of spirit level in finding the straightness of a bed and flatness of a surface.
15. Thread inspection with two wire/ three wire method & tool makers microscope.
16. Surface roughness measurement with roughness measuring instrument.

COURSE OUTCOME:
- Students will get to know the different classes of materials used in engineering applications and would be able to choose the right materials for specific applications
- Understand the methods of measurement and selection of measuring instruments, standards of measurement.

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Scheme & Syllabus
(V Semester)
Bachelor of Technology
Mechanical Engineering

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MATS UNIVERSITY
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Scheme of Teaching & Examination

V - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT510	Manufacturing Technology	3	3	0	-	70	30
2	BT511	Machine Design – I	3	3	0	-	70	30
3	BT512	Energy Studies	3	3	0	-	70	30
4	BT513	Heat and Mass Transfer	4	3	1	-	70	30
5	BT514	Manufacturing Technology Laboratory	1	-	-	2	30	20
6	BT515	Machine Design - I Laboratory	1	-	-	2	30	20
7	BT516	Heat and Mass Transfer Laboratory	1	-	-	2	30	20
8	BT517	Vocational Training/ Internship I	3	-	-	-		50
9	BTP1XX	Professional Elective II	3	3	0	-	70	30
Total			**22**	**15**	**1**	**6**	**440**	**260**

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Mechanical Engineering
Subject	:	Manufacturing Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 510

COURSE OBJECTIVES:
- To apply the in-depth technical knowledge attained in areas such as manufacturing processes and materials, tooling, automation and production operations.
- Graduates will effectively use their communication skills in oral, written, visual and graphic modes within interpersonal, team, and group environments.

UNIT – I
Introduction to Manufacturing Processes:
Importance of manufacturing processes, classification, economic and technological definitions ofmanufacturing processes. **Foundry Pattern making** - Types, material, allowances, colour codes, core – types, materials and its properties. **Mould Making -** Types of sand moulding, design considerations, moulding machines & moulding procedure, moulding sand – types, properties, composition and applications. **Casting -** Procedure, Melting furnaces, casting defects. **Special Casting Processes -** Investment casting, centrifugal casting, shell moulding, CO2 moulding, slush casting, die casting.

UNIT – II
Welding
Principles of Welding, survey and allied processes. **Arc Welding** Power Source and Consumable, MMAW, TIG and MIG processes and their parameter selection, atomic hydrogen welding, welding of cast iron, welding electrode – types, composition, specification.
Resistance Welding Principle, equipment and processes. Thermit Welding, brazing & soldering, Internal and external welding defects, Inspection & testing of weld.

UNIT – III
Powder Metallurgy
Powder Manufacturing, compacting and sintering processes, Advantages, limitations and applications of powder metallurgy .
Manufacturing of Plastic Components
Advantages, application and principle of the following processes, extrusion, injection moulding compression moulding, transfer moulding, blow moulding .

UNIT – IV
Forging - Principle, types, tools and fixture of forging, forging dies, forging machines, forging design, drop forging die design ,upset forging die design, forging practice and process capability, forging defects, Inspection and testing of forged parts.

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Extrusion

Principle, extrusion processes, process parameters, extrusion equipment, extrusion defects.

Rolling - Principle, classification of rolled products, types of rolling, rolling mill train components, roll pass design for continuous mill.

UNIT-V

Drawing

Wire drawing, tube drawing: Principle, setup, type, process capability.

Press Working - Types of presses, selection of press, components of a simple press, press working operations – shear, bending, drawing etc., types of dies, die sets, considerations in die design, scrap strip layout.

Unconventional Machining - Advantages, application and limitation, survey of Non-conventional machining processes, mechanics of metal removal, tooling, equipment, process parameters and surface finish obtained & specific application of following processes - EDM, ECM, USM, AJM, EBM and LBM.

COURSE OUTCOMES :

- Ability to identify, formulate and solve technical problems.
- Ability to design and conduct experiments, and to analyze and interpret data.
- Ability to function effectively on teams and within a diverse environment.

TEXT BOOKS

1. Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi
2. A Text Book of Production Technology(Manufacturing Processes) – P.C. Sharma – S.
1. Chand and Company Ltd., New Delhi

REFERENCE BOOK

1. Manufacturing Science – A. Ghosh & A.K. Mallik – East West Press Pvt. Ltd., New Delhi
2. Production Technology – R.K. Jain – Khanna Publishers, New Delhi

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Semester	:	V B.Tech
Branch	:	Mechanical Engineering
Subject	:	Machine Design – I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 511

COURSE OBJECTIVES:
- To choose proper materials to different machine elements depending on their physical and mechanical properties.
- To design and analyze basic elements of machine e.g. key, shaft and axle.
- To design and analyze various type of joints for members with axial load
- To design and analyze couplings and clutches for members in torsion
- To design and analyze threaded fastener and power screws
- To design and analyze riveted and welded joint

UNIT I
Definition of design, types of design, design process, need, defining the problem, feasibility, preliminary design alternatives, final design selection, preliminary and final plant drawings. Failure criterion & manufacturing considerations in design, basis of good design, failure of machine parts ,deformations ,wear, corrosion, manufacturing methods, machining tolerance, surface finish, cost design consideration in casting & forging. Mechanical properties , application and designing as per ISI and their equivalence with other standards of engineering materials, selection of material ,temperature effect on properties of material such as cast iron ,plain carbon steel, plastics, polymers & composites & their application .

UNIT – II
Basic Elements Design: Types of key and design, design of socket-spigot cotter joint, sleeve and cotter joint, gib and Cotter joint, design of Knuckle joint, design of splines.

UNIT III
Threaded Fasteners: Geometry of thread forms, terminology of screw threads and thread standards, specifications of steel bolts, initial tension, and relation between bolt tension and torque, design of statically loaded tension joints, design of bolted joints due to eccentric loading.
Riveted Joints: Types of rivet heads, types of riveted joints, failure of riveted joint, strength of rivet joint, efficiency of riveted joint, design of riveted joint for boiler.
Welded joint: Types of welded joints, stresses in butt and fillet welds, strength of welded joints, location and dimension of weld design, eccentrically loaded joint, welded joint subjected to bending moment, design procedure, fillet welds under varying loads, stress relieving techniques.

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UNIT-IV

Collar friction, Stresses in screw, coefficient of friction, efficiency of thread.

Power Screws: Power screws, Force analysis-square and trapezoidal threads,

Chain Drives: Chain drives, roller chains, geometric relationships, dimensions of chain components polygonal effect, power rating of roller chains.

UNIT-V

Design of transmission Shafts on the Basis of Strength , rigidity and critical speed. ASME Code for shaft Design, Design of Stepped shaft Axle splined Shaft, Design of axle. Design of couplings –muff, rigid and Flexible coupling, design of axle.

COURSE OUTCOMES:

- Apply knowledge of machine design for understanding, formulating and solving engineering problems.
- Identify, analyze, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS

1. Mechanical Design of Machine : Maleev hartman.
2. Machine Design : P. H. Black.

REFERENCE BOOK

1. Mechanical Engg. Design : J. E. Shigley.
2. Design of Machine Element : V. Bhandari , TMH PUBLICATIONS
3. Design of Data for Machine Elements : B. D. Shiwalkar.

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Semester	:	V B.Tech
Branch	:	Mechanical Engineering
Subject	:	Energy Studies
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 512

COURSE OBJECTIVES:
- To understand the construction and operation of various jet and rocket engine
- To analyze jet engine and rocket engine from fluid and thermodynamic principle
- To study important non-conventional energy resources and the technologies for harnessing these.

UNIT-I
Energy Sources - Fossil fuels, Nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

UNIT-II
Energy Conversion- Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

UNIT – III
Classical sources of energy crisis and search for alternative sources of energy. Solar energy, earth sun angles ,resolution, solar measurement, collection of solar energy, flat plate and focusing collector analysis, calculations and same design parameters. Applications of solar energy .Introduction to Photovoltaic cell energy conversion techniques. Derivation for collector efficiency for flat plate collector.

UNIT – IV
Gasifiers, Gobar Gas plant, types of applications, Biomass conversion technologies, biogas Generation. Basic principles of wind energy conversion, wind energy estimation, site selection consideration, basic components of wind energy conversion system, classification, advantages & disadvantages of WECS.

UNIT-V
Energy Policy: Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations.

COURSE OUTCOMES:
- Acquire knowledge and hands-on competence in the design and development of mechanical systems.
- Compare different non-conventional energy resources and choose the most appropriate based on local conditions

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- Perform simple techno-economical assessments of non-conventional energy resources
- Perform and compare basic environmental assessments of non-conventional energy resources and conventional fossil fuel systems
- Design renewable/hybrid energy systems that meet specific energy demands, are economically feasible and have a minimum impact on the environment

TEXT BOOKS
1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, WileyEastern, 2005.
2. Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.
3. Solar Energy – Garg & Prakash – TMH Pub.

REFERENCE BOOK
1. Non Conventional Energy Sources – D.S. Chauhan – New Age International Pub.
2. Fundamental of Compressible Fluid Dynamics – P. Balachandran – PHI
3. Non-Conventional Energy Sources - G.D. Rai – Khanna Publishers

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Semester   :   V B.Tech
Branch   :   Mechanical Engineering
Subject   :   Heat and Mass Transfer
Total Theory Periods   :   60
Total Tutorial Periods :   01
Total Credits   :   03
Code   :   BT 513

COURSE OBJECTIVES:
- To provide a fundamental understanding of the principles of heat transfer due to conduction, convection and radiation.
- To achieve an understanding of the basic concepts of phase change processes.
- To understand the principles of mass transfer.
- To learn about the design of heat exchangers.

UNIT – I
Introduction
General equation of conduction in Cartesian and cylindrical coordinates. Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzmann's Law, Combined modes of heat transfer, thermal transfer, thermal diffusivity, overall heat transfer coefficient.
Conduction
The thermal conductivity of solids, liquids and gases, factors influencing conductivity measurement. The general differential equation of conduction. One dimensional steady state conduction, linear heat flow through a plane and composite wall, tube and sphere, critical thickness of insulation, Effect of variable thermal conductivity, Conduction with heat generation in flat and cylinders.

UNIT - II
Fins
Analysis of pin fins, conduction through infinite & semi infinite slab and cylinder. Conduction convection system, extended surfaces rectangular, triangular, circumferential and pin fins. General conduction analysis, fins of uniform and non-uniform cross sectional area. Heat dissipated by a fin. Effectiveness and efficiency of fins. Approximate solution. Design of fins for maximum heat transfer. Solution for different boundary condition. Use of fin analysis for measuring temperature error of Thermometer.
Transient/Unsteady State Heat Conduction
System with negligible internal resistance, Lumped capacity method and its Validity. Unsteady state conduction through finite and semi- infinite slab without surface resistance, convection boundary conditions. Solution through Heislers chart.

UNIT – III
Forced Convection
Physical Mechanism of Forced Convection, Dimensional analysis for forced convection, velocity and Thermal Boundary layer, Flow over plates, Flow across cylinders and spheres, Flow in tubes, Reynold's

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analogy. Derivation of laminar heat transfer coefficient for pipe internal flow.,Heat transfer over laminar And turbulent flow over flat plates.

Natural Convection

Physical Mechanism of Natural Convection, Dimensional analysis of natural convection; empirical relationship for natural convection.

UNIT- IV
Two Phase Heat Transfer

Boiling heat transfer, Pool boiling, boiling regimes and boiling curve, next transfer correlations in pool boiling. Condensation heat transfer, Film condensation, derivation for the average heat transfer coefficient 'h' for the case of laminar film condensation over vertical plate, Heat transfer correlation for inclined plates, vertical tubes, Horizontal bank tubes.

Heat Exchangers

Different types of heat exchangers; Determination of heat exchanger performance, Heat exchanger transfer units, Analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method) Preliminary design of heat exchangers (i) liquid to liquid (ii) liquid to gas.

UNIT- V
Thermal Radiation

Introduction, absorption and reflection of radiant energy, Emission, Radiosity and irradiation, Black and non black bodies, Kirchhoff's law; intensity of radiation, radiation exchange between black surface, geometric configuration factor. Grey body relation exchange between surface of unit configuration factors. Electrical analogy to simple problems. Non-luminous gas radiation. Errors in temperature measurement due to radiation.

Introduction to Mass Transfer

Mass and mole concentrations, molecular diffusion, eddy diffusion, Molecular diffusion from an evaporating fluid surface, Introduction to mass transfer in laminar and turbulent convection Combined heat and mass transfer, the wet and dry bulb thermometer.

COURSE OUTCOMES:

* Apply knowledge of heat transfer for understanding, formulating and solving engineering problems.
* Acquire knowledge and hands-on competence in applying the concepts of heat and mass transfer in the design and development of mechanical systems.

TEXT BOOKS
1. Heat Transfer – S.P. Sukhatme – TMH
2. Heat & Mass Transfer – D.S. Kumar – S.K. Kataria& Sons

REFERENCE BOOK
1. Heat transfer- C P Arora, TMH
2. Heat & Mass Transfer – K. Kannan – Anuradha Agencies
3. Heat Transfer – J.P. Holman – TMH
4. Heat Transfer – A Practical Approach – Yunus A. Cengel – McGraw Hill

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Mechanical Engineering
Subject	:	Manufacturing Technology Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 514

COURSE OBJECTIVE:

- To introduce the student to be familiar with manufacturing techonology terminology & its capabilities.
- To recognize geometric and graphical elements of engineering design problems
- To apply a "hands-on" understanding of the basic concepts of manufacturing and prototyping through group and individual projects

LIST OF EXPERIMENTS

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

COURSE OUTCOME:

- Understand the needs of master production schedule and methods to develop it.
- Plan and execute the production activity control, which actually deals with operations in the shop floor.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

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Semester : V B.Tech
Branch : Mechanical Engineering
Subject : Machine Design – I Laboratory
Total Theory Periods : 28
Total Tutorial Periods : 00
Total Credits : 01
Code : BT 515

COURSE OBJECTIVES:

- To choose proper materials to different machine elements depending on their physical and mechanical properties.
- To design and analyze basic elements of machine e.g. key, shaft and axle.
- To design and analyze various type of joints for members with axial load
- To design and analyze couplings and clutches for members in torsion
- To design and analyze threaded fastener and power screws
- To design and analyze riveted and welded joint

EXPERIMENTS TO BE PERFORMED

Each student shall submit two-assembly design report along with the drawing for assembly/sub assembly for any mechanical system consisting of not less than four machine elements included in the syllabus.

COURSE OUTCOMES:

- Apply knowledge of machine design for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.

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Semester	:	V B.Tech
Branch	:	Mechanical Engineering
Subject	:	Heat and Mass Transfer Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 516

COURSE OBJECTIVES:
- To provide a fundamental understanding of the principles of heat transfer due to conduction, convection and radiation.
- To achieve an understanding of the basic concepts of phase change processes.
- To understand the principles of mass transfer.
- To learn about the design of heat exchangers.

LIST OF EXPERIMENTS
1. To Determine Thermal Conductivity of Insulating Powders.
2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal Conductivity of Liquid.
4. To determine the transfer Rate & Temperature Distribution for a Pin Fin.
5. To Measure the Emissivity of the Test plate Surface.
6. To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
9. To Determine Critical Heat Flux in Saturated Pool Boiling.
10. To Study Performance of Simple Heat Pipes.
11. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12. To Find the Heat transfer Coefficient in Forced Convection in a tube.
13. To find out the thermal conductivity of given slab material.
14. To determine the individual thermal conductivity of different lagging in a lagged pipe.
15. To study the rates of heat transfer for different materials and geometries
16. Testing and performance of different heat insulators.

COURSE OUTCOME:
- Apply knowledge of heat transfer for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts of heat and mass transfer in the design and development of mechanical systems.

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Semester   :   V B.Tech
Branch   :   Mechanical Engineering
Subject   :   Vocational Training/ Internship- 1
Total Credits   :   03
Code   :   BT 517

COURSE OBJECTIVE:
- The training helps the students gain a much deeper knowledge and interest about the stream of engineering so opted for.
- The training readily enhances the technical skills of the individuals in a practical environment.
- Learning the basics about working individually as well as in a team
- The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

DESCRIPTION
1. A 4-6-week industry internship is a compulsory course requirement during summer vacation (pre-semester). Each student shall submit vocational training report along with the training certificates of not less than four weeks at least included in the syllabus.
2. Evaluation marks to be carried over to present Semester.
3. Every student of the course is expected to work in the industry for a period of 4 - 6 weeks, during the months of May to June, after completing four semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.

COURSE OUTCOMES:
- Understand the working procedures in industry
- Gain knowledge about contemporary technologies
- Gain motivation towards lifelong learning

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Scheme & Syllabus
(VI Semester)
Bachelor of Technology
Mechanical Engineering

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Scheme of Teaching & Examination VI - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT610	Computer Aided Design & Manufacturing	4	3	1	-	70	30
2	BT611	Machine Design- II	4	3	1	-	70	30
3	BT612	Internal Combustion Engine	3	3	0	-	70	30
4	BT613	Computer Aided Design & Manufacturing Lab	1	-	-	2	30	20
5	BT614	Machine Design – II Laboratory	1	-	-	2	30	20
6	BT615	Internal Combustion Engine Laboratory	1	-	-	2	30	20
7	BT616	Project I	2	-	-	4	70	30
8	BTP1XX	Professional Elective III	3	3	0	-	70	30
9	BTOXX	Open Elective II	3	3	0	-	70	30
Total			**22**	**15**	**2**	**10**	**510**	**240**

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	VI B.Tech
Branch	:	Mechanical Engineering
Subject	:	Computer Aided Design and Manufacturing
Total Theory Periods	:	60
Total Tutorial Periods	:	01
Total Credits	:	03
Code	:	BT 610

COURSE OBJECTIVE:
- To introduce the student to be familiar with CAD/CAM terminology & its capabilities.
- To become familiar with CAD/CAM software, Graphical user interface & basic tools.
- To recognize geometric and graphical elements of engineering design problems
- To apply a "hands-on" understanding of the basic concepts of computer-aided manufacturing and prototyping through group and individual projects

UNIT – I
Introduction CAD/CAM
The influence of computers on manufacturing environment, Introduction of CAD/CAM, the product cycle & CAD/CAM, automation and CAD/CAM, the common database as linkage to various computerized applications. Product engineering, Benefits of CAD/CAM, Concurrent engineering.

UNIT – II
Geometric Modelling
Data base: Design database concept, objectives, data structures, creation of data files in application programs and relational database management system.
Requirement of Geometric Modelling, Geometric models, Geometric construction Methods, other modelling methods, curve representation, desirable modelling facilities & rapid prototyping.3D representation of surfaces and solids; Plane surface, surfaces of revolution, Bezier surfaces, spline surfaces, Solid entities, basic set theory.

UNIT – III
Numerical Control
Introduction to Numerical Control, Basic components of an NC system, the NC procedure, NC coordinate systems, NC motion control systems, applications of Numerical Control, Introduction to Computer Control in NC, problems with conventional NC, Computer Numerical Control, Direct Numerical Control, Combined DNC/CNC system, Adaptive control machining system,
NC Part Programming
Introduction to NC Part Programming, Manual part programming, Computer assisted part programming, the APT (Automatically Programming Tool) language, MACRO statement in APT, Advantages of CAD/CAM in NC programming.

UNIT – IV Group Technology
introduction to group technology, part families, parts classification & coding, three parts classification &

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coding system, group technology machine cells, benefits of group technology Computer integrated manufacturing (CIM) system. Introduction of CAPP, Flexible manufacturing system, benefits.

UNIT V Finite Element method

Introduction, types of analysis, general procedure of finite element analysis- stiffness matrix, solution procedure, one dimensional problem.

COURSE OUTCOME:
- Understand the various CAD/CAM and CNC processes.
- Understand the needs of master production schedule and methods to develop it.
- Plan and execute the production activity control, which actually deals with operations in the shop floor.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

TEXT BOOKS
1. CAD/CAM Principles & Applications – P.N. Rao – TMH Publication
2. CAD/CAM Computer Aided Design & Manufacturing – Mikell P. Groover, Emory W. Zimmer – Pearson Education
3. Concept and application of Finite element analysis, R D Cook, John Wiley

REFERENCES BOOKS
1. CAD/CAM Theory & Practice – Ibrahim Zied – TMH Publication
2. CAD/CAM – Surendra Kumar & A.K. Jha – Dhanpat Rai & Company
3. Finite element analysis

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Semester	:	VI B.Tech
Branch	:	Mechanical Engineering
Subject	:	Machine Design – II
Total Theory Periods	:	60
Total Tutorial Periods	:	01
Total Credits	:	03
Code	:	BT 611

COURSE OBJECTIVES:
- To design and analyze coil, leaf and laminated springs.
- To design and analyze spur, helical and bevel gears.
- To design and analyze rolling contact bearings.
- To design and analyze journal bearing.

UNIT - I Springs: Spring materials and their mechanical properties, equation for stress and deflection, helical coil springs of circularsection for tension, compression and torsion, dynamic loading, fatigue loading, Wahl line, leaf spring and laminated spring.

UNIT- II Spur Gears: Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems,
Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.
Helical Gears : Terminology, Proportions for helical gears, Beam strength and wear strength of helical gears, herringbone gears, crossed helical gears, Design of helical gears.

UNIT - III Bevel gears : Types of bevel, Terminology, Gear tooth proportions, Efficiency of bevel gears, Heat dissipation in bevel gearing, Strength and wear tooth load for bevel gears, Design of bevel gearing
Worm Gears: Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing

UNIT- IV Sliding Contact Bearing : Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,
Rolling Contact Bearing : Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing.

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UNIT- V Clutches and Brake: Friction clutches, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, centrifugal clutches. Design of brake, Shoe brake, Band Brake , Internal Expanding Brake.

COURSE OUTCOMES:
- Apply knowledge of machine design for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.

TEXT BOOKS
1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebers-Alex Valance and VI Doughtie, McGraw Hill Co.

REFERENCES BOOKS
1. Design Data book- P S Gill
2. Design Data Book – B D Shivalkar

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Semester   :   VI B.Tech
Branch   :   Mechanical Engineering
Subject   :   Internal Combustion Engine
Total Theory Periods   :   48
Total Tutorial Periods   :   00
Total Credits   :   03
Code   :   BT 612

COURSE OBJECTIVES:
- To study classifications of internal combustion engine.
- To understand how and why actual cycles deviate from air standard cycle and fuel- air cycle.
- To understand combustion in spark ignition engine and diesel engines.
- To impart knowledge on fuel and its specifications
- To impart knowledge about carburetion, gasoline injection and diesel injection.
- To impart knowledge about ignition, cooling, lubrication and governing systems.
- To impart knowledge about various engine performance characteristics and its testing

UNIT – I   Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems.

