# Curriculum Structure
# and
# Detailed Syllabus

## Bachelor of Technology
## in
## MECHANICAL ENGINEERING

# GITAAUTONOMOUS COLLEGE

**Affiliated to BPUT Odisha**

**Effective From Academic Year 2020-21**

## Approval History

| Date | Resolutions |
|---|---|
| **17.07.2021** | The curriculum structure and detailed syllabus of 1st Year& 2nd Year as proposed bythe Boards of Studies is approved by the Academic Council. 1st Semester Syllabus as per BPUT syllabus. |
| **08.10.2021** | The curriculum structure and detailed syllabus approved by Governing body members. |

## Program Outcomes (UG Engineering)

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The Program Outcomes (POs) for UG Engineering programmes defined by NBA are:

PO1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

PO2. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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.

## PEO: Program Educational Objectives Statements

PEO1 The graduates will utilize their expertise in engineering to solve industrial and technological problems.

PEO2 Graduates will be innovators and professionals in technology deployment, and system implementation.

PEO3 Graduates will function in their profession with social awareness and responsibilities.

PEO4 Graduates will interact with their peers in industry and society as engineering professionals and leaders.

PEO5 Graduates will succeed in achieving innovative skills in the field of research and computer application.

## Program specific outcomes (PSO) of the Department:

PSO1 The graduates will have the ability to design, develop, and innovate software product or Process in a systematic way by applying algorithm design, Artificial Intelligence, Soft Computing and programming skills.

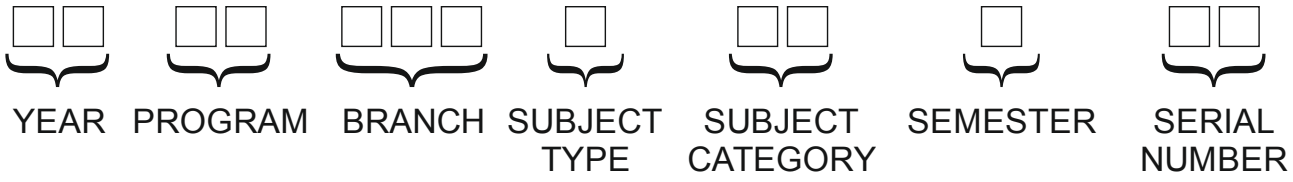
PSO2 The graduates will have the ability to take up higher studies, collaborative research and Entrepreneurships in the modern computing environment.

PSO3 The graduates will have the ability to achieve additional expertise through add-on programs in Machine Learning, Deep Learning, IoT etc and Lifelong learning.

## Course Types & Definitions

| | |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Laboratory / Practical / Sessional |
| BS | Basic Sciences |
| LC | Laboratory Courses |
| HS | Humanities & Social Sciences (including Management) |
| ES | Engineering Sciences |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| OO | Massive Open Online Course (MOOC) - Self Study |
| PI | Summer Internship / Industry Internship / Project Work / Seminar |
| VV | Viva Voce |

# Subject Code Format



# Curriculum Structure

**First Semester**

**Theory**

| Sl. No. | Category | Course Code | Course Title | L-T-P | Credit |
|---|---|---|---|---|---|
| 1 | BS | 20BTMETBS101 | Engineering Mathematics I | 3-0-0 | 3 |
| 2 | BS | 20BTMETBS102 / 20BTMETBS103 | Engineering Physics / Engineering Chemistry | 3-0-0 | 3 |
| 3 | ES | 20BTMETES101 / 20BTMETES102 | Basic Electrical Engg. / Basic Electronics Engg. | 3-0-0 | 3 |
| 4 | ES | 20BTMETES103 / 20BTMETES104 | Basic Mechanical Engg./ Basic Civil Engineering | 3-0-0 | 3 |
| 5 | HS | 20BTMETHS101 | Functional English | 2-0-0 | 2 |
| 6 | ES | 20BTMETES105 | Programming for Problem Solving using C | 3-0-0 | 3 |
| 7 | MC | 20BTMEPMC101 | Induction Training (21 Days) | | 0 |
| | | | **Total Credit (Theory)** | | **17** |

**Practical**

| | | | | | |
|---|---|---|---|---|---|
| 1 | BS | 20BTMEPBS102 / 20BTMEPBS103 | Physics Lab / Chemistry Lab | 0-0-2 | 1 |
| 2 | ES | 20BTMEPES101 20BTMEPES102 | Basic Electrical Engg. Lab / Basic Electronics Engg. Lab | 0-0-2 | 1 |
| 3 | ES | 20BTMEPES103 20BTMEPES104 | Basic Mechanical Engg. Lab / Basic Civil Engineering Lab | 0-0-2 | 1 |
| 4 | ES | 20BTMEPES105 20BTMEPES106 | Engineering Graphics & Design Lab / Workshop | 0-0-2 | 1 |
| 5 | HS | 20BTMEPHS101 | Functional English Lab | 0-0-2 | 1 |
| 6 | ES | 20BTMETES105 | Programming for Problem Solving using C Lab | 0-0-2 | 1 |
| | | | Total Credit (Practical) | | 6 |
| | | | Total Semester Credit | | **23** |