UNIT – II   Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems.performance against mixture strength.

UNIT – III   Combustion in I.C. Engines : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.performance of diesel engine .

UNIT – IV   Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

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UNIT – V   Engine Testing and Performance: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems.   Air pollution from I.C. Engine and Its remedies: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

COURSE OUTCOME:
- Demonstrate a basic understanding of engine design, function and performance.
- Acquire knowledge and hands-on competence in the design and development of mechanical systems.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.
- Demonstrate an understanding of the relationships between the design of the internal combustion engine and environmental issues

TEXT BOOKS:
1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines – V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India

REFERENCE BOOKS:
1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech
Branch	:	Mechanical Engineering
Subject	:	Computer Aided Design & Manufacturing Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT613

COURSE OBJECTIVES:

- To introduce the student to be familiar with CAD/CAM terminology & its capabilities.
- To become familiar with CAD/CAM software, Graphical user interface & basic tools.
- To recognize geometric and graphical elements of engineering design problems
- To apply a "hands-on" understanding of the basic concepts of computer-aided manufacturing and prototyping through group and individual projects
- To study Basic features of CAM so as to be capable of accepting professional responsibilities and to understand the associatively between design and manufacturing.
- Integrate the CAD system and the CAM system by using the CAD system for modelling design information and converting the CAD model into a CAM model for modelling the manufacturing information.

LIST OF EXPERIMENTS (CAD)

1. Introduction & different features of the CAD Software
2. 2-D Drafting
3. 3-D Modelling
4. 3-D Advanced Modelling
5. Assembly modelling
6. Feature Modification and Manipulation
7. Detailing
8. Sheet Metal Operations
9. Surface Modelling
10. One Dimensional problems of Finite Element Method.

(These exercises may be performed by any of the following Advanced CAD Software)

LIST OF EXPERIMENTS (CAM)

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.

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10. To prepare part program for drilling operation.
11. To prepare part program for multiple drilling operation in Z-axis.
12. To prepare part program for multiple drilling in X-axis.
13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

COURSE OUTCOME:

- Understand the various CAD/CAM and CNC processes.
- Generate and verify the tool path and NC programs for milling and drilling manufacturing processes.
- Recognize various types of Curves, surface and Solid and their application as used in geometric modeling.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

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Semester   : VI B.Tech
Branch   : Mechanical Engineering
Subject   : Machine Design – II Laboratory
Total Practical Periods : 28
Total Credits   : 01
Code   : BT614

COURSE OBJECTIVES:
- To design and analyze coil, leaf and laminated springs.
- To design and analyze spur, helical and bevel gears.
- To design and analyze rolling contact bearings.
- To design and analyze journal bearing.

EXPERIMENTS TO BE PERFORMED

Each student shall submit two-assembly design report along with the drawing for assembly/sub assembly for any mechanical system consisting of not less than four machine elements included in the syllabus.

COURSE OUTCOMES:
- To be able to understand application and design of springs, pressure vessels, etc.
- To understand and apply lubrication theory to design of journal bearings
- To be able to select rolling element bearing for a given application
- To be able to design spur gears, helical gears, bevel gears and worm sets

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Semester	:	VI B.Tech
Branch	:	Mechanical Engineering
Subject	:	Internal Combustion Engine Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT615

COURSE OBJECTIVES:
- Describe the combustion phenomenon in SI and CI engines
- Identify fuel metering and fuel supply systems for different types of engines
- Explain and analyze fuel pump and simple carburettor
- Carry out thermodynamic analysis of simple and improved ICE cycles
- Study of fuel supply system of a petrol engine and their fuels

LIST OF EXPERIMENTS (MINIMUM SIX EXPERIMENTS AND FOUR STUDIES)
1. Study of IC Engine models
2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models.
3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburettor)
5. Study of complete caurburettor (Solexcaurburettor)
6. Study of Petrol Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.
14. To draw the valve timing diagram of a Four stroke S.I. or C.I. Engine using experimental setup.
15. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

COURSE OUTCOMES:
- Evaluate the performance parameters of internal combustion engine.
- Identify and describe cooling and lubricating circuit of IC engine.
- Understand the valve timing and valve functioning of IC engine
- Understand the Common Rail Direct Injection system

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Semester	:	VI B.Tech
Branch	:	Mechanical Engineering
Subject	:	Project-I
Total Credits	:	02
Code	:	BT 616

COURSE OBJECTIVE:
- To develop the ability of solving a specific problem right from its identification
- To train the students in preparing project reports and to face reviews and viva voce examination.
- To produce scientific content in the form of report writing as per the standard norms

SUMMARY/ PROCEDURE OF PROJECT-I
1. The objective of the Project-I is to make use of the knowledge gained by the student at various stages of the degree course.
2. Students are permitted to form group of likeminded colleagues (not more than 4 members) for working on a particular project/topic.
3. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
4. There shall be four assessments during the semester by a review committee.
5. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
6. The Head of the Department shall constitute the review committee for each branch of study.
7. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner.
8. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
9. Each student is required to submit a Project report on the project assigned to him/group by the department.
10. The report should be based on the information available in the literature or data obtained by the student by way of experiments conducted in the laboratory/industry.

COURSE OUTCOME:
- On Completion of the project -1, students will be in a position to conduct experimental or Computational investigations relevant to practical problems by formulating proper methodology.
- To be able to formulate a practical problem in real life to explore for its possible solution after suitable review of literature.
- To be able to analysis the given problem and suffest suitable solution on the bans of background engineering knowledge
- To be able to synthesize the outcome of the problem and validate findings on the basis of experimentation
- To produce scientific content in the form of report writing as per the standard norms

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Scheme & Syllabus
(VII Semester)
Bachelor of Technology
Mechanical Engineering

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MATS UNIVERSITY
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Scheme of Teaching & Examination

VII - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT710	Automobile Engineering	3	3	0	-	70	30
2	BT711	Refrigeration & Air-conditioning	3	3	0	-	70	30
3	BT712	Robotics	3	3	0	-	70	30
4	BT713	Automobile Engineering Laboratory	1	-	-	2	30	20
5	BT714	Refrigeration & Air-conditioning Laboratory	1	-	-	2	30	20
6	BT715	Intresship II	3	-	-	-		50
7	BT716	Project II	2	-	-	4	70	30
8	BTP1XX	Professional Elective IV	3	3	0	-	70	30
9	BTOXX	Open Elective III	3	3	0	-	70	30
Total			**22**	**15**	**0**	**8**	**480**	**270**

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	VII B.Tech
Branch	:	Mechanical Engineering
Subject	:	Automobile Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 710

COURSE OBJECTIVES:
- Understand the basic structure of an automobile
- Understand construction of suspension system
- Understand transmission system and its elements
- Understand braking system, steering system and electrical system

UNIT-I
Chassis & Frame - Layout of chassis & its main components, types of frames, conventional frames & unitized chassis.
Suspension system &Springs -Objects & principles of suspension, system, types, rigid axle suspension & Independent suspension for front & rear ends, simple & double arm parallel & perpendicular type of suspension system. Gas filled suspension system.
Springs - Purpose, types viz. leaf, coiled, rubber, air, suspension system, torsion bar, stabilizer, Telescopic damper.

UNIT – II
Clutches: Characteristics, functions, principles of operation of clutch, friction clutch, single plate, multi plate, centrifugal clutch, positive clutch, friction plate clutch lining materials. Torque transmitted and related problems.
Fluid flywheel: Construction, principles of working & characteristics.

UNIT – III
Gear Box: Object of Gear Box, Air, rolling & gradient resistance, tractive effort variation with speed, performance curve.
Types of Gear Boxes:- Sliding mesh, constant mesh, synchromesh device, automatic transmission, overdrive, lubrication of gear box.
Torque converter: Principles of working, characteristics, Torque converter with direct drive.
Testing of automobiles

UNIT – IV
Universal Joint-: Types, propeller shaft, slip joint.
Differential – Functions, single & double reduction differential, limited slip differential.
Front Axle: Live & dead axle, stub axle.
Back Axle: Hotch kiss drive, torque tube drive.

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Brakes & Braking system: Purpose, principles, layout of braking system. Classification, mechanical, hydraulic, master cylinder, Tandoma master cylinder wheel cylinder, self energizing & self adjusting brakes, disc brakes, antiskidbrakes.power operated brakes:

UNIT – V

Steering system:- Gear & links, types of steering gears, reversibility of steering, center point steering, steering geometryviz castor, camber, king pin inclination toe in, toe out, cornering power, under-over steer; power steering, effect of shimmy, condition of true rolling, calculation of turning radius. Correct steering equation and related problems.

COURSE OUTCOMES:

- To be able to assemble piston and connecting rod over a crank-shaft.
- To study the gear train of an automobile engines.
- To feel and experience lubrication system of automobile engines.
- To have hands on experience of the working of brakes system of an automobile.

TEXT BOOKS

1. Automobile Engineering – Kripal Singh – Standard Publications
2. Automobile Engineering – G.B.S. Narang – Khanna Publishers

REFERENCE BOOKS

1. Automobile Engineering - Dr. N. K. Giri – Khanna Publishers
2. Automobile Engineering – K. R. Govindan – Anuradha Agencies
3. Automotive Mechanics – Heitner
4. Motor Vehicle – Newton & Steeds – Life & Sons Limited.

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SCHOOL OF ENGINEERING & I.T.

Semester : VII B.Tech
Branch : Mechanical Engineering
Subject : Refrigeration & Air – Conditioning
Total Theory Periods : 48
Total Tutorial Periods : 00
Total Credits : 03
Code : BT 711

COURSE OBJECTIVES:

- Analyze vapour compression cycles.
- Analyze alternative systems such as gas cycle refrigeration and vapour absorption etc.
- Understand psychrometry and psychrometric processes
- Select/ design equipment for refrigeration and air-conditioning systems.
- Carry out air conditioning calculations.

UNIT – I
Introduction: Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle.
Vapour Compression Refrigeration System: Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle.
Multiple Evaporator and compressor system.: Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.

UNIT – II
Gas cycle Refrigeration: Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E.
Air cycle for air craft: Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.

UNIT – III
Vapour Absorption System: Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System.
Refrigerants: Properties of refrigerants, Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants.
Refrigeration Equipments: Compressor, condenser, evaporator, expansion devices – types & working.

UNIT – IV
Psychrometry: Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor and air washers.
Human Comfort: Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.

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UNIT – V
Cooling load calculations: Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system for summer and winter (with sketches), main parts of air conditioning ,duct flow and materials .

COURSE OUTCOMES:
- Acquire knowledge and hands-on competence in the design and development of refrigeration and air conditioning system
- Demonstrate an understanding of Multiple Evaporator and compressor system
- Demonstrate a basic understanding of Vapour Compression Refrigeration System

TEXT BOOKS
1. Refrigeration & Air Conditioning – Ahmadid, Amean - PHI
2. Refrigeration and Air Conditioning –C. P. Arora - TMH.

REFERENCE BOOKS
1. Refrigeration and Air Conditioning – Manohar Prasad – Newage International Pub
2. Refrigeration and Air Conditioning – Arora&Domkundwar – DhanpatRai& Sons
3. Refrigeration and Air Conditioning – P.L. Ballaney – Khanna Pub.
4. Refrigeration and Air Conditioning – W.F. Stooker

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Semester	:	VII B.Tech
Branch	:	Mechanical Engineering
Subject	:	Robotics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 712

COURSE OBJECTIVES:
- Analyze Robotic Sensors and Vision.
- Select/ design equipment for Robotic Sensors and Vision systems.
- Carry out calculations of Robot Applications.

UNIT-I Introduction to Robotics
Evolution of Robots and Robotics, Laws of Robotics, What is and What is not a Robot, Progressive Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Programming Robots, The Future Prospects, Notations.

UNIT – II Coordinate Frames, Mapping and Transforms
Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation Matrices

UNIT – III Symbolic Modeling of Robots – Direct Kinematic Model
Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transormation Matrix. Introduction to Inverse Kinematic model

UNIT – IV Robotic Sensors and Vision
The Meaning of Sensing, Sensors in Robotics, Kinds of Sensors used in Robotics, Robotic vision, Industrial Applications of Vision-Controlled Robotic Systems, Process of Imaging, Architecture of Robotic Vision Systems, Image Acquisition, Description of Other components of Vision System, Image Representation, Image Processing.

UNIT – V Robot Applications
Industrial Applications, Material Handling, Processing Applications, Assembly Applications, Inspection Application, Principles for Robot Application and Application Planning, Justification of Robots, Robot Safety, Non-Industrial Applications, Robotic application for sustainable Development.

COURSE OUTCOMES:
- Understand robotics and automation terminology.
- Evaluate and plan robotic path.
- Know various end effectors along with selection criterion
- Analyze robot matching with workplace

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TEXT BOOKS
1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications - M.P.Groover, M.Weiss, R.N.Nagel,N.G.Odrey

REFERENCE BOOKS
1. Robotics Control Sensing, Vision and Intelligence - K.S.Fu, R.C.Gonzalex, C.S.G.Lee- McGrew hill Book co.
2. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co

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Semester   :   VII B.Tech
Branch   :   Mechanical Engineering
Subject   :   Automobile Engineering Laboratory
Total Theory Periods :   28
Total Tutorial Periods :   00
Total Credits   :   01
Code   :   BT 713

COURSE OBJECTIVES:
- Basic Understanding of automobile and its terminology.
- Understanding of various types of power generating devices
- Application of engineering principles to automotive performance
- Understanding of Automobile sub systems e.g. power train, brakes, suspension etc.

LIST OF EXPERIMENTS
1. Study of Frame and Chassis.
2. Study of Clutches – Single Plate, Multi Plate and Centrifugal
3. Study of Gear Boxes – Sliding mesh, Constant mesh, Synchro mesh.
4. Study of Differential, Universal joints, Axles and Slip Joints.
5. Study of Brakes – Mechanical, Hydraulic, Air Brake and Disc Brake.
6. Study of Steering System used with Rigid Axle suspension and independent suspension system, Power Steering
7. Study of different types of springs used in Automobiles.
8. Study of Rigid Axle suspension system.
9. Study of Front Independent Suspension System.
10. Study of Read Independent Suspension System.
11. Study of Battery, Staring and Generating System and Battery Charging System.
12. Study of Automotive Electrical System.
13. Study of Educational Car Model.

COURSE OUTCOME:
- To identify various subsystems of chassis
- To identify engine components and its subsystems such as cooling, lubrication fuel supply system
- To introduce students to steering, suspension, braking systems.
- To understand working of various types of power transmission systems

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VII B.Tech
Branch	:	Mechanical Engineering
Subject	:	Refrigeration & Air-conditioning Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 714

COURSE OBJECTIVES:

- To be able to have working knowledge of tools used in repair & maintenance of Refrigerator& Air conditioner.
- To be able to understand assembly & components refrigeration & air conditioner like condensers, cooling coil etc.
- To be able to practice gas welding &soldering
- To be able to change gas in refrigerators
- To have working knowledge of electric circuit in Refrigerator & Air conditioner.
- To troubleshoot problem in refrigeration& Air conditioning
- To be able to test for leakage etc. in refrigerators and air conditioners.

LIST OF EXPERIMENTS

1. To study Domestic Refrigerator.
2. To study the Hermetically Sealed Compressor.
3. To study Refrigeration Tutor and to determine the following:-
   a. Theoretical coefficient of Performance
   b. Actual Coefficient of Performance.
   c. Theoretical capacity of the plant
   d. Actual capacity of the plant.
4. To Study the Mechanical Heat Pump and to determine the following:-
   a. Theoretical coefficient of Performance
   b. Actual Coefficient of Performance.
   c. Theoretical capacity of the plant
   d. Actual capacity of the plant
5. To study the Air and Water Heat Pump and to determine the following:-
   a. Theoretical coefficient of Performance of the system as a refrigerator and as a heat pump.
   b. Actual Coefficient of Performance of the system as a refrigerator and as a heat pump.
   c. Capacity of the system in tons as a refrigerator.
   d. Capacity of the system in kW as a heat pump under the following conditions of operation:-
   i. Water cooled condenser and water-cooled evaporator.
   ii. Water-cooled condenser and air-cooled evaporator.

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      iii.   Air-cooled condenser and air-cooled evaporator.

      iv.   Air-cooled condenser and water-cooled evaporator.

6. To study the following processes on the Air Conditioning Test Rig.
   a. Sensible Heating
   b. Sensible Cooling
   c. Sensible Cooling/cooling dehumidification
   d. Humidification and cooling
7. To Find the Efficiency of Cooling Tower Test Rig.
8. To Study the Simple vapor Absorption System.
9. To study the AC Simulator and to determine the following:-
   a. Sensible Heating
   b. Sensible Cooling
   c. COP of R-22
   d. Air Washer Efficiency
   e. Sensible heat load applied
   f. Latent heat load applied
   g. RSHF
   h. ESHF

COURSE OUTCOMES:
- Understand the theory and practical concepts of various types of Refrigeration systems
- Understanding of types of compressors, condensers, expansion devices
- Understanding of comfort and Industrial air conditioning

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Semester   :   VII B.Tech
Branch   :   Mechanical Engineering
Subject   :   Internship-II
Total Credits   :   03
Code   :   BT 715

COURSE OBJECTIVE:
- The Internship-II helps the students gain a much deeper knowledge and interest about there learning in Internship-I
- The training readily enhances the technical skills of the individuals in a practical environment.
- The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

DESCRIPTION
1. A 4-6 week industry internship-II is a compulsory course requirement during summer vacation.
2. It is compulsory for every student to submit their daily report once the back to campus after completing the internship period.
3. Every student of the course is expected to work in the industry for a period of 4 - 6 weeks, during the months of June-July, after completing sixth semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.
5. Evaluation marks to be carried over to present Semester.

COURSE OUTCOME:
- Understand the working procedures in industry with more interest as in phase-I
- Gain knowledge about modern technologies adopted in engineering works
- Apply new methods to investigate complex engineering problems
- Gain motivation towards lifelong learning

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SCHOOL OF ENGINEERING & I.T.

Semester : VII B.Tech
Branch : Mechanical Engineering
Subject : Project-II
Total Credits : 02
Code : BT 716

COURSE OBJECTIVE:
- To utilize the knowledge gained from literature survey and continue to solve the chosen problem (in Project-I) till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination
- Success /failure in project work built confidence in students

SUMMARY/ PROCEDURE OF PROJECT-II
1. The objective of the Project-II is to make use of the knowledge gained by the student at various stages of the degree course.
2. Students are permitted to form group of likeminded colleagues (not more than 3 members) for working on a particular project/topic.
3. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
4. There shall be four assessments during the semester by a review committee.
5. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
6. The Head of the Department shall constitute the review committee for each branch of study.
7. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner.
8. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
9. Each student is required to submit a Project report on the project assigned to him/group by the department.
10. The report should be based on the information available in the literature or data obtained by the student by way of experiments conducted in the laboratory/industry.

COURSE OUTCOME:
- On Completion of the project-II work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
- Gain confidence to deal real life problems

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MATS UNIVERSITY
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Scheme & Syllabus
(VIII Semester)
Bachelor of Technology
Mechanical Engineering

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Scheme of Teaching & Examination

VIII - Semester

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of marks	
				L	T	P	ESE	IM
1	BT810	Internship/ Training III	6				70	30
2	BT811	Project III	6				120	80
3	BTP1XX	Professional Elective V (Online Mode/ MOOCs)	3				70	30
4	BTOXX	Open Elective IV (Through Online Mode/ MOOCs)	3				70	30
Total			**18**	**0**	**0**	**0**	**330**	**170**

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester   :   VIII B.Tech
Branch   :   Mechanical Engineering
Subject   :   Internship-III
Total Credits   :   06
Code   :   BT 810

COURSE OBJECTIVE:
- It gives career alternatives prior to graduation
- Provides a platform to Integrate theory and practice
- Assess interests and abilities in their field of study
- Develop communication, interpersonal and other critical skills in the job interview process
- Acquire employment contacts leading directly to a full-time job following graduation from college

DESCRIPTION:

1. A 6-8 week industry internship-III is a compulsory course requirement during winter vacation.
2. It is compulsory for every student to submit their daily report once the back to campus after completing the internship period.
3. Every student of the course is expected to work in the industry for a period of 6-8 weeks, during the months of December-January, after completing seventh semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.
5. Evaluation marks to be carried over to present Semester.

COURSE OUTCOME:
- Develop work habits and attitudes necessary for job success
- Identify, write down, and carry out performance objectives (mutually agreed upon by the employer and the student) related to their job assignment.
- Application of theory into practice develop confidence and improve understanding
- Job/work environment help student for interview and job opportunity

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Semester   :   VIII B.Tech
Branch   :   Mechanical Engineering
Subject   :   Project-III
Total Credits   :   06
Code   :   BT 811

COURSE OBJECTIVE:

- Final Year Projects offer the opportunity to apply and extend material learned throughout the engineering
- Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.
- In contrast to the majority of courses studied elsewhere in the program, projects are undertaken individually or in small groups.
- The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies, and vary from year to year.
- The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres.

SUMMARY/PROCEDURE OF PROJECT-III

1. The objective of the project-III work is to enable the students to work in a group of likeminded colleagues on a project involving theoretical and experimental studies related to the branch of study.
2. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
3. Students are permitted to form group of likeminded colleagues (not more than 3 members) for working on a particular project/topic.
4. Students can opt for the co-guide from industries/ other colleges to get the necessary supervision.
5. There shall be four assessments during the semester by a review committee.
6. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
7. The Head of the Department shall constitute the review committee for each branch of study.
8. The total marks obtained in the four reviews, shall be taken in to account.
9. There will be a viva-voce examination at the end of the Project-III work, conducted by one internal examiner and one external examiner.
10. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
11. Every project work shall have a guide who is the member of the faculty of the institution.
12. Eighteen periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
13. Each student/group shall finally produce a comprehensive report in the form of Thesis covering background information, literature survey, problem statement, project work details and conclusion.

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14. This final report shall be typewritten form as specified in the guidelines.

COURSE OUTCOME:
- Demonstrate a sound technical knowledge of their selected project topic
- Undertake problem identification, formulation and solution
- Design engineering solutions to complex problems utilizing a systems approach
- Communicate with engineers and the community at large in written an oral forms
- Demonstrate the knowledge, skills and attitudes of a professional engineer

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Professional Electives (Syllabus)
Bachelor of Technology
Mechanical Engineering

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List of Professional Electives – Mechanical Engineering

S.No.	Subject Code	Subject Name
1	BTP101	Composite Materials
2	BTP102	Engineering Measurement
3	BTP103	Advanced Thermal Systems
4	BTP104	Mechanical Behavior of Materials
5	BTP105	Engineering Economics
6	BTP106	Machine tools technology
7	BTP107	Welding Technology
8	BTP108	Disaster Management
9	BTP109	Engineering Risk Benefits Analysis
10	BTP110	Global Strategy Technology
11	BTP111	Mechanical Measurement and Metrology
12	BTP112	Ergonomics & Human Factor Engineering
13	BTP113	Power Plant Engineering
14	BTP114	Industrial Hydraulics
15	BTP115	Industrial Tribology
16	BTP116	Nuclear Engineering
17	BTP117	Applied Elasticity and Plasticity
18	BTP118	Operation Research
19	BTP119	Artificial Intelligence and Robotics
20	BTP120	Cryogenics
21	BTP121	Fatigue and Fracture Mechanics
22	BTP122	Total Quality Management
23	BTP123	Finite Element Method
24	BTP124	Computational Fluid Dynamics
25	BTP125	Design and optimization

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Branch	:	Mechanical Engineering
Subject	:	Composite Materials
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP101

COURSE OBJECTIVES

- To train students to be able to design composite structures, select composite materials, conduct stress analyses of selected practical applications using laminated plate theories appropriate strength criteria.
- To be familiar with the properties and response of composite structures subjected to mechanical loading under static and cyclic conditions.
- To be familiar with classification & characteristics of composite material and their application.
- To gain the knowledge about manufacturing methods, testing and environmental issue related with composite material.

UNIT I
INTRODUCTION

Definitions, Composites, Reinforcements and matrices, Types of reinforcements,Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites incomparison with standard materials, Applications of metal, ceramic and polymer matrix composites.

UNIT II
MANUFACTURING METHODS

Hand and spray lay - up, injection molding, resin injection, filament
winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Measurement of interface strength. Characterization of systems; carbon fibre/epoxy, glass fibre/polyester, etc.

UNIT III
MECHANICAL PROPERTIES -STIFFNESS AND STRENGTH

Geometrical aspects – volume and weight fraction. Unidirectional continuous fibre, discontinuous fibers, Shortfiber systems, woven reinforcements –Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

UNIT IV
LAMINATES

Plate Stiffness and Compliance, Assumptions, Strains, Stress Resultants, Plate Stiffness and Compliance, Computation of Stresses, Types of Laminates -, Symmetric Laminates, Antisymmetric Laminate,

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Balanced Laminate, Quasi-isotropic Laminates, Cross-ply Laminate, Angleply Laminate. Orthotropic Laminate, Laminate Moduli, Hygrothermal Stresses.

UNIT V
JOINING METHODS AND FAILURE THEORIES

Joining –Advantages and disadvantages of adhesive andmechanically fastened joints. Typical bond strengths and test procedures.

COURSE OUTCOMES

- Acquire knowledge and hands-on competence in applying the knowledge of composite materials in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components in the field of engineering.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS

1. Gibson, R.F., "Principles of Composite Material Mechanics", Second Edition, McGraw-Hill, CRC press in progress, 1994, -.
2. Hyer, M.W., "Stress Analysis of Fiber – Reinforced Composite Materials", McGraw Hill, 1998

REFERENCES

1. Agarwal, B.D., and Broutman L.J., "Analysis and Performance of Fiber Composites", John Wiley and Sons, New York, 1990.
2. Halpin, J.C., "Primer on Composite Materials, Analysis", Technomic Publishing Co., 1984.
3. Issac M. Daniel and Ori Ishai, "Engineering Mechanics of Composite Materials", Oxford University Press-2006, First Indian Edition - 2

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Branch	:	Mechanical Engineering
Subject	:	Engineering Measurement
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP102

COURSE OBJECTIVES
- To help the student to attain the industry identified competency.
- Use relevant analog and digital measuring devices in mechanical engineering related applications.
- To understand the principles of engineering measurements, methods of measurement and its application in manufacturing industries.

UNIT I
INTRODUCTION TO MEASUREMENT
Types of Measurement, Classification of Instruments, Static terms and Characteristics – Range and Span, Accuracy and Precision, Reliability, Calibration, Hysteresis, Sensitivity, Repeatability and Reproducibility, Speed of Response, Dynamic Errors, measurement errors, transducers.

UNIT II
DISPLACEMENT, FORCE AND TORQUE MEASUREMENT
Specification, Selection and Application of Displacement Transducer. Capacitive Transducer, Potentiometer, Force Measurement System and its Characteristics, Force and Load Sensors, Torque Measurement – Inline and Reaction Torque Measurement, Dynamometers – Construction and Working of Transmission Dynamometer, Absorption Dynamometer, Eddy Current Dynamometer.

UNIT III
PRESSURE AND TEMPERATURE MEASUREMENT
Pressure Measurement – Low pressure gauges – McLeod Gauge, Thermal Conductivity Gauge, Ionization Gauge, Thermocouple Vacuum Gauge, High Pressure Gauge – Diaphragm, Bellows, Bourdon Tube, Electrical Resistance Type, Non-electrical Methods – Bimetal, Liquid in Glass Thermometer, Electrical Methods – Resistance Thermometer, Thermistor, Thermoelectric Methods Thermocouple, Thermo emf Measurement, Pyrometers – Working and Principles of Radiation and Optical Pyrometer

UNIT IV
FLOW MEASUREMENT
Types of Flow Meter, Selection Criteria for Flow Meter, Orifice, Venturi Tube, Pitot Tube, Working and Principle of Rotameter, Anemometer, Positive Displacement Flow Meter, Ultrasonic Flow Meter

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UNIT V
VIBRATION AND STRAIN MEASUREMENT
   Concept of Natural Frequency, Spring Mass System, Types of Strain Gauges, Strain Measurement, Construction and working of Strain Gauge.

COURSE OUTCOMES
- Use relevant instrument for measuring displacement.
- Use relevant instrument for measuring force and torque.
- Use relevant pressure and temperature measuring instruments.
- Use relevant instruments for measurement of flow.
- Select relevant instruments for measurement of vibration and strain.

TEXT BOOKS
  1. Jain R.K., Engineering Metrology, Khanna Publishers, 1994
  2. Alan S. Morris, The Essence of Measurement, Prentice Hall of India, 1997

REFERENCES
  1. Gupta S.C, Engineering Metrology, Dhanpat rai Publications, 1984
  2. Jayal A.K, Instrumentation and Mechanical Measurements, Galgotia Publications 2000
  3. Beckwith T.G, and N. Lewis Buck, Mechanical Measurements, Addison Wesley, 1991
  4. Donald D Eckman, Industrial Instrumentation, Wiley Eastern, 1985.

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Branch   :   Mechanical Engineering
Subject   :   Advanced Thermal Systems
Total Theory Periods   :   48
Total Tutorial Periods   :   00
Total Credits   :   03
Code   :   BTP103

COURSE OBJECTIVES

- To illustrate the power generation through Rankine cycle.
- Student can able to understand the key role of quality of steam after evaporation.
- To be acquainted with the terms related to steam, steam tables and mollier chart.
- to understand the working of different high pressure and low pressure boilers.
- to distinguish the ideal flow and actual flow through nozzle.
- to distinguish the working of impulse and reaction turbines.

UNIT I
BASIC CONCEPTS

Rankine Cycle - Schematic Layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat Addition, Methods to Improve Cycle Performance - Regeneration - Reheating- Combined-Cycles.

UNIT II
BOILERS

Classification Based on Working Principles & Pressu res of Operation - L.P & H.P. Boilers
Steam Condensers: Requirements of steam condensing plants - Classification of condensers - working principles of different types - vacuum efficiency and condenser efficiency, air pump - cooling water requirement

UNIT III
STEAM NOZZLES

Function of Nozzle - Applications - Types, Flow through Nozzles, Thermodynamic Analysis - Assumptions - Velocity of Nozzle at Exit-Ideal And Actual Expansion in Nozzle, Velocity Coefficient, Condition for Maximum Discharge, Critical Pressure Ratio. Criteria for Design of Nozzle Shape: Super Saturated Flow and its Effects, Degree of Super Saturation and Degree of Under Cooling - Wilson Line -Shock at the Exit.

UNIT IV
IMPULSE TURBINE

Mechanical Details - Velocity Diagram - Effect of Friction - Power Developed Axial Thrust .Blade or Diagram Efficiency - Condition for Maxi mu m Efficiency . De- Laval Turbine - Its

Features. Methods To Reduce Rotor Speed - Velocity Compounding And Pressure Compounding, Velocity And Pressure Variation Along The Flow - Combined Velocity Diagram For A Velocity Compounded Impulse Turbine.

REACTION TURBINE- Mechanical Details - Principle of Operation, Thermodynamic Analysis of A Stage, Degree of Reaction -Velocity Diagram - Parson's Reaction Turbine - Cond ition for Maxim um Efficiency.

UNIT V
GAS TURBINES

Simple Gas Turbine Plant - Ideal Cycle, Essential Components - Parameters of Performance - Actual Cycle - Regeneration , Inter Cooling and Reheating - Closed And Semi- Closed Cycles - Merits and Demerits.

JET PROPULSION- Principle of Operation - Classification of Jet Propulsive Engines - Working Principles with Schematic Diagrams and Representation on T-S Diagram - Thrust, Thrust Power and Propulsion Efficiency - Turbo Jet, Turbo Prop, Pulse Jet Engines - Schematic Diagram, Thermodynamic Cycle. Introduction to Rocket Propulsion.

COURSE OUTCOMES

- To provide a sound knowledge in various aspects of thermal equipment's.
- Understand efficiency enhancement methods of Reheating and regeneration.
- To know the basic components of a gas turbine power plant. And about working of various propulsive devices.
- To become aware of using thrust equations in solving problems.
- To understand about Gas power generation plants.

TEXT BOOKS

1. Thermal Engineering, R.K. Rajput, 9/e, Lakshmi Publicatndons, 2013.
2. Basic and Applied Thermodynamics, P.K. Nag, TMH , 2 Edition ,2012.

REFERENCE BOOKS

1. Gas Turbines, V. Ganesan, TMH
2. Thermodynamics and Heat Engines, R.Yadav, Central Publishing House, Allahabad, 2002.
3. Gas Turbines and Propulsive Systems, P.Khajuria&S .P.Dubey, Dhanpatrai.
4. Thermal Engineering, R.S Khurmi& JS Gupta, S.Chand, 2012.
5. Thermal Engineering-M.L.Mathur&F.S.Mehta, Jain bros, 2006.
6. Thermal Engineering Data Book, B.S. Reddy and K.H. Reddy, I.K. International , 2007.
7. Steam Tables SI Units- Dr.B.UmamaheswarGowd and A. Nagraju , Siri Pub!.

NOTE:- Steam tables and Molliercharts to be supplied for exam.

MATS School of Engineering &I.T

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Mechanical Behaviour of Materials
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP104

COURSE OBJECTIVES

* To know the mechanical behavior of engineering materials, such as metals, ceramics, polymers, and composites, subjected to different types of loading.
* To provide with basic understanding of phase transformation by heat treating and stress-induced hardening,
* To have basic understanding of linear and nonlinear elastic behavior, deformation under multiaxial loading, plastic deformation and yield criteria,
* Brittle versus ductile properties, fracture, fracture mechanisms at different scales, fatigue, contact deformation, and wear.

UNIT I
ELASTIC AND PLASTIC BEHAVIOUR

Elastic behavior of materials – Hooke's law, plastic behaviour: stress – strain diagram for ductile and brittle materials, dislocation theory – dislocations in the FCC, HCP and BCC lattice, dislocation pile-ups, Slip and twinning.

UNIT II
STRENGTHENING MECHANISMS

cold working, and hot working process, grain size strengthening. phase transformation by heat treating and stress-induced hardening, Solid solution strengthening. Examples of above strengthening mechanisms from ferrous and non-ferrous systems, simple problems. Yield point phenomenon, strain aging.

UNIT III
FRACTURE AND FRACTURE MECHANICS

Types of fracture, basic mechanism of ductile and brittle fracture, Griffith's theory of brittle fracture, Orowan's modification. Izod and Charpy Impacts tests, Fracture mechanics-introduction, modes of fracture, stress intensity factor, strain energy release rate, fracture toughness

UNIT IV
TEMPERATURE EFFECTS

Ductile to Brittle Transition Temperature (DBTT), Factors affecting DBTT, Thermal Stress and strain, creep, simple problems.
UNIT IV

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MECHANICAL TESTS AND APPLICATIONS.

Various mechanical tests to provide hands-on experience about the structure, properties, and processing of engineering materials and their applications and how to interpret the results. Application of these principles to the design of improved materials and engineering structures. corrosion and wear resistance

COURSE OUTCOMES

- Understand various types of deformation and failure of engineering materials subjected to various static and dynamic loadings.
- Correlate microscopic and macroscopic material behaviors. Learn how to engineer the material properties to meet certain specifications.
- Determine the safety factor for various possible failure modes and loadings.
- Obtain hands-on-experience with standardized mechanical testing techniques and learn how to present/interpret the measurements in a formal report.

TEXT BOOKS

1. Thomas H. Courtney, Mechanical Behavior of Materials, (2nd edition), McGraw Hill, 2000
2. William F. Hosford, Mechanical Behavior of Materials, Cambridge University Press, 2005, 425 pages, ISBN: 9780521846707.

REFERENCE BOOKS

1. Ashby M.F., materials selection in Mechanical Design 2nd Edition, Butter worth 1999.
2. Charles, J.A., Crane, F.A.A. and Fumess, J.A.G., Selection and use of engineering materials, (34d edition), Butterworth-Heiremann, 1997.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4th Edition) Jaico, 1999.
4. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988
5. Metals Hand book, Vol.10, Failure Analysis and Prevention, (10th Edition), Jaico, 1999.

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Engineering Economics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP105

COURSE OBJECTIVES

- Establish an understanding of the theoretical and conceptual foundations in engineering project analysis and decision-making while considering the ethical dimensions of those decisions.
- Acquire knowledge and skills necessary for informed financial and economic decision-making.
- Integrate and apply computer and other decision-making tools for the analysis of engineering economics problems.
- Develop an appreciation for the engineer's and manager's role in business decisions that use engineering economics and financial engineering.
- Practice the ability to synthesize information from multiple sources and disciplines to evaluate financial alternatives for large-scale projects.
- Refine the ability to effectively communicate economic and financial decisions to technical and non-technical audiences.
- Prepare for the engineering economics portion of the Fundamentals of Engineering Examination.

UNIT I
INTRODUCTION TO ECONOMICS

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics , Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, Process planning.

UNIT II
VALUE ENGINEERING

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Effective interest rate, Examples in all the methods.

UNIT III
CASH FLOW

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.
UNIT IV

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REPLACEMENT AND MAINTENANCE ANALYSIS

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V
DEPRECIATION

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation, Inflation, procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

COURSE OUTCOMES

- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

TEXT BOOKS

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley

REFERENCE BOOKS

1. Chan S. Park, Contemporary Engineering Economics, Prentice Hall, Inc.
2. E. Paul De Garmo, William G. Sullivan and James A. Bonta delli,Engineering Economy, MC Milan Publishing Company.
3. James L. Riggs, David D. Bedworth and Sabah U. Randhawa,Engineering Economics, Tata MCGraw Hill Education Private Limited.
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI 6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Machine Tools Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP106

COURSE OBJECTIVES
- To impart knowledge about cutting tool geometry, tool material, mechanics of metal cutting, machinability and importance of cutting fluid.
- To understand the kinematics drive of machine tool.
- To design speed gear box and feed gear box • To understand the procedure of acceptance test of machine tool

UNIT I
CUTTING TOOL
Types, requirements, specification & application Geometry of Single Point Cutting Tool - tool angle, Tool angle specification system, ASA, ORS and NRS andinter-relationship.

Mechanics of Metal Cutting, Theories of metal cutting, Chip formation, types of chips, chip breakers, Orthogonal and Oblique cutting, stress andstrain in the chip, velocity relations, power and energy requirement in metal cutting.

UNIT II
MACHINABILITY
Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Tool lifeequation, Machinability index, factors affecting machinability. Thermal Aspects in Machining and Cutting Fluid Source of heat in metal cutting and its distributions, temp measurement in metal cutting, function of cutting fluid,types of cutting fluid.

UNIT III
DESIGN OF MACHINE TOOL ELEMENT
Design of Lathe bed, Material and construction feature, various bed section, analysis of force under headstock, tailstock and saddle, torque analysis of lathe bed, bending of lathe bed, designing for torsion rigidity, use of reinforcing stiffener in lathe bed. Design of Guide ways, Material and construction features, overturning diagram, Antifriction guide ways.

UNIT IV

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DESIGN OF SPEED GEAR BOX

Drives in Machine Tool, classification, selecting maximum and minimum cutting speeds, speed loss, kinematicadvantage of Geometric progression, kinematic diagrams, design of Gear Box of 6,9,12 and 18 speed.

UNIT V
DESIGN OF FEED GEAR BOX

Elements of feed gear box, classification-Norton drive, draw key drive, Meander's drive, Design of feed gear box forlongitudinal and cross feed and for thread cutting. Machine Tool Installation and Maintenance Machine Tool installation, Machine Tool Maintenance, lubrication, reconditioning of machine tool. Machine Tool Testing, Geometrical checks, measuring equipment for testing, acceptance test for Lathe and Radial drilling machines.

COURSE OUTCOMES
- Graduates will gain a strong foundation in machine tool engineering
- Acquire knowledge and hands-on competence in design and development of machine tool.
- Develop an ability to identify, analyze and solve technical problems related to machine tools.

TEXT BOOKS
1. Machine Tool Engineering – G.R. Nagpal – Khanna Publishers, New Delhi
2. Fundamentals of Metal Cutting & Machine Tool – B.L. Juneja, G.S. Sekhan, NitinSethi – New Age Publishers – New Delhi

REFERENCE BOOKS
1. Production Engineering – P. C. Sharma – S. Chand & Company – New Delhi
2. Production Technology – R.K. Jain – Khanna Publisher – New Delhi
3. Principle of Metal Cutting - G.C. Sen, A. Bhattacharya – New Central Book Agency (P) Ltd., Calcutta
4. Machine Tool Practices – Kibbe Richard R – PHI, New Delhi
5. Principles of Machine Tool – G.C. Sen, A. Bhattacharya – New Central Book Agency, Calcutta

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Welding Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP107

COURSE OBJECTIVES

- Identify some common hazards in welding
- Explain and identify proper personal protection used in welding
- Explain some of the causes of accidents
- Explain safety techniques for storing and handling cylinders
- Explain how to avoid electric shock
- Identify and explain the use of oxy fuel cutting equipment
- Perform oxy fuel cutting • Perform set-up and run leads on shielded metal arc welding
- Braes weld using oxygen and acetylene

UNIT I
INTRODUCTION

Welding as a production process – its advantages and limitations. Gas welding process, Types of fuels, Acetylene, Indane, Butane etc. Gas welding equipment, Gas welding technique. Electric arc welding – Manual metal arc welding – Power supplies, cables and other accessories for arc welding, Welding technique - atomic, hydrogen welding, Thermit welding, soldering, brazing and braze welding.

UNIT II
SPECIAL WELDING PROCESSES

Power sources, equipments and accessories, application , limitation and other characteristics of: (a) Gas tungsten arc (TIG) welding (b) Gas metal arc (MIG) welding (c) Submerged arc welding (d) Electro slag welding processes. Resistance welding processes- principle-Types (spot, seam, projection, percussion, flash), Equipment required for each application.

UNIT III
MODERN WELDING PROCESSES

Electron beam welding, Laser beam welding, Plasma arc welding, Friction welding, Explosive welding, Ultrasonic welding, Stud welding, Under water welding, Diffusion bonding, Cold welding, Welding of dissimilar metals.

UNIT IV
WELDMENT TESTING

Defects in welding in various processes-Causes and remedies; Destructive testing of weldments - Strength, hardness, ductility, fatigue, creep properties etc. Non-destructive testing of weldments; Ultrasonic dye penetrant, magnetic particle inspection. X ray testing procedures and identification of defects – case studies. Weld thermal cycle – Residual stressed distortion in welding stress relieving techniques.

UNIT V
WELDABILITY, AUTOMATION AND DESIGN IN WELDING

Weldability –definition. Temperature distribution in welding –heat affected zone weldability of steel, cast iron. Aluminum, Pre heating and post heating of weldments. Estimation of transition temperature. Automation in welding – Seam tracking vision and arc sensing welding robots. Design of weldments-Welding symbols positions of welding joint and groove design. Weld stress – Calculations – Design of weld size.

COURSE OUTCOMES
- Describe proper safety procedures in welding environments
- Identify the use and applications of welding equipment
- Describe the use, and applications of blueprints in welding
- Perform mathematical calculations commonly used in a welding
- Create parts using information provided in blueprints to the given specifications.

TEXT BOOKS
1. Abbott, J., & Smith, K. M.Welding Technology: Texas State Technical College Publishing.
2. Radhakrishnan.V.M. Welding Technology and Design, New Age International Pub. Ltd.,

REFERENCE BOOKS
1. Little R.L.,Welding Technology Tata McGraw-Hill
2. Partner R.S.Welding Process and Technology, Khanna Publishers

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Disaster Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP108

COURSE OBJECTIVES

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
- Describe the four sets of tools available to disaster managers.
- Describe the eight principal disaster management technologies with which a disaster manager should be familiar.
- Identify the regulatory controls used in hazard management.

UNIT I

Introduction- Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

UNIT II

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III

Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT IV

Disaster Risk Reduction (DRR), Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local

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institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V
Disasters, Environment and Development,Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental-friendly recovery; reconstruction and development methods.

COURSE OUTCOMES
- It promotes a multi-stakeholder and inter-sectoral angle to risk management.
- It highlights the root causes of risks by identifying underlying risk factors.
- It offers a comprehensive overview of capacities and conditions and steps needed in order to pursue more comprehensive DRR and CCA strategies.
- It identifies aspects of development processes and institutional structures that need to be addressed in risk management.

TEXT/REFERENCE BOOKS
1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management ,APH Publishing Corporation.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Engineering Risk–Benefits Analysis
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP109

COURSE OBJECTIVES:
- To synthesis, Engineering Risk–Benefit Analysis
- To perform mechanism analyses to find the Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model
- To synthesis Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees
- To analyze Data Needs for Risk Studies

UNIT I
Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management 63 and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model.

UNIT II
System Definition and Structure: System Definition Models, Hierarchical Definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems.

UNIT III
Consequence Assessment-Types, Cause-Consequence Diagrams, Microeconomic Modeling, Value of Human Life, Flood Damages, and Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence

UNIT IV
Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models.

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UNIT V

Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance

COURSE OUTCOMES

- Ability to apply basic knowledge of Engineering Risk–Benefit Analysis.
- Ability to identify, formulate and solve technical problems.
- Ability to Risk Analysis in Engineering and Economics
- Ability to design and conduct experiments, and to analyze and interpret data.
- Ability to function effectively on teams and within a diverse environment.

TEXT BOOKS

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.
2. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & McCuen, 2003.

REFERENCE BOOKS

1. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.
2. Bedford, T. and Cooke, R. Probabilistic Risk Analysis: Foundations and Methods. New York: Cambridge University Press, 2001.
3. Normal Accidents, Living with High-Risk Technologies, C. Perrow, Princeton University Press, 1999.
4. Accident Precursor Analysis and Management - Reducing Technological Risk Through Diligence, National Academy of Engineering, the National Academies Press, Washington, DC, 2004.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Global Strategy Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP110

COURSE OBJECTIVES

- More easily align objectives with course content and evaluation methods.
- Clearly communicate your expectations of students.
- Establish a logical sequence of learning milestones.
- Allow both you and your students to self-evaluate based on stated expectations;
- Provide an opportunity for students to make connections across courses and institutional goals.

UNIT I

Introduction to Global Strategy- What the motivations to expand abroad are and how firms can manage conflicting demands in terms of global integration, local responsiveness and worldwide learning. How Global are we? How global most MNCs are? The End of Corporate Capitalism Beyond Off shoring Distance Still Matters Going International.

UNIT II

Location and Global Strategy: Home-Country Effects: Shifting global leadership in the watch industry Success of Swatch as a company in this industry Potential threat on the horizon that could once again cause the decline of the Swiss watch industry. Distance and Global Strategy: Host Country Choices: The Globalization of CEMEX The benefits that CEMEX has derived from expanding across borders Challenges that CEMEX is likely to confront in the future How far can Cemex‟s competitive advantage travel.

UNIT III

International Corporate Governance: International Corporate Governance with Chinese Characteristics Corporate governance matters in China‟s capital market Corporate governance model in China differ from international standards Special problems associated with Petro China‟s corporate governance model Conditions required for further reforms in Petro China‟s corporate governance system. Cross-cultural Negotiation: Learn from the MOUSE negotiation Issues/factors affect positively or negatively & the negotiation outcome Issues crucial in aligning different parties interests. Negotiators attitudes and culture in reaching the agreement

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UNIT IV

Technology: Productivity and Diffusion: Productivity Impact and Managing Diffusion Science, Technology and Productivity. Technology, Markets and Competition Incumbents and Entrants Commercialization Intellectual Property and Complementary Assets.

UNIT V

Investing in R&D Capabilities: Incentives to Innovate Investing in basic/applied research; Real options and other approaches. Applying the Concepts and Frameworks: R&D Investment Decisions: Applying the NPV, Real Options and Scenario-Planning Frameworks.

COURSE OUTCOMES

- Ability to apply basic knowledge of Introduction to Global Strategy.
- Ability to identify, formulate and solve technical problems.
- Ability to understands International Corporate Governance
- Ability to design and conduct experiments, and to analyze and interpret data.
- Ability to understand Location and Global Strategy.

TEXT/REFERENCE BOOKS

- Ghemawat & Hout (2008) Tomorrow's Global Giants? Not the Usual Suspects, HBR Michael E. Porter, "The Competitive Advantage of Nations" HBR, 1990.
- Larker and Tayan, "Models of Corporate Governance: Who's the Fairest of them all?" Stanford Business School Case, 2008, CG11.
- Aguilera, R. V. (2005) "Corporate Governance" In J. Beckert and M. Zafirovski, International Encyclopedia of Economic Sociology. London: Rutledge.

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Branch   :   Mechanical Engineering
Subject   :   Mechanical Measurement and Metrology
Total Theory Periods   :   48
Total Tutorial Periods :   00
Total Credits   :   03
Code   :   BTP111

COURSE OBJECTIVES
- To introduce techniques and instrumentation used in mechanical measurement and Metrology.
- To measure displacement and strains.
- To acquaint with Standards of measurement and metrology.

UNIT I
GENERALIZED MEASUREMENT SYSTEM
Introduction - Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors sensors and Transducers – Types of sensors, type of transducers and their characteristics.

UNIT II
MEASUREMENTS AND MEASUREMENT OF STRAINS
Measurement of displacement and angular velocity. Measurement of pressure: Gravitational direct acting, elastic and indirect type pressure transducers. Measurement of very low pressure –Mcleod gauge and Pirani gauge.
MEASUREMENT OF STRAIN- Type of strain gauges and their working, strain gauge circuits, Mcleod guage, Pirani guage, temperature compensation. Strain rosettes. Measurement of force and torque. Measurement of temperature by thermometers, bimetallic, thermocouples, thermistors and pyrometers-total radiation and optical pyrometry.

UNIT III
MEASUREMENT OF FLOW
Obstruction meters, variable head meters, hot wire and magnetic meters, ultrasonic flow meters. Vibration and noise measurement .

UNIT IV
METROLOGY STANDARDS OF MEASUREMENT
Linear and angular measurement devices and systems limit gauges, gauge blocks. Measurement of geometric forms like straightness, flatness, roundness and circularity, principles and application of optical projectors, tool makers, microscope,Autocollimator s etc.

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UNIT V
METROLOGY & INTERFEROMETRY

Principle and use of interferometry. Comparators, Measurement of screw threads and gears. Surface texture measurement.

COURSE OUTCOMES

- Interpret characteristics of measuring instruments.
- Apply methods of measurement for various physical quantities.
- Use instruments for linear and angular measurement
- Use devices for gear, screw threads and surface finish measurements.

TEXT BOOKS

1. Mechanical Measurements and Control – D.S. Kumar – S.K. Kataria & Sons
2. Mechanical Measurements – G. Beckwith Thomas G. – Pearson Education

REFERENCES BOOKS

1. Measurement Systems, Application Design – E.O. Deoblein - McGraw Hill
2. Engineering Metrology – K.J. Hume - MacDonald and Company
3. Engineering Metrology – I.C. Gupta - Dhanpat Rai & Sons
4. Mechanical & Industrial Measurements – R.K. Jain – Khanna Publishers

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Branch	:	Mechanical Engineering
Subject	:	Ergonomics & Human Factor Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP112

COURSE OBJECTIVES

- To have an understanding of basic human capabilities and limitations with respect to system performance.
- Apply ergonomic concepts to the prevention, control, or elimination of hazards.
- Understand basic control/display relationships, population stereotypes, and compatibility between control operation and desired system output.
- Understand the implications of human factors engineering for workplace design.
- Understand the impact of various environments on human perceptions and performance.
- Be able to apply human factors engineering concepts in the evaluation of existing systems and in the design of new systems.

UNIT I
Human factors in Production System Characteristics, features of man-machine system, Human performance and performance reliability, the human sensory motor system, stimulus dimensions, human information processing, noise and theory of signal detection.Displays Quantitative and Qualitative visual displays, auditory displays, factual and factory displays.

UNIT II
Method Study Objectives, steps, human factor considerations, recording techniques, critical evaluation of method, learning curves.

UNIT III
Control System Special movements and conceptual relationship of stimuli and response, continuous control system, control functions, tools and related devices, design of work place and works components, applied anthropomely, activity analysis, motion economy, design of individual work place.

UNIT IV
Human Performance - Performance under heat, cold, illumination, vibration, noise, pollution, static and dynamic condition, organizational factors, energy expenditure in physical work activity, shift, work, age, sex.

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UNIT V

Biomechanics - Concepts and principles, Bio-Engineering aspects of human motor activity, performance analysis of body, members in making specific movements.

COURSE OUTCOMES

- Understand the regulatory environment in ergonomics
- Describe some of the common potential injuries associated with performance of tasks that present hazards
- Understand human factors engineering to the interaction of workers and machines.
- Understand the regulatory issues, guidelines and standards for ergonomics, Describe the various types of ergonomic injuries and recognize the risk factors that contribute to an ergonomic injury.
- Describe the fundamentals of Human Factors Engineering and methods for reducing safety problems through improved design.
- Describe the role of ergonomics in business goals and be able to recognize the cost benefit categories associated with ergonomic projects
- Apply benchmarking and performance criteria to the field of ergonomics. Understand best practices in ergonomics and how to apply ergonomic tools to the design of products and processes

TEXT BOOKS

1. Ergonomics in Manufacturing, edited by W. Karwowski and G. Salvendy, published by the Society of Manufacturing Engineers, Dearborn, MI, 1998.
2. Human Factors in Engineering and Design, 7th Edition by Sanders and McCormick (McGraw Hill, ISBN # 978-0070549012).

REFERENCE BOOKS

1. Work Systems and the Methods, Measurementt, and Management of Work by Mikell P. Groover, Prentice Hall, 2007.
2. Kodak's Ergonomic Design for People at Work, 2 nd ed.,The Eastman Kodak Company, Wiley, 2003.
3. Elements of Ergonomics Programs, U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 97-117, March 1997.
4. Handbook of Human Factors and Ergonomics, 2nd ed., edited by G. Salvendy, John Wiley and Sons, 1997.
5. A Guide to the Ergonomics of Manufacturing, M. Helander, Taylor & Francis, 1995.
6. Ergonomics-How to Design for Ease and Efficiency, 2nd ed., K. Kroemer, H. Kroemer, and K. Kroemer-Elbert, Prentice Hall, 2001.

MATS School of Engineering &I.T

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch   :   Mechanical Engineering
Subject   :   Power Plant Engineering
Total Theory Periods   :   48
Total Tutorial Periods   :   00
Total Credits   :   03
Code   :   BTP113

COURSE OBJECTIVES

- To impart knowledge on sources of energy and types of power plants.
- To understand construction and working of Steam Power Plants, Hydro Electric power station, diesel power station, and Nuclear Power Station.
- To impart knowledge about various performance characteristics and its analysis.
- To impart knowledge about variable load problem.
- To impart knowledge about terms and factors associated with power plant economics.

UNIT I
ELEMENTS OF POWER PLANT

General Sources of power, renewable and non renewable concepts of public and private power stations, Distribution of power generation, transmission, and utilizations, Importance of Central Power Stations, types of power stations – steam, nuclear, diesel and hydro – Elements of modern power stations (Steams only) brief layout and arrangement of elements and complements, sitting of different power stations, foundation. Elements of Electric power systems primary and secondary distribution substations (in brief).

UNIT II
STEAM POWER PLANT

Steam power plants selection of working medium, Heat Balance in stem cycles, Heat rates, comparison of efficiencies gas loop, fuels and fuel handling. Equipments, fuel gas cleaning and ash handling. Air pre-heater, feed water pre-heaters, steam re-heaters, deaerators, feed water treatment, pumping and regulation water walls, modern developments in steam boilers, Important instrumentation and piping of gas and water loop. Factors to be controlled from maximum efficiency and variable output. Pollution generated by thermal power plants, pollution abatement, clearance from pollution boards, equipments used for reducing pollution – ESP, bag filter and chimney.

UNIT III

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HYDRO ELECTRIC POWER STATION

Potential power with reference to rainfall and catchments area, Water storage, equipment used in hydro electric power stations. Characteristics of hydraulic turbines. Comparison of the factors governing the cost of hydro steam and diesel power stations.

Diesel power station – Suitability of diesel engines for bulk power, advantages and limitations of diesel, power stations, efficiency and heat balance.

UNIT IV
NUCLEAR POWER STATION

Evolution of nuclear energy from atoms by fission and fusion. Chain reactions, fission materials, types of reactors ,gas cooled, boiling water liquid, metal cooled and fast reactor, arrangements of various elements in a nuclear power station, stem cycles and boilers coolant heat exchangers, Reactor control, Reactor shielding and safety methods.

UNIT V
VARIABLE LOAD PROBLEMS

Idealized and realized load curves, effect of variable load on plant design and operation variable load operation and load dispatch.

Power station Economics – Source of income, cost of plant and production, elements of cost, depreciation and replacement theory of rates.

Pollution-Board:-concept of state and central pollution Board , power board.

COURSE OUTCOMES

- Demonstrate a basic understanding of various types of power plants.
- Acquire knowledge and hands-on competence in the design and development of mechanical systems associated with power plants.
- Compare different energy resources and choose the most appropriate based on local conditions.
- Perform simple techno-economical assessments of energy resources.
- Design power plant that meets specific energy demands that are economically feasible and have a minimal impact on the environment.

TEXT BOOKS

1. A Text Book of Power Plant Engineering – R.K. Rajput – Laxmi Publications
2. A Course in Power Plant Engineering – Arora, Domkundwar – Dhanpat Rai & Co., 2005

REFERENCE BOOKS

1. Power Plant Engineering, 2nd Edn. – P.K. Nag – Tata McGraw-Hill Pub. Com., New Delhi, 2004
2. Power Plant Engineering – P.C. Sharma – S.K. Kataria & Sons, 2003

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MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch : Mechanical Engineering
Subject : Industrial Hydraulics
Total Theory Periods : 48
Total Tutorial Periods : 00
Total Credits : 03
Code : BTP114

COURSE OBJECTIVES

- To Learn basic concepts and terminologies of hydraulics
- To understand construction and working of various hydraulic power system
- To understand the constructional details of pumps and actuators
- To understand various valves and auxiliaries & rectification of their problems.
- To understand the hydraulic circuits & develop Hydraulic Circuits
- To understand accumulators and intensifiers

UNIT I
FLUIDICS
Technology, Terminology, types of fluid logic elements, amplifiers, logic states, methods of obtaining input signals and power outputs, application of fluidics, third generation fluidics.

UNIT II
HYDRAULIC FLUID
Types of hydraulic fluids, properties of fluid, selection of fluids, JIC/ISOsymbols for hydraulic circuits. Fluid Power System: Components, advantages, applications in the field of Machine Tools, material handling, presses, mobile and stationary machines, clamping & indexing devices etc., transmission of power at static and dynamic states.

UNIT III
PUMPS
Types, classification, principle and working of vane, gear, radial and axial plunger pumps, power and efficiency calculations, selection of pumps for hydraulic transmission. Actuators: Linear and rotary actuators, hydraulic motor types & construction methods of control of acceleration, types of cylinder and mountings, calculation of piston velocity, thrust under static and dynamic application.

UNIT IV
CONTROL OF FLUID POWER
Principle, working types of the following valves, pressure control, direction control, flow control, relief valves, sequence values etc.

UNIT V
HYDRAULIC CIRCUITS
Meter in, meter out circuits, Pressure control for cylinders, Flow divider circuits, Circuit illustrating use

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of pressure reducer valves, sequence valve, counter balance valves, unloading valves with the use of electrical control, accumulators etc. Accumulators and Intensifiers: Types, function, application, selection and design procedure.

COURSE OUTCOMES
- Acquire knowledge and hands-on competence in applying the concepts of industrial hydraulics in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS
1. Hydraulic Machines including fluidics – Dr. Jagdish Lal, Metropolitan Book Company, New Delhi
2. Introduction to Fluid Power – Sahastrabadhe, Nirali Prakashan, Pune

REFERENCE BOOKS
1. Industrial Hydraulics manual by Vickers
2. Industrial Hydraulics – Pipenger & Hicks, Mc Graw Hill Company, New York
3. Hydraulics Vol. 1 & 2 by Rexroth
4. Fluid Power – Goodwin

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Industrial Tribology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP115

COURSE OBJECTIVES

- Comprehend the concept of tribology for applying lubrication in bearings and other machine elements
- Design the tribological systems consisting bearings
- Apply modern technologies of surface texturing for performance improvements of bearings.
- Derive governing equations of all types of bearings using knowledge of fluid mechanics.
- Solve general Reynolds equation for lubrication problems using FDM.

UNIT I

Friction, Wear, and Lubrication, Tribology principles, Principles for selection of bearing types, Lubricants and Lubrication, Mineral oils, Synthetic oils, Viscosity, Density and compressibility, Thermal Properties, Oil life, Greases, Solid lubricants, Lubricant supply methods.

UNIT II

Surface Texture and Interactions, Geometric characterization of surfaces, Surface parameters, Measurement of surface texture, Measurement of surface flatness, Statistical descriptions, Contact between surfaces, Lubrication regime relation to surface roughness, Bearing Materials, Distinctive selection factors, Oil-film bearing materials, Dry and semi-lubricated bearing materials, Air bearing materials, High-temperature materials, Rolling bearing materials.

UNIT III

Fundamentals of Viscous Flow, Conservation of mass, momentum, and energy, non-dimensionalisation, Reynolds Equation and Applications, Performance parameters, Thrust Bearings, Thrust bearing types, Design factors, Performance analysis, Design procedure.

UNIT IV

Journal Bearings, Full-arc plain journal bearing with infinitely long approximation, Boundary conditions, Definition of the Sommerfeld number, Cavitation phenomena, Bearing performance parameters, Finite journal bearing design and analysis, Bearing Stiffness, Rotor Vibration, and Oil-Whirl Instability, General design guides, Squeeze-Film Bearings, Governing equations, Planar squeeze film, Nonplanar squeeze film, Squeeze film of finite surfaces, Piston rings.

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UNIT V

Hydrostatic Bearings, Types and configurations, Circular step thrust bearings, Capillary compensated hydrostatic bearings, Orifice-compensated bearings, Design procedure for compensated bearings, Hydraulic lift, Rolling Element Bearings, Ball bearing types, Roller bearing types, Thrust bearing types, Load–life relations, Adjusted rating life, Static load capacity.

COURSE OUTCOMES
- Understand the basic concepts of friction, wear, and lubrication
- Apply the knowledge of surface texture parameters for selection of bearing materials
- Write Reynold's equation for various bearing problems and design thrust bearings
- Design journal bearings and squeeze-film bearings
- Design hydrostatic and rolling element bearings

TEXT BOOKS

1. M. M. Khonsari and E. R. Booser. Applied Tribology: Bearing Design and Lubrication, Second Edition. John Wiley & Sons, Ltd, 2008.

REFERENCE BOOKS

1. B. J. Hamrock, S. R. Schmid, B. O. Jacobson. Fundamental of Fluid Film Lubrication. Second Edition. Marcel Dekker, Inc., 2004.
2. G. W. Stachowiak, A. W. Batchelor. Engineering tribology. ButterworthHeinemann, 2001.

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Nuclear Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP116

COURSE OBJECTIVES
- To Perform calculations related to nuclear reactions, reactor physics and nuclear safety.
- To Evaluate real-world questions relating to nuclear engineering.
- Deconstruct the issues that led to past reactor accidents and challenges of current new-build reactors.

UNIT I
BASIC CONCEPTS IN NUCLEAR PHYSICS
Nuclear constituents – charge, mass, shape, and size of nucleus, Binding energy, packing fraction, nuclear magnetic moment, saturation and short range nuclear forces, Radioactivity – Laws of radioactive decay, half life, mean life, specific activity, Nuclear models – single particle shell model, evidence and limitations of shell model, liquid drop model : Introduction, assumptions, semi-empirical mass formula.

UNIT 2
MECHANISMS OF NUCLEAR DECAY
Law of radioactive decay, half life, mean life, specific activity, partial radioactive decay, successive disintegration, α decay: Barrier penetration, β decay: Fermi theory, selection rules, parity non-conservation, γ decay of excited states.

UNIT III
DETECTION AND MEASUREMENT OF RADIOACTIVITY
Ionization chamber, Geiger- Muller, proportional, scintillation counters, Wilson cloud chamber, Health physics instrumentation-Film badges, Pocket ion chambers, portable counters and survey meters, Accelerators: Van de Graff and cyclotron.

UNIT IV
NUCLEAR DETECTORS AND ACCELERATORS
Types of detectors, Geiger-Mueller counter, Scintillation counter, classification of accelerators, Cyclotron, Betatron.

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UNIT V
NUCLEAR ENGINEERING & NUCLEAR REACTORS
Theories of Nuclear reactions, Conservation laws, Q-value equation, Nuclear fission, explanation on the basis of liquid drop model, energy available from fission, Nuclear chain reaction, Nuclear fusion. Nuclear Reactor – Basic principle, classification, constituent parts, Heterogeneous reactor, Swimming pool reactor, Breeder reactor, Heavy water cooled and moderated CANDU type reactors, Gas cooled reactors

COURSE OUTCOMES
- An understanding of nuclear energy fundamentals, nuclear fissions, and fission reactors.
- An understanding of nuclear reactions and radiations, and reactor heat generation.
- An understanding of neutron transport behavior and nuclear steam supply system, nuclear safety, nuclear fuel cycle.
- An understanding of radiation protection and ability to perform shielding calculations for a simple reactor system.
- To build a general understanding of nuclear power plant systems, licensing, design, operation & maintenance, safety, and security.
- Ability to perform a general design and nuclear safety analysis for a simple reactor system.

TEXT BOOK
- D.C.Tayal, Nuclear Physics, Himalayan Publication house, Bombay ,1980.

REFERENCE BOOKS
- Irving Kaplan, "Nuclear Physics", Narosa Book Distributors, 2002.
- R.D. Evans, "The atomc Nucleus", McGraw-Hill,1955.
- D.C.Tayal, Nuclear Physics, Himalayan Publication house, Bombay ,1980.
- J.H.Horlock ,"Combined Power Plants" ,Pergamon Press, 1992.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Applied Elasticity And Plasticity
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP117

COURSE OBJECTIVES

- To study the classical theory of linear elasticity for two and three dimensional state of stress and obtain solutions for selected problems.
- To understand the plastic stress strain relations, criteria of yielding and elasto- plastic problems.

UNIT I

Theory of Elasticity- Analysis of stress and strain, equilibrium, Compatibility and constitutive equations, Plane stress and plane strain problems, General equation in Polar co- ordinates, Rotating discs and stresses in circular discs, Stress function in terms of harmonic and complex functions, Equation of equilibrium of a deformed body in curvilinear coordinates, Principle of superposition and principle of virtual work, Torsion of thin tubes,

UNIT II

Bending of cantilevers, Uniformly and continuous loaded beams, Bending of circular, elliptical and rectangular cross-section bars, Axi-symmetric formulation and deformation of solids of revolution.

UNIT III

Theory of Plasticity-Nature of engineering plasticity, Differential equations of equilibrium, 3D stress analysis, infinitesimal deformation, finite deformation, Von Mises', Tresca's and anisotropic yield criteria, Halgh-Westergard stress space representation of yield criteria, experimental verification of yield criteria, Subsequent yield surfaces.

UNIT IV

Elastic and plastic stress-strain relations and stress strain rate equations, Prandtle- Reuaa equations, Generalized plastic stress strain relations, Anisotropy and instability.Plane plastic flow, Slip-line field theory

UNIT V

Application of slip line field theory to plane strain metal forming processes Plane plastic stress and

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pseudo plane stress analysis and its applications, Extremum principle for rigid perfectly plastic material, surfaces of stress and velocity discontinuity. Upper bound and lower bound theorems and applications.

COURSE OUTCOMES
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Apply knowledge of applied elasticity and plasticity for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of mechanical systems.

TEXT/REFERENCE BOOKS
1. A I Lurie ; Theory of Elasticity (Foundations of Engineering Mechanics)
2. Gladwell G M Kluwer ; Contact Problems in the Classical Theory of Elasticity
3. Chakrabarty J.,Applied Plasticity; Springer-Verlag
4. R. Hill ;The Mathematical Theory of Plasticity, Oxford University.

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Operation Research
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP118

COURSE OBJECTIVES

- To impart knowledge in concepts and tools of Operations Research
- To understand mathematical models used in Operations Research.
- Formulate and solve problems as networks and graphs.
- To apply these techniques constructively to make effective business decisions

UNIT I
INTRODUCTION

Various stages of Operation research., fields of application, optimization and its classification. General linear programming problems- introduction, maximization and minimization of function with or without constraints, formulation of a linear programming problem, graphical method and simplex method, big m method degeneracy, application of l.p.p. In mechanical engineering.

UNIT II
THE TRANSPORTATION PROBLEMS

Mathematical formulation computational procedures, stepping stone method, modified distribution method, vogels approximation method, solution of balanced and unbalanced transportation problems and case of degeneracy. The assignment problems - Mathematical formulation of assignment problems, solution of assignment problems, traveling salesman problems, air crew assignment problems.

UNIT III
WAITING LINE THEORY

Basic queuing process, basic structure of queuing models, some commonly known queuing situations kendall's service time, solution to m/m/1: /fcfs models. Network analysis - Cpm/pert, network representation, techniques for drawing network. Resource smoothing and leveling, project cost, optimum project duration, project crashing, updating, time estimation in pert.

UNIT IV
GAME THEORY

Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists, when no saddle point exists, solution of 2xn and mx2 game.

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UNIT – V : SIMULATION

Basic concept of simulation, applications of simulation, merits and demerits of simulation, monte carlo simulation, simulation of inventory system, simulation of queuing system.

COURSE OUTCOMES
- Solve Linear Programming Problems
- Solve Transportation and Assignment Problems
- Understand the usage of game theory and Simulation for Solving Business Problems

TEXT BOOKS
1. Operation research ,sasienyaspan
2. Operation research – N. D. VOHRA – tmh
3. Operation research– Hira& Gupta – s. Chand & co.

REFERENCES
1. Operation research – h. Gillette – tmh, new delhi
2. Operations research – m. Taha – tmh, new delhi
3. Fundamentals of operation research – ackofsasieni – dhanpatrai& sons
4. Quantitative approach to management – lovin and krit patrick – tmh
5. Operation research– s.d. Sharma – s. Chand & com. New delhi

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Artificial Intelligence And Robotics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	aaaaaaa03
Code	:	BTP119

COURSE OBJECTIVES

- To impart knowledge on sources of energy and types of power plants
- To understand construction and working of Steam Power Plants, Hydro Electric power station, diesel power
- station, and Nuclear Power Station.
- To impart knowledge about various performance characteristics and its analysis
- To impart knowledge about variable load problem
- To impart knowledge about terms and factors associated with power plant economics

UNIT I
ELEMENTS OF POWER PLANT

General Sources of power, renewable and non renewable concepts of public and private power stations, Distribution of power generation, transmission, and utilizations, Importance of Central Power Stations, types of power stations – steam, nuclear, diesel and hydro – Elements of modern power stations (Steams only) brief layout and arrangement of elements and complements, sitting of different power stations, foundation. Elements of Electric power systems primary and secondary distribution substations (in brief).

UNIT II
STEAM POWER PLANT

Steam power plants selection of working medium, Heat Balance in stem cycles, Heat rates, comparison of efficiencies gas loop, fuels and fuel handling. Equipments, fuel gas cleaning and ash handling. Air pre-heater, feed water pre-heaters, steam re-heaters, deaerators, feed water treatment, pumping and regulation water walls, modern developments in steam boilers, Important instrumentation and piping of gas and water loop. Factors to be controlled from maximum efficiency and variable output. Pollution generated by thermal power plants, pollution abatement, clearance from pollution boards, equipments used for reducing pollution – ESP, bag filter and chimney.

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UNIT III
HYDRO ELECTRIC POWER STATION

Potential power with reference to rainfall and catchments area, Water storage, equipment used in hydro electric power stations. Characteristics of hydraulic turbines. Comparison of the factors governing the cost of hydro steam and diesel power stations.

Diesel power station – Suitability of diesel engines for bulk power, advantages and limitations of diesel, power stations, efficiency and heat balance.

UNIT IV
NUCLEAR POWER STATION

Evolution of nuclear energy from atoms by fission and fusion. Chain reactions, fission materials, types of reactors ,gas cooled, boiling water liquid, metal cooled and fast reactor, arrangements of various elements in a nuclear power station, stem cycles and boilers coolant heat exchangers, Reactor control, Reactor shielding and safety methods.

UNIT V
VARIABLE LOAD PROBLEMS

Idealized and realized load curves, effect of variable load on plant design and operation variable load operation and load dispatch.

Power station Economics – Source of income, cost of plant and production, elements of cost, depreciation and replacement theory of rates.

Pollution-Board:-concept of state and central pollution Board , power board.

COURSE OUTCOMES

- Demonstrate a basic understanding of various types of power plants.
- Acquire knowledge and hands-on competence in the design and development of mechanical systems associated with power plants.
- Compare different energy resources and choose the most appropriate based on local conditions.
- Perform simple techno-economical assessments of energy resources.
- Design power plant that meets specific energy demands that are economically feasible and have a minimal impact on the environment.

TEXT BOOKS
1. A Text Book of Power Plant Engineering – R.K. Rajput – Laxmi Publications
2. A Course in Power Plant Engineering – Arora, Domkundwar – Dhanpat Rai & Co., 2005

REFERENCE BOOKS
1. Power Plant Engineering, 2nd Edn. – P.K. Nag – Tata McGraw-Hill Pub. Com., New Delhi, 2004
2. Power Plant Engineering – P.C. Sharma – S.K. Kataria & Sons, 2003

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Cryogenics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP120

COURSE OBJECTIVES
- to provide the knowledge of evolution of low temperature science
- to provide knowledge on the properties of materials at low temperature
- to familiarize with various gas liquefaction and refrigeration systems and
- to provide design aspects of cryogenic storage and transfer lines

UNIT I
Introduction to cryogenic systems, properties of materials at low temperature, properties of cryogenic fluids. air and gas liquefaction systems: thermodynamically ideal system, production of low temperatures liquefaction systems for gases other than neon, hydrogen and helium, liquefaction systems for neon, hydrogen and helium. Cryogenic refrigeration system.

UNIT II
Gas separation and gas purification systems the thermodynamically ideal separation system properties of mixtures, principles of gas separation, air separation systems, hydrogen, argon, helium air separation systems, gas purification methods.

UNIT III
Vacuum techniques, system for production of high vacuum such as mechanical, diffusion, ion and cryopumps. cryogenics measurement systems, temperature pressure, flow rate, liquid level measurement, introduction to cryo-coolers.

UNIT IV
Cryogenic fluid storage systems, introduction, basic storage vessels, inner vessel, outer vessel design, piping, access manways, safety device. Cryogenic insulations,vacuum insulation, gas filled powders and fibrous materials, solid foam, selection and comparison of insulations. Cryogenic fluid transfer systems. Transfer through uninsulated lines, vacuum insulated Lines, porous insulated lines etc.

UNIT V
Advances in cryogenics vortex tube and applications, pulse tube refrigerator, cryogenic engine for space vehicles.cryogenic applications in gas industry, cryogenic fluids, space research, cryobiology, food

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processing, electronics, nuclear and high energy physics, chemical processing, metal manufacturing, cryogenic power generation, medicine, analytical physics and chemistry.

COURSE OUTCOMES

- To apply the knowledge of low temperature production methods to understand and analyse different liquefaction systems.
- To gain knowledge about the critical components involved in liquefaction.
- To apply the knowledge of ideal refrigeration techniques, to understand and analyze common cryogenic refrigeration systems. To understand some of the novel cryogenic refrigeration methods.
- To gain knowledge and to understand various cryogenic fluid storage and transport systems and to evaluate their performance applying fundamental concepts

TEXT BOOKS

1. Cryogenic systems – R.F. Barron
2. Cryogenic engineering – R.B. Scott – D.Van nostrand company, 1959

REFERENCE BOOKS:

1. Cryogenic process engineering – K.D. Timmerhaus and T.M. Flynn, plenum press, new york,1989
2. High vacuum technology – A. Guthree – New age international publications.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch   :   Mechanical Engineering
Subject   :   Fatigue and Fracture Mechanics
Total Theory Periods :   48
Total Tutorial Periods :   00
Total Credits   :   03
Code   :   BTP121

COURSE OBJECTIVES

- To introduce the physical and mathematical principles of fracture mechanics and their applications in wide range of engineering design.
- To expand the students knowledge on experimental methods to determine the fracture toughness and develop the understanding on the design principle of materials and structures using fracture mechanics approaches.
- To Provide the basic knowledge on the mechanics of elastic and Plastic deformation,
- To understand creep, Fracture and fatigue failure, as applied to metals, composites, Ceramics.
- To Provide practical examples of the application of fracture mechanics to design and Life prediction

UNIT I
FATIGUE OF STRUCTURES

S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT II
STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR

Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life – cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques - Cumulative damage - Miner's theory - Other theories.

UNIT III
PHYSICAL ASPECTS OF FATIGUE

Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations -fatigue fracture surfaces.

UNIT IV
FRACTURE MECHANICS

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Strength of cracked bodies - Potential energy and surface energy - Griffith's theory -Irwin - Orwin extension of Griffith's theory to ductile materials - stress analysis of cracked bodies - Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

UNIT V

FATIGUE DESIGN AND TESTINIG

Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in Turbo machineries- Application to composite materials and structures.

COURSE OUTCOMES

- Safe life and Fail-safe design philosophies and to understand the Importance of Fracture Mechanics in Turbo machineries, composite materials and structures.
- Understanding and mathematical modeling of the elements of plastic deformation, with respect to continuum and microscopic mechanisms.
- Ability to use creep data to predict the life of structures at elevated temperatures and the understanding of mechanisms of creep deformation and fracture.
- Use of fracture mechanics to quantitatively estimate failure criteria for both elastically and plastically deforming structures, in the design of life prediction strategies, and for fracture control plans, with examples from automotive, aerospace, medical, and other industries.
- Understanding of fatigue and how this affects structural lifetimes of components
- Will gain an understanding of linear elastic and elastic-plastic fracture mechanics, and apply this knowledge to the analysis and design of structural materials.

TEXT BOOKS

1. Prasanth Kumar – "Elements of fracture mechanics" – Wheeter publication, 1999.
2. Barrois W, Ripely, E.L., "Fatigue of aircraft structure", Pegamon press. Oxford, 1983.

REFERENCE BOOKS

1. Sin, C.G., "Mechanics of fracture" Vol. I, Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1989.
2. Knott, J.F., "Fundamentals of Fracture Mechanics", Buterworth & Co., Ltd., London, 1983.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Total Quality Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP122

COURSE OBJECTIVES

- Define and understand various terms associated with quality control
- Enhance the students understanding of the complexity of statistical analysis and interpretation.
- Provide an introduction to the fundamental concept of SPC, total quality management, six sigma, quality function deployment and applications of these concepts.
- Understanding the philosophies of TQM in order to better evaluate the TQM implementation proposals.
- Assess exactly where an organization stands on quality management with respect to ISO 9000 quality management.

UNIT I
BASIC CONCEPT OF QUALITY

Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of conformance, History of quality control, Quality policy and objectives, Economics of quality.

STATISTICAL CONCEPT OF VARIATION

Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and weibull distribution, pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.

UNIT II
QUALITY ASSURANCE

Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planning for quality, Quality function deployment (QFD).

STATISTICAL QUALITY CONTROL

Objectives, Growth and applications of S.Q.C.,S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts for variables and attributes and their analysis, process capability, concept of six sigma.

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UNIT III
ACCEPTANCE SAMPLING
Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans, LTPD, AOQL, AOQ.

UNIT IV
TOTAL QUALITY MANAGEMENT
Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM,

UNIT V
QUALITY SYSTEM
Quality system, need for quality system, ISO 9000 Quality Managmeent Standards, ISO 9000:2000 requirement, Quality Auditing, ISO 14000, Benefits of ISO 14000.

COURSE OUTCOMES

- Explain the importance of quality & role of statistical quality control
- Apply methods and techniques of statistical quality control, to studies and interpret the results in business.
- Demonstrate motivation and responsibility to advocate for quality in business
- Develop an understanding on quality management philosophies and frameworks
- Develop in-depth knowledge on various tools and techniques of quality management

TEXT BOOKS
1. Quality Planning and Analysis by Juran J.M. and Gryana FM. – McGraw Hill, New York
2. Statistical Quality Cntrol – R.C. Gupta – Khanna Publishers, Delhi
3. Statistical quality control – E. L. Grant and R. S. Leavenworth – Mc. Graw Hill, New York

REFERENCE BOOK
1. Engineering Statistics and quality control – I. W. Burr, Mc. Graw Hill, New York
2. Managing for Total quality from Deming to Tguchi and SPC. - Logothetis – Prentice Hall of India
3. Statistical Quality Control – M. Mahajan – DhanpatRai& Company – New Delhi

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch   :   Mechanical Engineering
Subject   :   Finite Element Method
Total Theory Periods   :   48
Total Tutorial Periods   :   00
Total Credits   :   03
Code   :   BTP123

COURSE OBJECTIVES

- The basic concepts of Finite Element methods and its applications to complex engineering problems.
- The characteristics and selection of different finite elements used in finite element methods.
- The equilibrium equations and stress-strain relations for different boundary conditions encountered in structural and heat transfer continuum problems.
- The application of the FEM technique to dynamic problems and validate the solutions through simulation software for real time applications.

UNIT I
FORMULATION OF FINITE ELEMENT EQUATION

Formulation of Finite Element Equation starting from governing differential equation, Domain residual and minimization, Weighted residual method, Weak form of weighted residual method, solution of weak form using trial function, piecewise continuous trial function solution, formulation of one dimensional bar element using weak form of weighted residual element Minimization of potential energy, Rayleigh-Ritz method, Piece-wise continuous trail function, finite element form of Rayleigh-Ritz method, finite element formulation derived from a functional, formulation of bar element and heat transfer element using Rayleigh-Ritz method

UNIT II
ONE DIMENSIONAL FINITE ELEMENT ANALYSIS

One dimensional finite element analysis, generic form of total potential for one dimensional case, determination of shape functions for linear bar finite element and quadratic bar finite element, stiffness matrix, one dimensional problems of structure mechanics and heat conduction

UNIT III
SHAPE FUNCTIONS AND ELEMENT MATRICES

Stiffness matrix formulation for beam and frame element, Determination of shape functions and element matrices, Application problems

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UNIT IV
TWO DIMENSIONAL FINITE ELEMENT ANALYSIS

Two dimensional finite element analysis, simple three node triangular elements, four node rectangular element, six node triangular element, natural coordinates, coordinate transformation, simple two dimensional problems, Gauss Quadrature Technique

UNIT V
APPLICATION OF FINITE ELEMENT ANALYSIS

Finite element analysis for plane stress and plane strain problem, Strain displacement matrix for 2-D elements, two-dimensional integrals. Application problems, Scalar field problems including heat conduction and flow problems.

COURSE OUTCOMES

After successful completion of course student will be able to:

- Recall potential energy concepts or vibrational methods for solving complex structural geometries of aeronautical, mechanical and civil applications.
- Explain the shape function concepts of one and two dimensional elements for enriching knowledge on stiffness matrix and load vector.
- Apply numerical methods on one dimensional bar elements for obtaining displacements, stresses, strains and reaction forces.
- Recall the fundamental structural concepts of equilibrium equations, stress-strain relations and strain displacements for solving 1D elastic problems.
- Illustrate finite element modelling of triangular, axi-symmetric and four noded elements for obtaining shape functions of two dimensional elements.

TEXT BOOKS

1. Textbook of Finite Element Analysis – Seshu P – Prentice Hall of India.
2. Fundamentals of Finite Element Analysis - David Hutton – TMH, Delhi Finite Element in Engineering - T.R. Chandrupatla and Belegundu, Pearson, Singapore

REFERENCE BOOKS

1. Concepts and Applications of Finite element analysis - Cook, Robert – John Wiley
2. The Finite Element Method, A Practical Course - Liu and Quek. – McGraw Hill
3. The Finite Element Method in Engineering - S.S. Rao.
4. An Introduction to the Finite Element Method – J.N. Reddy – TMH, Delhi
5. Finite Element Method – Zienkiewicz. O C - TMH, Delhi
6. Finite Element Analysis: Theory And Programming – Krishnamoorthy C.S.- TMH, Delhi
7. Finite Element Procedure – K.J.Bathe – Prentice Hall of India 10. A First Course in The Finite
8. Element Method – Logan – Cenegage Learning Finite Element Method: Basic concepts & Applications- Alavala – PHI, Delhi

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mechanical Engineering
Subject	:	Computational Fluid Dynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP124

COURSE OBJECTIVES

- To introduce the student to widely used techniques in the numerical solution of fluid equations, issues that arise inthesolutionof such equations, and modern trends in CFD.
- To acquire core knowledge of the fundamentals of CFD for engineers, and an introduction to the methods andanalysistechniques used in CFD.
- By studying a variety of flow situations students will develop a better intuition of fluid mechanics more quicklythanispossible with traditional analytical approaches.
- Quantify and analyze the numerical error in CFD discretization schemes.
- Develop finite difference and finite volume forms of the CFD equations and important model systems
- Formulate explicit and implicit algorithms for solving equations.
- Understand and apply verification strategies for evaluating CFD code.

UNIT I
FUNDAMENTAL CONCEPTS
Introduction - Governing Equations of Fluid Dynamics. Mathematical Behavior of Partial Differential Equations - Elliptic, Parabolic and Hyperbolic equations. Physical Classification of fluid dynamics problems, Well-posed problems.

UNIT II
FINITE ELEMENT AND FINITE DIFFERENCE METHOD
Overview of Finite Element and Finite difference Techniques in Computational Fluid Dynamics. Strong and Weak Formulations of a Boundary Value Problem.

UNIT III
FINITE VOLUME SCHEMES
General Discretisation Methodologies: Cell Centered Formulation- Lax-Vendoroff Time Stepping, Cell Vertex Formulation - Multistage Time Stepping. Discretisation of convective fluxes: Flux-vector splitting formulation, Flux-difference splitting formulation. Up-wind formulation.

UNIT IV
DISCRETIZATION
Boundary layer Equations and methods of solution - Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation –Stability properties of explicit and

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implicit methods - Conservative up-wind discretization for Hyperbolic systems - Further advantages of upwind differencing.

UNIT V
PRINCIPLES OF GRID GENERATION
Structured grid: C-, H- and O-Grid topology. Algebraic, Elliptical and Hyperbolic Grid Generation, Unstructured grid: DelaunayTriangulation, Advancing-Front Method, Generation of Anisotropic Grids, Mixed-Element/Hybrid Grids, Assessment and Improvement of Grid Quality,

COURSE OUTCOMES
- Develop an understanding for the major theories, approaches and methodologies used in CFD.
- Build up the skills in the actual implementation of CFD methods for mechanical engineering design, analysis and application.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS
1. Introduction to computational fluid dynamics: the finite volume method - Versteeg, & Malalasekera - Addison-Wesley.
2. Introduction to Computational Fluid Dynamics – Niyog & Chakraborty – Pearson ,Singapore.

REFERENCES
1. Computational Techniques for Fluid Dynamics, - Vols. I and II - Fletcher C.A.J. – Springer, Verlag, Berlin, 1988.
2. Computational Fluid Dynamics: An Introduction - John F. Wendt (Editor) – Springer, Verlag, Berlin.
3. Numerical Computation of Internal and External Flows, Vols. I and II - Charles Hirsch - John Wiley & Sons, NewYork.
4. Computational Fluid Dynamics for Engineers, Vols. I & II - Klaus A Hoffmann and Steve T. Chiang – Engineering Education System, W. Wichita, K.S., 67208 – 1078 USA.
5. Fundamentals of Aerodynamics - Anderson, Jr.D - McGraw Hill.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Branch   : Mechanical Engineering
Subject   : Design and Optimization
Total Theory Periods : 48
Total Tutorial Periods : 00
Total Credits   : 03
Code   : BTP125

COURSE OBJECTIVES
- To provide an introductory overview of "single-objective" design optimization concepts, models and techniques.
- To formulate a formal design optimization problem
- To solve the problem, Assess and validate solution results,
- To work as a team, communicate and report effectively the outcome of their project activity

UNIT I
OPTIMIZATION TECHNIQUE
optimization technique classification of optimization, problems, single variable and multivariable optimization with equality constraints and inequality constraints. convex programming problem.

UNIT II
LINEAR PROGRAMMING
linear programming - ii duality in linear programming, dual simplex method, decomposition principle, sensitivity analysis, quadratic programming, changes in cost coefficient, golden section method.

UNIT III
NON-LINEAR PROGRAMMING
non-linear programming – i rate of convergence, design variables, random search methods, chrivariate methods, powell's method, newton's method, marquard method, test function.

UNIT IV
GEOMETRIC PROGRAMMING
geometric programming unconstrained minimization problem, primal dual relationship, geometric programming with mixed erie quality, application and complementary function.

UNIT V
DYNAMIC PROGRAMMING
dynamic programming multistage decision processes. principles of optimality, continuous dynamic programming.

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COURSE OUTCOMES

- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints.
- an ability to identify, formulate, and solve engineering problems
- an ability to communicate effectively
- Iterate on design solutions to continually improve a product's design and performance
- Communicate design solutions, including rationales for a given choice, advantages, and disadvantages over alternatives

TEXT BOOKS
1. Optimization techniques – c.s. Rao – dhanpat rai & sons, new delhi
2. Optimization methods for engineering design – r.l. Fox - addison wesley

REFERENCE BOOKS
1. Engineering optimization theory and practice – s.s. Rao – new age publishers.
2. Introduction to optimum design – j.s. Arora – mc. Grawhill publishers
3. Optimization methods for engineering – raju – phi,delhi
4. Foundation of mathematical optimization – pallaschke – kluwer academic publishers
5. Optimization methods in operations research and system analysis–k v mittal– wiley,delhi
6. Engineering optimization: theory and practice - singiresu s rao – new age
7. Optimization for engineering design- deb, kalyanmoy-prentice hall
8. Optimization methods – mohan & deep- new age, delhi
9. An introduction to optimization- chang, edwin& zak stanislaw -john wiley, new york
10. Optimization concepts and applications in engineering – belegundu & chandrupatla-pearson,singapore

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MATS UNIVERSITY
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Scheme & Syllabus
(OPEN ELECTIVES)
Bachelor of Technology
Mechanical Engineering

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MATS UNIVERSITY
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Scheme of Teaching & Examination

OPEN ELECTIVE

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BTO01	Cyber Law and Ethics	3	-	-	70	30	3
2.	BTO02	Supply Chain Management	3	-	-	70	30	3
3.	BTO03	Engineering Economics & Financial Accounting	3	-	-	70	30	3
4.	BTO04	Knowledge Entrepreneurship	3	-	-	70	30	3
5.	BTO05	Technology Management	3	-	-	70	30	3
6.	BTO06	Ad-Hoc and Sensor Networks	3	-	-	70	30	3
7.	BTO07	Technologies for Sustainable Development	3	-	-	70	30	3
8.	BTO08	E- Commerce & Strategic IT	3	-	-	70	30	3
9.	BTO09	Decision Support & Executive Information System	3	-	-	70	30	3
10.	BTO10	Applied Graph Theory	3	-	-	70	30	3
11.	BTO11	Innovative Entrepreneurial Skill	3	-	-	70	30	3
12.	BTO12	Soft Computing	3	-	-	70	30	3
13.	BTO13	Disaster Management	3	-	-	70	30	3
14.	BTO14	Professional Ethics in Engineering	3	-	-	70	30	3
15.	BTO15	Intellectual Property Rights	3	-	-	70	30	3

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16.	BTO16	IT in Business	3	-	-	70	30	3
17.	BTO17	Environmental Management & Sustainable Development	3	-	-	70	30	3
18.	BTO18	Satellite Communication	3	-	-	70	30	3
19.	BTO19	Enterprise Resource Planning	3	-	-	70	30	3
20.	BTO20	Entrepreneurship Development	3	-	-	70	30	3
21.	BTO21	Renewable Energy Sources	3	-	-	70	30	3
22.	BTO22	Soft Skills and Interpersonal Communication	3	-	-	70	30	3
23.	BTO23	ICT for Development	3	-	-	70	30	3
24.	BTO24	Human Resource Development and Organizational Behaviour	3	-	-	70	30	3
25.	BTO25	Introduction to Philosophical Thoughts	3	-	-	70	30	3
26.	BTO26	Comparative study of Literature	3	-	-	70	30	3
27.	BTO27	Indian Music System	3	-	-	70	30	3
28.	BTO28	History of Science and Engineering	3	-	-	70	30	3
29.	BTO29	Introduction to Arts and Aesthetics	3	-	-	70	30	3
30.	BTO30	Economic Policies in India	3	-	-	70	30	3
31.	BTO31	Metro Systems and Engineering	3	-	-	70	30	3

L – Lecture,   T – Tutorial,   ESE – End Semester Examination,
P – Practical,   IM – Internal Marks (Include Class Test & Teacher's Assessments)

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SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Cyber Law and Ethics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO01

COURSE OBJECTIVES
- To create cyber security awareness.
- To understand principles of web security.
- To understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
- To have idea about issues for creating security policy for a large organization.

UNIT I
INTRODUCTION TO CYBER LAW
Evolution of Computer Technology, Emergence of Cyber Space, Cyber Jurisprudence, Jurisprudence and Law, Doctrinal Approach, Consensual Approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of Courts, Civil and Criminal Jurisdictions, Cyberspace-Web Space, Web Hosting and Web Development Agreement, Legal and Technological Significance of Domain Names, Internet as a Tool for Global Access.

UNIT II
INFORMATION TECHNOLOGY ACT
Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT III
CYBER LAW AND RELATED LEGISLATION
Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright Disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

UNIT IV
ELECTRONIC BUSINESS AND LEGAL ISSUES
Evolution and Development in E-Commerce, Paper vs. Paperless Contracts, E-Commerce Models: B2B, B2C, E security.

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UNIT V
APPLICATION AREA
Business, Taxation, Electronic Payments, Supply Chain, EDI, E-Markets, Emerging Trends.

COURSE OUTCOMES
- Acknowledge about the cybercrime, cyber criminal, and intellectual property rights.
- Protection and resilience of critical information infrastructure.
- To enable effective prevention, investigation and prosecution of cybercrime and enhancement of law enforcement.

TEXT BOOKS
1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher.
2. Information Security Policy & Implementation Issues, NIIT, PHI

REFERENCE BOOKS
1. Cyber Crime Notorious Aspects of the Humans & Net Criminals Activity in Cyber World, Barna Y Dayal D P Dominant Publisher.
2. Cyber Crime Impact in the new millennium, Marine R.C. Author press.
3. Spam Attack, Cyber Stalking & abuse, Barna Y, Dayal D P Dominant publisher.
4. Frauds & Financial criouses in Cyber space, Barna Y, Dayal D P , Dominant publisher.
5. Information Security, NIIT, PHI.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Supply Chain Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO02

COURSE OBJECTIVES
- To have knowledge of supply chain management.
- To learn the applicability of supply chain management in any business/organization.

UNIT I
INTRODUCTION
Supply Chain Management (SCM), Importance of Supply Chain Management, Supply Chain Management Today and Tomorrow, The Supply Chain Management Pipeline, Objectives of the Supply Chain Management, Supply Chain Principles/ Methodology and Solutions: Supply Chain Principles, Methodology of a Supply Chain Management project-solutions, Expected results/ benefits, Opportunity areas (examples), Characteristics of Firms/ Organizations and Service Providers.

UNIT II
SUPPLY CHAIN DRIVERS AND METRICS
Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing, Obstacles to Achieving Fit.

UNIT III
APPLICATIONS
Where the technique has been applied, how can be SCM applied to an organization? Types of firms/ Organizations, where SCM can be applied, Duration and Implementation cost of Supply Chain Management, Conditions for implementation, European Organizations supporting the implementation of the method.

UNIT IV
IMPLEMENTATION PROCEDURE
Steps-actions/ phases: Implementing a competitive approach to Warehousing and Distribution Partial techniques and tools included in each step, related software.

UNIT V
INFORMATION TECHNOLOGY IN A SUPPLY CHAIN
The Role of IT in a Supply Chain, The Supply Chain IT Framework, Customer Relationship Management, Internal Supply Chain Management, Supplier Relationship Management, The Transaction

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Management Foundation, The Future of IT in the Supply Chain, Risk Management in IT, Supply Chain IT in Practice , Summary of Learning Objectives.

COURSE OUTCOMES

On completion of this course, the students will be able to:

1. Know how Supply chain management is essential to company success and customer satisfaction.
2. Understand the fundamentals of elements and functions of supply chain, demand forecasting.
3. To apply various techniques of inventory management and their practical situations.
4. Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain.
5. Apply Supply chain management knowledge and capabilities to support medical missions, conduct disaster relief operations, and handle other types of emergencies.

TEXT BOOKS

1. Supply Chain Management: Strategy, Planning, and Operation, Sunil Chopra and Peter Meindel, Prentice Hall of India.

REFERENCE BOOKS

1. Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies, Second Edition, David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, McGraw-Hill/Irwin, New York, 2003.
2. Introduction to Supply Chain Management, Robert Handfield & Ernest Nichols, Prentice hall.

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MATS UNIVERSITY, RAIPUR (C.G.)
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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Engineering Economics & Financial Accounting
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO03

COURSE OBJECTIVES
- To introduce the theory of engineering economics, demand and supply analysis.
- To understand the project financial procedures
- To study the concepts of financial accounting.

UNIT I
INTRODUCTION
Managerial Economics, Relationship With Other Disciplines, Firms: Types, Objective And Goals, Managerial Decisions And Decision Analysis.

UNIT II
DEMAND AND SUPPLY ANALYSIS
Demand, Types of Demand, Determinants of Demand, Demand Function, Demand Elasticity, Demand Forecasting, Supply: Determinants of Supply, Supply Function, Supply Elasticity.

UNIT III
PRODUCTION FUNCTION AND COST ANAYSIS
Production Function, Returns of Scale, Production Optimization, Least Cost Output, Isoquants, Managerial uses of Production Function. Cost Concepts: Cost Function, Types of Cost, Determinants of Cost, Short Run and Long Run Cost Curves, Cost Output Decision, Estimation of Cost.

UNIT IV
PRICING
Determinants of Price, Pricing under Different Objectives and different Market Structures, Price Discrimination, Pricing Methods in Practice, Role of Government in Pricing Control.

UNIT V
FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT

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Balance Sheet & related concepts, profit & loss statements and related concepts, Financial Ratio Analysis, Cash Flow Analysis, Funds Flow Analysis, Comparative Financial Statements, Analysis & Interpretation of Financial Statements. Investments, Risks And Return Evaluation Of Investment Decision, Average Rate Of Return, Payback Period, Net Present Value, Internal Rate Of Return.

COURSE OUTCOMES
- Explain theory of engineering economics,
- Understand demand and supply concept and application area of it.
- Analyze the project in terms of financial procedures and accounting.

TEXT BOOKS
1. Managerial Economics; Applications, Strategy and Tactics, McGuigan, Moyer and Harris, Thomson   South Western, 10th Edition, 2005.
2. Fundamentals of Financial Management, Prasanna Chandra, Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.

REFERENCE BOOKS
1. Economics, Samuelson Paul A. and Nordhaus W.D., Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
2. Basic Financial Accounting for Management, Paresh Shah, Oxford University Press, New Delhi, 2007.
3. Managerial Economics in a global economy, Salvatore Dominick, Thomson South Western, 4th Edition, 2001.

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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Knowledge Entrepreneurship
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO04

COURSE OBJECTIVES
1. To study about entrepreneurship.
2. To learn how to start a business/venture with attractive business opportunities.
3. To learn how to create functional plans, from where to get finance for business setup.
4. To learn business management.

UNIT I
ENTREPRENEURSHIP
Concept, Knowledge and Skills Requirement, Characteristic of successful Entrepreneurs, Role of Entrepreneurship in Economic Development, Entrepreneurship Process, Factors Impacting Emergence of Entrepreneurship, Managerial Vs. Entrepreneurial Approach And Emergence Of Entrepreneurship.

UNIT II
STARTING THE VENTURE
Generating Business Idea: Sources of new ideas, methods of generating ideas, creative problem solving, Opportunity Recognition, Environmental Scanning, Competitor and Industry Analysis, Feasibility Study-Market Feasibility, Technical/Operational Feasibility, Financial Feasibility, Drawing Business Plan, Preparing Project Report, Presenting Business Plan to Investors.

UNIT III
FUNCTIONAL PLANS
Marketing Plan , marketing research for the new venture, steps in preparing marketing plan, contingency planning, organizational plan, form of ownership, designing organization structure, Job Design, Manpower Planning, Financial Plan, Cash Budget, Working Capital, Performa Income Statement Performa Cash Flow, Perform Balance Sheet, Break Even Analysis.

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UNIT IV
SOURCES OF FINANCE

Debt or Equity Financing, Commercial Banks, Venture Capital, Financial Institutions Supporting Entrepreneurs, Legal Issues , Intellectual Property Rights: Patents, Trade Marks, Copy Rights, Trade Secrets, Licensing, Franching

UNIT V
BUSINESS MANAGEMENT FOR ENTREPRENEURS

The Core Group and the Employees, The Board : The Board in Practice ,The Board Work in the New Business, The Main Tasks of the Board ,The Useful Effect of the Board ,The Director's Fee .

COURSE OUTCOMES

- Have idea of entrepreneurship.
- Start a venture with attractive business opportunities.
- Create functional plans and execute these plans with proper financial support from investors.
- Manage business efficiently.

TEXT BOOK

1. Knowledge Based Entrepreneurship, John Heeboll, Copenhagen University SCIENCE and KU-HUM/DTU Summer School 2007.

REFERENCE BOOK

1. Knowledge-Driven Entrepreneurship: The Key to Social and Economic Transformation, Thomas Andersson, Piero Formica, Martin G. Curley, Springer Science & Business Media, 01-Dec-2009.

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MATS UNIVERSITY, RAIPUR (C.G.)
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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Technology Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO05

COURSE OBJECTIVES
- To study about technology market and associated industry.
- To learn the development of a new product with proper management.
- To study about innovation in the field of technology.

UNIT I
THE EVOLUTION OF TECHNOLOGY, MARKETS, AND INDUSTRY
Technology and Industry Evolution, Evolution of Markets: Innovation Adoption, Diffusion, Market Growth, New Product Entry, and Competitor Responses.

UNIT II
THE DEVELOPMENT AND INTRODUCTION OF NEW PRODUCTS
Understanding Customer Needs, Product Development as a Problem Solving Process, Managing the 'Unmanageable' of Sustained Product Innovation.

UNIT III
THE MANAGEMENT AND ORGANIZATION OF INNOVATION
Rival Interpretations of Balancing Exploration and Exploitation: Simultaneous or Sequential? , R&D Project Selection and Portfolio Management: A review of the past, a description of the present, and a sketch of the future, managing the innovative performance of technical professionals.

UNIT IV
TECHNOLOGY STRATEGY
The Economics and Strategy of Standards and Standardization, Intellectual Property and Innovation, Orchestrating Appropriability: Towards an endogenous view of capturing value from innovation investments, Individual Collaborations, Strategic Alliances and Innovation: Insights from the Biotechnology Industry.

UNIT V
WHO INNOVATES
Technology Based Entrepreneurship, knowledge spillover, Entrepreneurship and Innovation in large and small firms, Financing of Innovation, the contribution of public entities to Innovation and Technological Changes.

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COURSE OUTCOMES

- Explain the concept of technology management with its application areas.
- Develop a new product with the proper management.
- Apply innovative ideas in technology invention.

TEXT BOOK

1. Handbook of Technology and Innovation Management, Scott Shane, Case Western Reserve University, A John Wiley and Sons, Ltd., Publication.

REFERENCE BOOK

1. Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini , John Wiley & Sons.

MATS UNIVERSITY, RAIPUR (C.G.)
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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Ad-Hoc and Sensor Networks
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO06

COURSE OBJECTIVES

- Learn Ad hoc network and Sensor Network fundamentals.
- Understand the different routing protocols.
- Have an in-depth knowledge on sensor network architecture and design issues.
- Understand the transport layer and security issues possible in Ad hoc and Sensor networks.

UNIT I
AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS
Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

UNIT II
SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES
Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

UNIT III
WSN NETWORKING CONCEPTS AND PROTOCOLS
MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols, Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT IV
SENSOR NETWORK SECURITY
Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming,

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tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks

UNIT V
SENSOR NETWORK PLATFORMS AND TOOLS
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

COURSE OUTCOMES
- Know the basics of Ad hoc networks and Wireless Sensor Networks
- Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement .
- Apply the knowledge to identify appropriate physical and MAC layer protocols.
- Understand the transport layer and security issues possible in Ad hoc and sensor networks.

TEXT BOOKS
1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, PTR, 2004.
2. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.

REFERENCE BOOKS
1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Holger Karl, Andreas Willig "Protocols and Architecture for Wireless Sensor Networks" John Wiley and Sons, Ltd.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Technologies for Sustainable Development
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO07

COURSE OBJECTIVES

- Understand the relevance and the concept of sustainability and the global initiatives in this direction.
- Explain the different types of environmental pollution problems and their sustainable solutions.

UNIT I
Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

UNIT II
Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

UNIT III
Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

UNIT IV
Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

UNIT V
Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.

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COURSE OUTCOMES
- Discuss the environmental regulations and standards.
- Outline the concepts related to conventional and non-conventional energy.
- Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

TEXT BOOKS
1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development,Cengage learning.
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
4. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

REFERENCE BOOKS
1. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System.
2. Nibin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
3. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
4. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	E- Commerce & Strategic IT
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO08

COURSE OBJECTIVES
- To understand the business impact and potential of e-commerce.
- To learn the technologies associated with e-Commerce.
- To learn e-commerce from an enterprise point of view.
- To learn the security concern related to e-commerce.

UNIT I
INTRODUCTION
E-Commerce History and Evolution, E-Commerce Industry Framework, Brief History of Ecommerce, Consumer to Business Electronic Commerce, Architectural Framework, Internet and other Novelties, Networks and Electronic Transactions Today.

UNIT II
ENCRYPTION
Encryption Techniques, Symmetric Encryption: Secret Key Encryption, Asymmetric Encryption: Public and Private Pair Key Encryption, Digital Signatures, Virtual Private Network, Domain Name Server, LAN, Electronic Commerce Online Resources Designing, Electronic Payment Systems.

UNIT III
ELECTRONIC PAYMENT SYSTEMS
Types of electronic payment systems, digital token-based electronic payment systems, smart cards & electronic payment systems, credit card based electronic payment systems, Internet Strategies: Internet Techniques, Shopping techniques and online selling techniques;

UNIT IV
INFORMATION DISTRIBUTION AND MESSAGING
FTP, E-Mail, www server, HTTP, Web service implementation, Information publishing , Web Browsers, HTML, Common Gateway Interface

UNIT V
MOBILE & WIRELESS COMPUTING FUNDAMENTALS
Mobile computing framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications, personal communication service.

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COURSE OUTCOMES

- Apply the skills necessary for large scale web based e-commerce project development.
- Work on information distribution and messaging services in e-commerce applications.
- Work on business applications of wireless and mobile technologies for e-commerce.

TEXT BOOKS

1. Frontiers of E-commerce, Kalakota & Whinston, Addison Wesley.
2. E-Business Road Map for Success, Dr. Ravi Kalakota & Marcia Robinson, Addison Wesley.
3. Electronic Commerce by Bharat Bhasker, TMH.

REFERENCE BOOKS

1. Pete Lohsin , John Vacca "Electronic Commerce", New Age International.
2. Goel, Ritendra "E-commerce", New Age International.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Decision Support & Executive Information System
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO09

COURSE OBJECTIVES

- To get idea about the fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems.
- To examine examples and case studies documenting computer support for organizational decision making, and various planning, analysis and control tasks.
- To discuss and develop the analysis, design and implementation of computerized Decision Support Systems.

UNIT I
DECISION SUPPORT SYSTEM

What is a DSS? Decision Making Rational Decisions, Definitions of Rationality, Bounded Rationality and Muddling Through, The Nature of Managers, Appropriate Data Support, Information Processing Models, Group Decision Making.

UNIT II
COMPONENT OF DSS

Data Component : Information and its Usefulness, Characteristics of Information, Databases to Support Decision Making, Database Management Systems, Data Warehouses, Data Mining and Intelligent Agents Model Component-:Models Representation Methodology, Time Model Based Management Systems, Access to Models, Understandability of Results, Integrating Models Sensitivity of a Decision, Brainstorming and Alternative Generation, Evaluating Alternatives, Running External Models, Mail Component: Integration of Mail Management Examples of Use implications for DSS.

UNIT III
INTELLIGENCE AND DECISION SUPPORT SYSTEMS

Programming Reasoning, Backward Chaining Reasoning, Forward Chaining Reasoning, Comparison, Certainty Factors, User-Interface Component: User Interface Components, The Action Language, Menus, Command Language, I/O Structured Formats, Free Form Natural Language, The Display or Presentation Language, Windowing Representations, Perceived Ownership of Analyses, Graphs and Bias Support for All Phases of Decision Making, The Knowledge Base Modes of Communication

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UNIT IV
DESIGNING A DSS

Planning for DSS, Designing a Specific DSS, Interviewing Techniques, Other Techniques, Situational Analysis, Design Approaches, Systems Built from Scratch, Using Technology to Form the Basis of the DSS, Evaluating a DSS Generator, Using a DSS Generator, The Design Team, DSS Design and Re-engineering Discussion.

UNIT V
IMPLEMENTATION AND EVALUATION OF DSS

Implementation Strategy, Prototypes, Interviewing, User Involvement, Commitment to Change, Managing Change, Institutionalize System, Implementation and System Evaluation, Technical Appropriateness, Measurement Challenges , Organizational Appropriateness.

COURSE OUTCOMES
- Define the relationship between business information needs and decision making
- Appraise the general nature and range of decision support systems.
- Appraise issues related to the development of DSS.

TEXT BOOKS
1. Decision Support System, Vicki l Sauter
2. Management Information system, Gerald V. Post & David L. Anderson.

REFERENCE BOOKS
1. Decision Support Systems and Intelligent Systems, E. Turban and J.E. Aronson, Prentice Hall.
2. Decision Support Systems, V. S. Janakiraman and K.Sarukesi, PHI.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Applied Graph Theory
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO10

COURSE OBJECTIVES

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration- Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

COURSE OUTCOMES

- Understand the basic concepts of graphs, and different types of graphs.
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

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TEXT BOOKS

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

REFERENCE BOOKS

1. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
2. West, D. B., ―Introduction to Graph Theory‖, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, ―A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill , 2007.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Innovative Entrepreneurial Skill
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO11

COURSE OBJECTIVES

- To understand the concept of innovation and applicability of innovation in entrepreneurship.
- To identify and analyze the opportunities for entrepreneurship and innovation.
- To understanding industry dynamics and factors for developing successful innovations and apply this understanding to innovations in various sectors.

UNIT I
INNOVATION
An Abstract Concept, Creativity, Innovation and Imagination, Types of Innovation, classification according to products, Processes or Business Organizations.

UNIT II
ENTREPRENEURSHIP
Who is an Entrepreneur? Entrepreneurship: A state of Mind, Emergence of entrepreneur, Role of Entrepreneur, A Doer not a Dreamer, Characteristics of an Entrepreneur, Factors affecting Entrepreneurial Growth: Social, Cultural, Personality Factors, Psychological and Social Factors, Impact of Entrepreneurship for Sustainable Development.

UNIT III
ENTERPRENEUR vs. ENTERPRENEURSHIP
Difference between Entrepreneur and Entrepreneurship, Difference between Entrepreneur and Intra-preneur, Common Entrepreneurial Competencies/Traits, Entrepreneurship Stimulants, Obstacles Inhibiting Entrepreneurship, Types of Entrepreneurs, Functions of an Entrepreneur.

UNIT IV
IDENTIFICATION OF BUSINESS OPPORTUNITIES
Introduction, Sources of Business Product Ideas, Steps in Identification of Business Opportunity and its SWOT Analysis.

UNIT V
TECHNO ECONOMIC FEASIBILITY OF THE PROJECT
Introduction, Techno Economic Feasibility of the Project, Feasibility Report, and Considerations while preparing a Feasibility Report, Proforma of Feasibility Report, Role of Institutions and entrepreneurship.

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COURSE OUTCOMES

- Apply innovative skills in entrepreneur activity.
- Have entrepreneurship in leading sectors.

TEXT BOOKS

1. Competing through Innovation, Bellon & Whittington, Prentice Hall of India
2. A Guide to Entrepreneurship, David Oates- JAICO Publishing House.

REFERENCE BOOKS

1. Entrepreneurship, Rober D Hisrich, Peters, Shepherd- TMH
2. Entrepreneurship in Action, Coulter, Prentice Hall of India.
3. Entrepreneurship Management and Development, Ajith Kumar, HPH.
4. Fundamentals of entrepreneurship- Mohanty, PHI.
5. Patterns of Entrepreneurship- Jack M Kaplan, Wiley, student Edit

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Soft Computing
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO12

COURSE OBJECTIVES
- To introduce basics of soft computing (neural networks, fuzzy system).
- To give idea of genetic algorithm and its applications.

UNIT I
INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS
Evolution of Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics.

UNIT II
GENETIC ALGORITHMS
Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning, Machine Learning Approach to Knowledge Acquisition, Chromosome representation, Encoding, Decoding, Genetic Operators, Selection, Crossover, Mutation, Elitism, Schema Theorem, EGA, Convergence Theorem, Real-Coded GA, Ordered GA, Steady-State GA, Multi-Objective Evolutionary Algorithms, Applications in Search and Optimization, Recent Advances in Evolutionary Computing (Particle Swarm Optimization, Ant Colony Optimization).

UNIT III
NEURAL NETWORKS
Machine Learning using Neural Network, Adaptive Networks, Feed Forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks, Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance Architectures, Advances in Neural networks.

UNIT IV
FUZZY LOGIC
Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

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UNIT V
NEURO-FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification, Neuro Fuzzy Control, Case studies.

TEXT BOOKS
1. Neuro-Fuzzy and Soft Computing, Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Prentice-Hall of India, 2003.
2. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall, 1995.
3. Neural Networks Algorithms, Applications, and Programming Techniques, James A. Freeman and David M. Skapura, Pearson Edn., 2003.

REFERENCE BOOKS
1. An Introduction to Genetic Algorithm, Mitchell Melanie, Prentice Hall, 1998.
2. Genetic Algorithms in Search, Optimization and Machine Learning, David E. Goldberg, Addison Wesley, 1997.
3. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam, S. Sumathi and S. N. Deepa, Springer, 2007.
4. Introduction to Genetic Algorithms, S.N.Sivanandam · S.N.Deepa, Springer, 2007.
5. Introduction to Artificial Neural Systems, Jacek M. Zurada, PWS Publishers, 1992.

COURSE OUTCOMES
1. Explain the neural network, fuzzy set theory.
2. Implement numerical methods in soft computing
3. Apply genetic algorithm in real time applications.

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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Disaster Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO13

COURSE OBJECTIVES
- To introduce disaster, its nature and types.
- To understand disaster zoning and hazard assessment.
- To know about the disaster mitigation and preparedness.
- To understand management during disaster and construction technology for its mitigation.
- To identify relief measures.

UNIT I
INTRODUCTION
Nature of Disasters, Natural and Other Disasters, Earthquakes, Floods, Draught, Cyclones, Fire, and other Environmental Disasters.

UNIT II
DISASTER ASSESSMENT
Behavior of structures in Disaster Prone Areas, Disaster Zoning, Hazard Assessment, Environmental Impact Assessment

UNIT III
DISASTER PROTECTION
Methods of Mitigating Damage during Disasters, Disaster Preparedness.

UNIT IV
DISASTER MANAGEMENT
Management Systems during Disasters, Construction Technology for Mitigation of Damage of Structures.

UNIT V
RELIEF MEASURES
Short Term, and Long Term Relief Measures.

COURSE OUTCOMES
- Explain disaster and its nature.
- Understand impact and hazard assessment.
- Understand disaster preparedness and mitigation.
- Use construction technology for disaster management.

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TEXT BOOKS

1. Design of Earthquake Resistant Buildings – Minoru Wakabayashi (McGraw Hill Publication).
2. Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd edition), Anil K Chopra (Pearson Education Publication)

REFERENCE BOOKS

1. Fundamentals of Vibrations – Anderson, R.A. (Mc Millan) IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
2. Earth quake engineering damage assessment and structural design – S.F. Borg Disasters and development – Cuny F (Oxford University Press Publication)

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Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Professional Ethics in Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO14

COURSE OBJECTIVES

- To study about engineering Ethics, variety of moral issues and moral dilemmas, professional Ideals and virtues.
- To learn basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis.
- To learn Collegiality and Loyalty, Collective Bargaining, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights.

UNIT I
MORALS AND ETHICS IN ENGINEERING

Senses of Engineering Ethics, Variety of Moral Issues, Types of Inquiry, Moral Dilemmas, Moral Autonomy, Kohlberg's Theory, Gilligan's theory, Indian Theory Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Uses of Ethical Theories.

UNIT II
ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation, Engineers as Responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, A Balanced Outlook on Law, The Challenger Case Study, Titanic disaster as Case Study.

UNIT III
ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis, Reducing Risk, The Government Regulator's Approach to Risk, Disasters at Chernobyl and Bhopal (Case Studies).

UNIT IV
RESPONSIBILITIES, RIGHTS AND ACCOUNTABILITY

Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination.

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UNIT V
GLOBAL ISSUES
Multinational Corporations: Business Ethics, Environmental Ethics, Computer Ethics, Role in Technological Development, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Honesty, Moral Leadership, Sample Code of Conduct.

COURSE OUTCOMES
- Have perception of profession, professional ethics, various moral & social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
- Know professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
- Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

TEXT BOOKS
1. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill, New York, 2005.

REFERENCE BOOKS
1. Engineering Ethics Concepts and Cases, Charles E Harris, Michael S Pritchard and Michael J Rabins, Thompson Learning, 2000.
2. Engineering Ethics, Charles D Fleddermann, Prentice Hall, New Mexico, 1999.
3. Ethics and the Conduct of Business, John R Boatright, Pearson Education, 2003.
4. Fundamentals of Ethics for Scientists and Engineers, Edmund G Seebauer and Robert L Barry, Oxford University Press, 2001.
5. Business Ethics – An Indian Perspective, Prof. (Col) P S Bajaj and Dr. Raj Agrawal, Biztantra, New Delhi, 2004.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	Intellectual Property Rights
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO15

COURSE OBJECTIVES
- To provide an overview of Intellectual Property Right.
- To study the complexities involved in the process of attributing intellectual property rights to people.
- To learn the legalities of intellectual property to avoid plagiarism, copyright infringements etc.

UNIT I
INTRODUCTION
Basic Concepts of Intellectual Property: Introduction to Intellectual Property Rights, Laws and its Scope, Trade Related Aspects of Intellectual Property Rights.

UNIT II
PATENTS
Patents: Introduction to Patent Law and Condition for Patentability, Procedure for Obtaining Patents, Rights of a Patentee, Patent Infringements, Biotechnology Patents and Patents on Computer Programs, Patents from an International Perspective.

UNIT III
TRADEMARK AND GEOGRAPHICAL INDICATIONS
Statutory Authorities and Registration Procedure, Rights Conferred by Registration, Licensing, Assignment and Transfer of Trademark Rights, Trademark Infringement, Geographical Indication of Goods & Appellations of Origin.

UNIT IV
COPYRIGHT
Registration Procedure, Copyright Authorities, Assignment & Transfer of Copyright, Copyright Infringement and Exceptions to Infringement, Software Copyright.

UNIT V
LAW ON DESIGNS
Introduction to the Law on Industrial Designs, Registration and Piracy, International Perspective, Introduction to the Law on Semiconductor Layout Design, Registration, Commercial Exploitation and Infringement.

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COURSE OUTCOMES

- Identify different types of Intellectual Properties, right of ownership, scope of protection as well as the ways to create and to extract value from Intellectual Property.
- Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
- Identify activities and constitute Intellectual Property infringements and the remedies available to the owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development.

TEXT BOOKS

1. Managing Intellectual Property, Vinod V Sople, PHI
2. Cyber Law, Intellectual Property and E-Commerce Security, Kumar K, Dominent Publication And Distribution, New Delhi.

REFERENCE BOOKS

1. Inventors Guide to Trademarks and Patents, Craig Fellenstein, Rachel Ralson- Pearson Education.
2. Intellectual Property, David Bainbridge, Longman.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	Mechanical Engineering
Subject	:	IT in Business
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO16

COURSE OBJECTIVES
- Understand the fundamentals of information technology.
- Understand how businesses use information technology

UNIT I
INFORMATION TECHNOLOGY AND BUSINESS – AN OVERVIEW
Concepts of data, impact of information technology on business (business data processing, intra-organizational and inter-organizational communication by using network technology,). Types of Information System - Transaction Processing System (TPS),
Management Information System (MIS), Decision Support System (DSS), Knowledge Management System (KMS) - and their implementation at managerial levels(operational, tactical and strategic). Recent trends in information technology (brief ideas) – Enterprise computing, mobile communication, smart card.

UNIT II
NUMBER SYSTEM AND REPRESENTATION OF DATA IN COMPUTING SYSTEM
Data representation – bits, bytes, KB, MB, GB, TB. Concept of Number systems [Decimal, Binary, Octal and Hexadecimal], Binary arithmetic [addition, subtraction using 1's & 2's complement method], Computer Codes – BCD, EBCDIC, ASCII.

UNIT III
FUNDAMENTALS OF COMPUTER
Components of digital computer and their functions (input unit, processing unit, output unit and storage unit). Basic concepts of hardware & software. Relationship between hardware and software. Types of software: System software – Operating systems [characteristics & functions, uses of GUI based O.S. – LINUX AND WINDOWS], Programming Languages Translator – Assembler, Compiler and Interpreter, Utilities. Application software (basic ideas and examples).

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UNIT IV

DATA ORGANIZATION AND DATA BASE MANAGEMENT SYSTEM

(a) Data organization: Character, field, record, file and database. Types of Data Processing Systems [Serial, Batch, Real-time, Online, Centralized, Distributed], File Organizations [Sequential, Direct, Indexed-Sequential, Relative], Traditional file organization Vs. Database File organization.

(b) Data Base Management System: Concept of Data Base Management System, Important terms of Database [including Entity, Attribute, Primary Key, Foreign Key, Candidate Key, Referential integrity, Table, Views, Data Dictionary]. Types of database [hierarchical, network and relational]. Basic ideas of Data Warehouse and Data mining.

UNIT V

DATA COMMUNICATION AND COMPUTER NETWORK

(a) Data Communication: Concept of Data communications, Transmission Modes [Simplex, Half-Duplex, Full Duplex, Serial, Parallel, Synchronous, Asynchronous], Communication Media. Wireless and satellite communication, Wireless Broadband, WAP, Network components – Bridge, Switch, Router, Gateway

(b) Computer Networks: Network Concept, Types: LAN, WAN, MAN, VAN, SAN. Various Topologies: Bus, Star, Ring, Mesh, Tree.

COURSE OUTCOMES

- Learn core concepts of computing and modern systems.
- Understand modern software programs and packages.
- Learn about upcoming IT technologies.

TEXT BOOKS

1. Turban, Rainer and Potter, Introduction to Information Technology, Wiley.
2. ITLESL, Introduction to Information Technology, Pearson.

REFERENCE BOOKS

1. Sinha & Sinha, Fundamentals of Computers, BPB Publication.
2. Ramesh Behl, Information Technology for Management, TMH.

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Semester   :   Open Elective
Branch   :   Mechanical Engineering
Subject   :   Environmental Management & Sustainable Development
Total Theory Periods :   48
Total Tutorial Periods :   00
Total Credits   :   03
Code   :   BTO17

COURSE OBJECTIVES

- To understand the environmental, social and economic dimensions of sustainability and the principles evolved through landmark events so as to develop an action mindset for sustainable development.

UNIT I
SUSTAINABILITY AND DEVELOPMENT CHALLEGES

Definition of sustainability – Environmental, Economical and Social dimensions of sustainability Sustainable Development Models – Strong and Weak Sustainability – Defining Development- Millennium Development Goals – Mindsets for Sustainability : Earthly, Analytical, Precautionary, Action and Collaborative– Syndromes of Global Change: Utilization Syndromes, Development Syndromes, and Sink Syndromes – Core problems and Cross Cutting Issues of the 21 Century - Global, Regional and Local environmental issues – Social insecurity - Resource Degradation – Climate Change –Desertification

UNIT II
PRINCIPLES AND FRAME WORK

History and emergence of the concept of sustainable development - Our Common Future - Stockholm to Rio plus 20– Rio Principles of Sustainable Development – Precautionary Principle- Polluter Pays Principle – Role of Civil Society, Business and Government -Natural Step- Peoples Earth Charter – Business Charter for Sustainable Development –UN Global Compact – Agenda 21

UNIT III
SUSTAINABILE LIVELI HOOD

The Unjust World and inequities - Quality of Life - Poverty, Population and Pollution - Combating Poverty -Millennium Development Goals, Indicators, Targets, Status and intervention areas - Demographic dynamics of sustainability - Strategies to end Rural and Urban Poverty and Hunger – Sustainable Livelihood Framework- Health, Education and Empowerment of Women, Children, Youth, Indigenous People, Non-Governmental Organizations, Local Authorities and Industry for Prevention, Precaution , Preservation and Public participation.

UNIT IV
SUSTAINABLE SOCIO-ECONOMIC SYSTEMS

Protecting and Promoting Human Health – Investing in Natural Capital- Agriculture, Forests,

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Fisheries - Food security and nutrition and sustainable agriculture- Water and sanitation - Biodiversity conservation and Ecosystem integrity –Ecotourism - Urbanization and Sustainable Cities – Sustainable Habitats- Green Buildings - Sustainable Transportation – Sustainable Consumption and Production – Sustainable Mining - Sustainable Energy– Climate Change – Mitigation and Adaptation - Safeguarding Marine Resources - Financial Resources and Mechanisms

UNIT V
ASSESSING PROGRESS AND WAY FORWARD

Nature of sustainable development strategies and current practice- Sustainability in global, regional and national context – Rio Plus 20 - Approaches to measuring and analyzing sustainability– limitations of GDP- Ecological Footprint- Human Development Index- Human Development Report – National initiatives for Sustainable Development -Hurdles to Sustainability - Operational guidelines –- Science and Technology for sustainable development –Performance indicators of sustainability and Assessment mechanism – Inclusive Green Growth and Green Economy – National Sustainable Development Strategy Planning – Governance - Science and Technology- Sustainability Education.

COURSE OUTCOMES
- Develop a fair understanding of the social, economic and ecological linkage of human production and consumption.
- Learn to integrate the Rio principles of Sustainable development in decision making and Contribute towards Green Economy

TEXT BOOKS
1. Barry Dalal Clayton and Stephen Bass, Sustainable Development Strategies- a resource book", Earthscan Publications Ltd, London, 2002.
2. Karel Mulder, Sustainable Development for Engineers - A Handbook and Resource Guide, Green Leaf Publishing, 2006.
3. MoEF " Sustainable Development in India –stocktaking in the Run up to Rio plus 20", Ministry of Environment and Forests, Government of India, New Delhi. 2012,

REFERENCE BOOKS
1. UNEP, , Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication,ISBN: 978-92-807-3143-9, 2011.
2. World Bank "Inclusive Green Growth – The pathway to Sustainable development, World Bank- Washington DC, 2012

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Satellite Communication
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO18

COURSE OBJECTIVES
- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

UNIT I
SATELLITE ORBITS
Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non-Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II
SPACE SEGMENT
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III
SATELLITE LINK DESIGN
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV
SATELLITE ACCESS AND CODING METHODS
Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

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UNIT V
SATELLITE APPLICATIONS

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

COURSE OUTCOMES
• Analyze the satellite orbits
• Analyze the earth segment and space segment
• Analyze the satellite Link design
• Design various satellite applications

TEXT BOOKS
1. Dennis Roddy, ―Satellite Communication‖, 4th Edition, Mc Graw Hill International, 2006.
2. Timothy, Pratt, Charles, W.Bostain, JeremyE.Allnutt,"SatelliteCommunication‖,2nd Edition, Wiley Publications,2002

REFERENCE BOOKS
1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, ―Satellite Communication Systems Engineering‖, Prentice Hall/Pearson, 2007.
2. N.Agarwal, ―Design of Geosynchronous Space Craft‖, Prentice Hall, 1986.
3. Bruce R. Elbert, ―The Satellite Communication Applications‖, Hand Book, Artech House Bostan London, 1997.
4. Tri T. Ha, ―Digital Satellite Communication‖, II nd edition, 1990.
5. Emanuel Fthenakis, ―Manual of Satellite Communications‖, Mc Graw Hill Book Co., 1984.

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Enterprise Resource Planning
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO19

COURSE OBJECTIVES
- Describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity.
- Explain how ERP is used to integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation.
- Describe the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes; explain the effect of a new product launch on the three core business processes.

UNIT I
ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.

UNIT II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Man-agreement (PLM), LAP, Supply chain Management.

UNIT III
ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT IV
ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT V
ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.

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COURSE OUTCOMES

- Develop model for ERP for large projects.
- Develop model for E-commerce architecture for any application.
- Describe the advantages, strategic value, and organizational impact of utilizing an ERP system for the management of information across the functional areas of a business: sales and marketing, accounting and finance, human resource man-agreement, and supply chain.
- Demonstrate a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.
- Evaluate organizational opportunities and challenges in the design system within a business scenario.

TEXT BOOKS

1. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning Concepts and Practice", PHI.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology.

REFERENCE BOOKS

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill.
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill.
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – A Concepts and Practice", PHI.
4. Mary Summer, "Enterprise Resource Planning"- Pearson Education

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Entrepreneurship Development
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO20

COURSE OBJECTIVES
- The objectives of the course are to
- Introduce various qualities required for entrepreneurship
- Explain various entrepreneurship models
- Organize interaction with successful entrepreneurs
- Introduce to various tools as Six hat techniques, Five S

UNIT I
Introduction to entrepreneurship, concept of Market Survey **.**

UNIT II
Project report preparation.

UNIT III
Introduction to various types of entrepreneurships**.**

UNIT IV
Introduction to import-export**.**

UNIT V
Environmental Protection and social responsibility of entrepreneur, discuss on source of entrepreneurship, Factory visit and meeting with entrepreneur**.**

COURSE OUTCOMES
- Identify qualities of entrepreneurs.
- Write project proposal. .
- Use various entrepreneurship models.
- Understand various schemes supporting entrepreneurship.
- Think creative and innovative

TEXT BOOKS
1. Dr. Gupta and Dr. Srinivasan, Entrepreneurship development in India.
2. Vasant Desai, Dynamics of Entrepreneurial Development and Management.

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3. Sarugadharan and Resia Begum, Women Entrepreneurship; institutional support and problems.

4. M.W.Deshpande, Entrepreneurship of small Scale Industries
5. D.L. Saxon and RW Smilor (eds), The Art and Science of Entrepreneurs.

REFERENCE BOOKS
1. Venkateshwara Rao and Udai Pareek, (Eds)Developing Entrepreneurship-A Handbook.
2. Raja Gopal, Agriculture Business and Entrepreneurship H.Sadhak, industrial development in Backward Regions in India.
3. Ravi J. Mathai, Rural Entrepreneurship A Frame Work in Development Entrepreneurship -A Handbook

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Renewable Energy Sources
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO21

COURSE OBJECTIVES
- To introduce about renewable energy sources.
- Explain solar energy and solar cell.
- Explain wind energy and wind turbines.
- Explain fuel cells.
- Explain nuclear energy and other form of renewable energy.

UNIT I
INTRODUCTION TO RENEWABLE ENERGY TECHNOLOGIES
Energy Storage: Introduction; Necessity of Energy Storage; Energy Storage Methods
Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data

UNIT II
SOLAR THERMAL SYSTEMS
Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems
Solar Photovoltaic systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems.

UNIT III
WIND ENERGY
Introduction; Origin and nature of winds; Wind turbine siting; Basics of fluid mechanics; Wind turbine aerodynamics; wind turbine types and their construction; Wind energy conversion systems

UNIT IV
FUEL CELLS
Overview; Classification of fuel cells; operating principles; Fuel cell, thermodynamics Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification.

UNIT V
OTHER FORMS OF ENERGY
Introduction: Nuclear, ocean and geothermal energy applications; Origin and their types; Working principles Learning Resources.

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COURSE OUTCOMES

- Understand basic concepts of solar radiation and analyze solar thermal systems for its utilization.
- Understand working of solar cells and its modern manufacturing technologies.
- Understand concepts of Fuel cells and their applications
- Identify methods of energy storage.
- Compare energy utilization from wind energy, geothermal energy, biomass, biogas and hydrogen.

TEXT BOOKS

1. Non-conventional Energy Resources, B.H.Khan, Tata McGraw Hill, New Delhi, 2017, 3rd edition.
2. Solar Energy-Principles of Thermal Collection and Storage, S.P.Sukhatme and J.K.Nayak, TMH, 2008, 3rd edition

REFERENCE BOOKS

1. Solar Energy Thermal Processes, J.A.Duffie and W.A.Beckman, John Wiley, 2010, 2nd edition
2. Energy Technology: Non-Conventional, Renewable and Conventional, S.Rao and B.B.Parulekar, Khanna Publishers, 2010, 1st Edition.

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Soft Skills and Interpersonal Communication
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO22

COURSE OBJECTIVES

- The aim of this course is to improve the grammatical competence in the learner-friendly material with task-based activities to enhance their communicative competence.
- The aim of this course is to introduce the basics of Grammar and Vocabulary as well as reading skills.
- The aim of this course is to reinforce writing skills and soft skills. The students are able to explore various aspects of through life skills in addition to the Communication and Soft Skills.

UNIT I
GRAMMAR
Parts of Speech, Using the Dictionary, Primary Auxiliaries, Modal Auxiliaries, Subject and Object (Direct/Indirect) -Yes or No Questions, Wh-word Questions, Question Tags. How to Greet-Introduce (Self and others)-Give Instructions, Give Directions. Homophones. Vocabulary Building, Types of Verbs, Subject- Verb Agreement. **T**ense (present and past) and Aspect, The several possibilities for denoting future Time.

UNIT II
LISTENING SKILLS
The Importance of Listening, Barriers/Obstacles to Effective Listening, Strategies for Effective Listening.

UNIT III
READING & WRITING SKILLS
 Reading Skills-Skimming, Scanning, Comprehension.
Writing Skills- Information Transfer- Pie Diagrams, Tree Diagrams, Flow Charts, Tables.

UNIT IV
SPEAKING SKILLS
Presentation -The Sounds of English**,** Word Accent, Intonation**,**
Speaking Skills**-**Conversation Skills, Interview Skills, Presentation Skills**,** Role Play, Group Discussion**.**

UNIT V
SOFT SKILLS
 Positive Attitude, Body Language, SWOT/SWOC Analysis. Paragraph Writing-Paragraph Structure, Principles of making paragraph. Summarizing-What Makes a Good Summary, Stages of Summarizing**.** Letter Writing-Letter Writing (Formal and Informal)**,** Resume, Cover Letter

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COURSE OUTCOMES

- Students can gain potential knowledge towards Grammatical and Communicative competence through the useful inputs and task-based activities. This enables them to build their confidence in using English language.
- By the end of the semester, the students can acquire linguistic competence to be able to compete with the globalized world and become successful in all the challenges that they face.
- The students, by the end of this course, are able to develop Linguistic competence and Communicative competence which helps them to develop "thinking" skill in English in addition to LSRW skills.
- This course enables the students to earn Socio-linguistic competence and discourse competence with the help of specially designed lessons. The students can hone their interpersonal and employability skills draw upon real-life situations and examples.

TEXT BOOKS
1. Effective communication and soft skill by Mamata Bhatnagar and Nitin Bhatnagar.
2. Communication and soft skill by Pravin Kumar

REFERENCE BOOKS
1. Communication and soft skill by E. Suresh Kumar, P.Sreehari, J. Savitari .
2. Advanced Grammar in use by Matin Hewings.

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Semester	:	Open Elective
Branch	:	B. Tech. (All Branch)
Subject	:	Soft Skills and Interpersonal Communication
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO23

COURSE OBJECTIVES

- With rising use of Information and Communication technologies available, there is a high potential for these technologies to address sustainability issues.
- The students of MA (SDP), as development practitioners must be equipped with the knowledge about their applications in the development field so as to enable them to provide ICT solutions to the target communities.
- This is an elective course intended for students who would like to gain knowledge and skills on how ICTs can be best used to overcome sustainability challenges.
- In order to succeed in the practice of sustainable development, professionals must be trained in a basic set of competencies that integrate cross-disciplinary knowledge for practical problem solving with the use of information and communication technologies.

UNIT I
INTRODUCTION TO ICTS FOR SUSTAINABLE DEVELOPMENT
Introduction to Information and Communication Technology (ICT); Role of ICTs in Sustainable Development; Current Status of ICTs in Sustainable Development-Global and India Scenario. Potential of ICTs in various fields, impact of information, Technologies on GDP growth

UNIT II
BUILDING KNOWLEDGE SOCIETIES
The concept of Knowledge Society; identifying stakeholders and target, communities; Understanding information needs, Traditional vs. contemporary, knowledge systems, information processing and retrieval; Understanding means of communication in different areas, developing an effective communication strategy Case: Warna Unwired.

UNIT III
INFORMATION AND COMMUNICATION TECHNOLOGIES
The hardware and software, the physical infrastructure, satellite, wireless solutions, telecommunication technologies, mobiles, fixed line, internet and world wide web, community radio, technology-user interface, design of relevant ICT products and services.

UNIT IV
ICT APPLICATIONS
Applications of ICT in education, Health (telehealth, telemedicine and health informatics), Gender Equality, Agriculture (e Governance, telecentres, Mobiles for development, climate change and disaster management, ICT Networks for water management**.**

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UNIT V
ICT FOR DEVELOPMENT IN INDIA

Policy and Institutional Framework in India, e governance, ICT Models in health, education, agriculture, finance, gender equality, Mobiles for Development Experience sharing by ICT for Development practitioners Case Studies: Reuters Market Light, Iffco Kisaan Sanchar Ltd**.**

COURSE OUTCOMES
- The main objective of the course is to help students learn about the concepts, theories and applications concerning the field of ICT for sustainable development. Through case studies and live projects, the students are expected to learn how ICTs can be best applied for sustainability challenges. The learning objectives of the course would be

TEXT BOOKS
1. Introduction to information technology by V. Rajaman
2. Introduction to information technology by Dr. Sanjay Kumar Khokhar

REFERENCE BOOK
   1.Introduction to information & communication technology by Vinay Namdeo

Semester	:	Open Elective
Branch	:	B.Tech. (All Branch)
Subject	:	Human Resource Development and Organizational Behavior
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO24

COURSE OBJECTIVES

- The course shall be conducted in an interactive manner since students learn best by active participation.
- Lecture and discussion method will be followed to familiarize students with the theories, concepts, techniques, etc. The instructor would also employ tools like case discussions, exercises, games, psychometric testing, etc. to aid students' understanding of theoretical concepts.
- Collaborative learning would be emphasized in the form of group exercises, group projects, role plays, etc.
- Thrust would be given to analysis and application of each topic from the perspective of development organizations.
- Students will require attending classes with in-advance readings of the topic(s) with reading material available in text/reference books and library resource centre as per the course outline.

UNIT I
INTRODUCTION TO HRM AND ORGANIZATIONAL BEHAVIOR (OB)

Human resource management (HRM) at work: Definition – HR Challenge –Management process, Changing environment of Human Resource Management: Work force diversity, Technological trends – Globalization, Strategic planning and HR today: Nature of strategic planning – Building competitive advantage – Human resource as a source of competitive advantage, Definition of organizational behavior (OB) and historical development: Definition–Goals of OB – Challenges and opportunities, OB in a global context: The global economy – Facing the international challenge – Behavior across cultures

UNIT II
UNDERSTANDING AND MANAGING INDIVIDUAL BEHAVIOR

Foundation of individual behaviour: Biographical characteristics – Ability – Learning – Implication for performance and satisfaction, Values and attitudes: Importance of values –Types of values – Types of attitude –Attitude and consistency, Perception: Defining perception and its importance – Factors influencing perception, Personality & emotions: Personality determinants – Personality traits – Major personality attributes influencing OB, Emotional intelligence: Defining emotions – The six universal emotions – Emotions and national culture – OB applications, Individual decision making: The rational decision-making process – Improving creativity in decision making – Identifying problems – Ethics in decision making

UNIT III
UNDERSTANDING AND MANAGING GROUP BEHAVIOUR

Defining & classifying groups: Formal group– Informal group – Command group – Task group – Interest group, Basic group concepts: Roles – Norms – Cohesiveness – Size – Composition – Status, Group

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decision making: Individual vs. group – Group decision making techniques, Understanding work teams: Team versus groups – Types of teams – Cross functional teams – Creating effective teams, Conflict and inter-group behaviour: Definition of conflict – Transitions in conflict thought – The conflict process – Intergroup relations

UNIT IV
RECRUITMENT AND PLACEMENT: NATURE OF JOB ANALYSIS
Definition – Uses of job analysis information, Steps in job analysis, Methods of collecting job analysis information: Interview – Questionnaires –Observation – Quantitative job analysis techniques, Job description and specification: Job identification – Responsibilities and duties – Specification for trained versus untrained personnel, Recruitment and selection process: Introduction – Advertising – Employment agencies – Selection process – Basic testing concepts, Human resource planning and forecasting: Employment planning and forecasting – Factors in forecasting personnel needs – Forecasting supply of inside candidates –Recruiting job candidates

UNIT V
TRAINING AND DEVELOPMENT
Building employee commitment – Orientation and socialization, Training needs analysis: Task analysis – Performance analysis – Setting training objectives, Training techniques: On-the-job training – Job instruction training – Audiovisual techniques – Programmed learning, Information technology and HR – Training via the internet, Nature and purpose of management development: Definition – Succession planning, Job rotation and management: Coaching – Action learning – Advantage, Performance management & appraisal: Appraisal process – Appraisal methods –
Problems and solutions – Role of appraisals in managing performance, Using HR to build a responsive learning organization: HR and systematic problem solving – Learning from
experience – Transferring knowledge

COURSE OUTCOME
- Quizzes: Two quizzes of objective-type format would be held- the first would test students 'understanding based on module 1 (i.e. OB) and the second would test students' understanding based on module 2 (i.e. HRM).
- Group Project and Presentations: An important component is group project and presentations. Groups of 4-5 students would be required to select a development organization of their choice and undertake a study and analysis of the OB concepts and techniques (like motivation, communication, team working, leadership, organizational culture etc.) as well as HR practices and policies (like recruitment, selection, training, development, performance measurement, compensation practices etc.) relevant to the presentations on the group project undertaken.

TEXT BOOKS
1. Introduction to Human Resource Management (Textbook) [Ref. No: IHRM 03 2K4 09] [ISBN: 81-7881-978-3]

REFERENCE BOOKS
1. Organizational Behavior-Stephen P. Robbins, Prentice-Hall of India, New Delhi
2. Human Resource Management- Gary Dessler, Pearson Education

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Semester	:	Open Elective
Branch	:	B.Tech. (All Branch)
Subject	:	Introduction to Philosophical Thoughts
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO25

COURSE OBJECITVES
- Philosophy, the love of wisdom, involves attempts to answers the most profound and perennial of questions.
- The ultimate aim is to find and embrace the good life and ideals in its pursuit.
- The focus is on problems concerning the nature of meaning trust reality religion and morality and mined.

UNIT I
Introduction to Indian Philosophy: Brief discussion on Veda and Upanishads; Origin of Indian Philosophy

UNIT II
Samkhya Philosophy: Metaphysics; Theory of Causation. --Prakṛti, Purusa, Evolution; Epistemology

UNIT III
Samkhya Philosophy: Metaphysics; Theory of Causation. --Prakṛti, Purusa, Evolution; Epistemology

UNIT IV
Yoga Philosophy: Organization of the Yoga Sutras; Psychology of Yoga -- Stages of Citta, Forms of Citta, Modifications of Citta, Kinds of Klesas; The Eight-Fold Yoga; God and Liberation

UNIT V
Nyaya Philosophy: Epistemology -- Perception (Pratyaksa), Inference (Anumāna), Comparison (Upamāna), Testimony (Sabda); Theory of Causation (Asatkāryavāda); Self and Liberation; The Concept of God

COURSE OUTCOMES
- Identify what yours students will know and be able to do upon successful completion of your subject

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TEXT BOOKS
1. Philosophical Questions: Classic And Contemporary Readings- Williams Lawhead

REFERENCE BOOKS
1. What does It All Mean? – Thomas Nagel

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Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	Comparative study of Literature
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO26

COURSE OBJECTIVES
- This course is aims to introduce the major aspects and concepts literature theories. Its objective is to give the students substantial knowledge about the critical theory developed in the prominently in the India with interdisciplinary perspective.
- The ancient Greek, Latin theory, medieval and modern theories of the Russian and French colonial and postmodern theories are introduces in detail.

UNIT I
CONCEPTUAL FRAMEWORK OF COMPARATIVE LITERATURE
1. The Emergence of Comparative Literature
2. Difference/ Alterity and the Ethics of Plurality
3. Limitations of the Idea of National Literature
4. Theories of Interpretation

UNIT II
LITERARY HISTORIOGRAPHY
1. Sources of Literary History: Oral, Manuscriptal, Scriptal and Virtual
2. Approaches to Literary History: Integrationist and other models
3. Problems of Periodization

UNIT III
HISTORY OF COMPARATIVE LITERATURE
1. History of Comparative Literature : French, German, Russian and Tel Aviv Schools
2. COMPARATIVE Literature in India: From Tagore to the Present
3. World Literature: From Goethe to the Present
4. "The State of the Discipline" Reports

UNIT IV
TRANSLATION IN COMPARATIVE CONTEXT
1. History and Politics of Translation
2. Translation as Reception
3. Problems and Promises of Translation in Multilingual Situations
4. Untranslatability and Silence

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UNIT V
POETICS AND LITERARY THEORY
 1. Indian Poetics: Sanskrit and Tamil
2. Perso-Arabic Traditions
3. Western Classical Literary Theory

COURSE OUTCOMES
- Comparative Literature focuses on the study literature from different cultures, nations, and genres and explores relationships between literature and other forms of cultural expression.

REFERENCE BOOKS
1. Syal, Pushpinder 1998, An Introduction to Linguistics, Prentice Hall India.

REFERENCE BOOKS
1. Amresh Dana. Encylopedia of Indian Literature.Rajendra C.
2. Trans Cultural Approach to Sanskrit Poetry

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Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	Indian Music System
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO27

COURSE OBJECTIVES

- To impart theoretical knowledge about various forms and genres in Indian music system and the concept of bandies and ornamentation
- To study the contribution of some early practitioners of music
- To impart the knowledge of notating different talas along with layakaris

UNIT I
TECHNICAL TERMS

Sangeet, Nada: ahata & anahata , Shruti & its five jaties, Seven Vedic Swaras, Seven Swaras used in Gandharva, Suddha & Vikrit Swara, Vadi- Samvadi, Anuvadi-Vivadi, Saptak, Aroha, Avaroha, Pakad / vishesa sanchara, Purvanga, Uttaranga, Audava, Shadava, Sampoorna, Varna, Alankara, Alapa, Tana, Gamaka, Alpatva-Bahutva, Graha, Ansha, Nyasa, Apanyas, Avirbhav,Tirobhava, Geeta; Gandharva, Gana, Marga Sangeeta, Deshi Sangeeta, Kutapa, Vrinda, Vaggeyakara Mela, Thata, Raga, Upanga ,Bhashanga ,Meend, Khatka, Murki, Soot, Gat, Jod, Jhala, Ghaseet, Baj, Harmony and Melody, Tala, laya and different layakari, common talas in Hindustani music, Sapta Talas and 35 Talas, Taladasa pranas, Yati, Theka, Matra, Vibhag, Tali, Khali, Quida, Peshkar, Uthaan, Gat, Paran, Rela, Tihai, Chakradar, Laggi, Ladi, Marga-Deshi Tala, Avartana, Sama, Vishama, Atita, Anagata, Dasvidha Gamakas, Panchdasa Gamakas ,Katapayadi scheme, Names of 12 Chakras, Twelve Swarasthanas, Niraval, Sangati, Mudra, Shadangas , Alapana, Tanam, Kaku, Akarmatrik notation

UNIT II
FOLK MUSIC

Origin, evolution and classification of Indian folk song / music. Characteristics of folk music. Detailed study of folk music, folk instruments and performers of various regions in India. Ragas and Talas used in folk music Folk fairs & festivals in India.

UNIT III
RASA AND AESTHETICS

Rasa,Principles of Rasa according to Bharata and others. Rasa nishpatti and its application to Indian Classical Music. Bhava and Rasa Rasa in relation to swara, laya, tala, chhanda and lyrics. Aesthetics according to Indian and western Philosophers. General knowledge of 64 kalas according to Vatsyayan General history of Raga-Ragini Paintings and Raga Dhayana. Interrelation of Fine Arts.

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UNIT IV
RESEARCH METHODOLOGY AND PEDAGOGY, AVENUES INTERDISCIPLINARY ASPECTS AND MODERN TECHNOLOGY:

Research Pedagogy: Research areas, review of literature, selection of suitable research topics and research problems, Methodology of Music research, Preparing synopsis, Data collection and its sources, Analysis of data collection, Writing project report, Research project Indexing, references and bibliography etc.

UNIT V
APPLIED THEORY

Detail study of Sangeet Utpatti; Musical scales (Indian and western); Detail study of Gram, Murchchhana and Chatussarna; Jaati Lakshana, Jaati Bhed, concept of Raag, Raag-Lakshan.

Classification of Raag:
1) Gram Raag and Deshi Raag Classification
2) Male Raag classification
3) Thaat Raag classification
4) Shuddha, Chhayalag and Sankeerna Raag classification
5) Raag-Raagini classification

COURSE OUTCOMES
- To acquire an enhanced understating of musicological terms related to Indian music and various genres.
- Develop ability in notating various talas and acquires command over different notation systems

REFERNECE BOOKS
1. Classical music of India: L. Subramaniam & Viji Subramaniam
2. History of Indian Music: bhavarav A. Pingle

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	History of Science and Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO28

COURSE OBJECTIVES
- This course introduces students to methods in the history of science and technology with attention to global and interdisciplinary protectives.
- Our Aim is to explore how histories of science and technology can be useful for scholars and professionals in wide range of fields and with a wide range of interest

UNIT I
SCIENCE AND TECHNOLOGY- THE BEGINNING
Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine; Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India; Development of Geography: Geography in Ancient Indian Literature

UNIT II
DEVELOPMENTS IN SCIENCE AND TECHNOLOGY IN MEDIEVAL INDIA
Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up; Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine; Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc

UNIT III
DEVELOPMENTS IN SCIENCE AND TECHNOLOGY IN COLONIAL AND INDEPENDENT INDIA
Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service; Indian Response to new Scientific Knowledge, Science and Technology in Modern India; Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites and Development of ISRO

UNIT IV
PROMINENT SCIENTIST OF INDIA SINCE BEGINNING AND THEIR ACHIEVEMENT
Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna; Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga &Patanjali.

UNIT V
SCIENTISTS OF MODERN INDIA

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Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Acharya Prafulla Chandra Roy, SatyendraNath Bose, MeghnadSaha, HomiJehangirBhabha and Dr.Vikram Sarabhai

COURSE OUTCOMES
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental factors.
- An ability to communicate effectively with a range of audience.

REFERENCE BOOKS
1. Binod Bihari Satpathy. "History of Science and Technology in India". Development. Volume 29.
2. G. Kuppuram. 1990. "History of Science and Technology in India". South AsiaBooks.
3. M. Bhardwaj. 2010. "History of Science and Technology in Ancient India". Bookwin

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	Introduction to Arts and Aesthetics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO29

COURSE OBJECTIVES

- The aim of this course is to introduce the students to some of the basic issues pertaining to art through exposure to different art-media and art-works.
- The emphasis will be on critical analysis of art-works and aesthetic ideas, with special reference to literature and music.

UNIT I
INTRODUCTION
The nature of aesthetics, its relation to philosophy and literature:Indian traditions
The nature of aesthetics and its relation to philosophy and literature:Western traditions

UNIT II
THE CONCEPT OF RASA
(a)Bharata's Natya Shastra and its Critics(b)Abhinavagupta's Rasa Siddhanta.
The Concept of Dhvani Anandavardana's Dhanyaloka, with reference to Abhidha, lakshana, Vyanjana andTatparya. Its extension to music, dance and drama.

UNIT III
ANCIENT GREEK
Plato (Mimesis, the Arts and Unity of Values)and Aristotle(Mimetic Arts and Techne, Emotions and Catharsis) Similarities and Differences with Classical Indian views

UNIT IV
MODERN WESTERN AESTHETICS
Humean Aesthetics of Taste and Kantian Aesthetics of Reception(c)Similarities and Differences with Classical Indian views.

UNIT-V
Contemporary Indian Aesthetics I: (a) Rabrindranath Tagore**,** Sri Aurobindo
Contemporary Indian Aesthetics II: R. D. Ranade (b)Coomaraswami.

COURSE OUTCOMES

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- This course is interdisciplinary to suit the development of academic life in a complex twenty first century context.

TEXT BOOKS
1. Basham, A.L. — The wonder that was India,
2. Kramrish stella - The Hindu temple I and II (Motilal Banarasidass).

REFERENCE BOOKS
1. Prof. S.N. Dasgupta - History of Indian Philosophy.
2. M. Hiriyanna - Essentials of Indian Philosophy.
3. M. Hiriyanna - Outlines of Indian of Philosophy.

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Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	Economic Policies in India
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO30

COURSE OBJECTIVES

- To learn about high economic growth. Achieved the annual Percentage increase in a country's total level of output known as gross domestic product (GDP)

UNIT I
FRAMEWORK OF INDIAN ECONOMY

National Income: Trends and Structure of National Income; Demographic Features and Indicators of Economic Growth and Development Rural- Urban Migration and issues related to Urbanization; Poverty debate and Inequality, Nature, Policy and Implications; Unemployment-Nature, Central and State Government's policies, policy implications, Employment trends in Organized and Unorganized Sector

UNIT II
DEVELOPMENT STRATEGIES IN INDIA

Agricultural- Pricing, Marketing and Financing of Primary Sector; Economic Reforms- Rationale of Economic Reforms, Liberalization, Privatization and Globalization of the Economy; Changing structure of India's Foreign Trade; Role of Public Sector- Redefining the role of Public Sector, Government Policy towards Public Sector, problems associated with Privatization, issues regarding Deregulation-Disinvestment and future of Economic Reforms

UNIT III
THE ECONOMIC POLICY AND INFRASTRUCTURE DEVELOPMENT:

Energy and Transport Social Infrastructure- Education, Health and Gender related issues, Social Inclusion; Issues and policies in Financing Infrastructure Development; Indian Financial System- issues of Financial Inclusion, Financial Sector Reforms-review of Monetary Policy of R.B.I. Capital Market in India.

UNIT IV
THE ECONOMIC POLICY AND INDUSTRIAL SECTOR

Industrial Sector in Pre-reforms period, Growth and Pattern of Industrialization; Industrial Sector in Post-reform period- growth and pattern of Micro, Small, Medium Enterprises.

UNIT-V
PROBLEMS OF INDIA'S INDUSTRIAL EXPORTS

Labour Market-issues in Labour Market Reforms and approaches to Employment Generation

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COURSE OUTCOMES
- Refers to led to increased competition in the sectors like banking, leading to more customer choice and increased efficiency.
- It has lead also led to increased investment and growth of private players in these sectors.

TEXT BOOKS
1. Brahmananda, P.R. and V.A. Panchmukhi.[2001], Ed. 'Development Experience in Indian Economy, Inter-state Perspective,' Bookwell, New Delhi.
2. Gupta,S.P.[1989],'Planning and Development in India: A Critique,' Allied Publishers Private Limited, New Delhi.

REFERENCE BOOKS
1. Bhagwati, Jagdish.[2004],'In Defense of Globalization,' Oxford University Press, U.K.
2. Dhingra, Ishwar //C.[2006],'Indian Economy,' Sultan Chand and Sons, New Delhi.
3. Datt, Ruddar and Sundaram, K.P.M.[Latest edition] ,'Indian Economy,' S. Chand and Co, New Delhi.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	Open Elective
Branch	:	B.Tech (All Branch)
Subject	:	Metro Systems and Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTO31

COURSE OBJECTIVES:
- Understanding and managing risk: Analyzing and allocating risk and responsibility among stack holders in road and metro scheme and practical ways of the designing risk allocation rule.

UNIT-I
General: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials

UNIT-II
Civil Engineering-Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

UNIT-III
Electronics And Communication Engineering- Signalling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors

UNIT-IV
Mechanical & TV + AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators

UNIT-V
Electrical: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics

COURSE OUTCOMES:
- Explain the construction method of metro system.
- Described various initial surveys and investigations for metro construction's.
- Explain the constructions quality and safety system of metro.
- Explain environmental and social safe guards.

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REFERENCE BOOKS:

1. General and Technical information of Hyderabad metro.
2. General and Technical information of Delhi metro.