**Second Semester**

**Theory**

| Sl. No. | Category | Course Code | Course Title | L-T-P | Credit |
|---|---|---|---|---|---|
| 1 | BS | 20BTMETBS204 | Engineering Mathematics II | 3-0-0 | 3 |
| 2 | BS | 20BTMETBS202 / 20BTMETBS203 | Engineering Physics / Engineering Chemistry | 3-0-0 | 3 |
| 3 | ES | 20BTMETES201 / 20BTMETES202 | Basic Electrical Engg. / Basic Electronics Engg. | 3-0-0 | 3 |
| 4 | ES | 20BTMETES203 / 20BTMETES204 | Basic Mechanical Engg./ Basic Civil Engineering | 2-0-0 | 3 |
| 5 | HS | 20BTMETHS201 | Business Communication and life Skills | 2-0-0 | 2 |
| 6 | ES | 20BTMETES205 | Programming for Problem Solving using Python | 3-0-0 | 2 |
| 7 | MC | 20BTMEPMC201 | NSS / NCC / Yogo | | 0 |
| | | | **Total Credit (Theory)** | | **16** |

**Practical**

| | | | | | |
|---|---|---|---|---|---|
| 1 | BS | 20BTMEPBS202 / 20BTMEPBS203 | Physics Lab / Chemistry Lab | 0-0-2 | 1 |
| 2 | ES | 20BTMEPES201 / 20BTMEPES202 | Basic Electrical Engg. Lab / Basic Electronics Engg. Lab | 0-0-2 | 1 |
| 3 | ES | 20BTMEPES203 / 20BTMEPES204 | Basic Mechanical Engg. Lab / Basic Civil Engineering Lab | 0-0-2 | 1 |
| 4 | ES | 20BTMEPES205 20BTMEPES206 | Engineering Graphics & Design Lab / Workshop | 0-0-2 | 1 |
| 5 | ES | 20BTMEPES207 | Programming for Problem Solving using Python Lab | 0-0-2 | 2 |
| | | | | | |
| | | | Total Credit (Practical) | | 6 |
| | | | Total Semester Credit | | **22** |
| | | | **SUMMER INTERNSHIP TRAINING for 30 Days** | | |

| 1st Semester | 20BTMETBS101 | ENGINEERING MATHEMATICS - I | L-T-P 3-0-0 | Credit 3 |
|---|---|---|---|---|

## Prerequisite

Function, Limit of a function, Continuity of function, Differentiation, Integration.

## CourseObjectives:

- TodiscusstheconceptsassociatedwithAsymptote, Curvature,Special functions, Partial differentiation, Maxima, Minima and theirapplications.
- TodiscusstheconceptsanddifferentmethodsforsolutionofFirst order differential equations and its application to Electrical circuits.
- TodescribetheconceptsofLinear differential equation of second order and its methods of solution as well as application to Electrical circuits.
- TopresenttheconceptsofPower series method and its its use in solving differential equations.
- Topresenttheconcepts of Laplace Transformation and it's use in getting solution to differential equations.

## Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

## Module - I (8 Hrs)

Asymptote, Curvature (Cartesian and Polar), Gamma and Beta function, Partial differentiation, Maxima and Minima for function of two variables.

## Module - II (8 Hrs)

Differential Equations: First order differential equations, Separable equation, Exact differential equation, Linear differential equation, Bernoulli's equation and application to Electrical circuits.

## Module - III (9 Hrs)

Linear differential equation of second order, Homogeneous equation with constant co-efficient, Euler-Cauchy equations, Solution by undetermined co-efficient, Solutions by variation of parameters, Modeling of electric circuits.

## Module - IV (10 Hrs)

Series solution of differential equations, Power series method, Legendre's equation and Legendre's polynomials, Bessel's equation, Bessel's function and its properties.

## Module - V (10 Hrs)

Laplace Transformation and it's use in getting solution to differential equations, Convolution, Integral equations.

Text Books :

1. Differential Calculus by Santi Narayan and Mittal, Publisher: S. Chand.
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: Willey, 8th Edition.

References:

1. Higher Engineering Mathematics by B. V. Ramana , Publisher: Mc-Graw Hills Education.
2. Higher Engineering Mathematics by B.S. Grewal,, Khanna Publishers, 36th Edition, 2010.
3. Ordinary and Partial Differential Equations by J. Sinha Ray and S. Padhy, Publisher: Kayani Publishers.
4. Advanced Engineering Mathematics by P. V. O'NEIL , Publisher: CENAGE.

Online Resources :

Laplace Transform-https://onlinecourses.nptel.ac.in/noc21_ma69/preview

## CourseOutcomes:

Afterreadingthis subject,students willbeableto:

1. Identify, formulate and solve Engineering problems.
2. Apply the knowledge of Mathematics in Physical sciences and Engineering.
3. Acquire knowledge about Advance Calculus.
4. Acquire knowledge about Series solution of Differential equations.
5. Acquire knowledge about Gamma and Beta function.
6. Acquire knowledge about Laplace transform and apply it to solve IVP.

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|---|---|---|---|---|
| 1st& 2nd Semester | 20BTMETBS102 / 20BTMETBS202 | ENGINEERING PHYSICS | L-T-P 3-0-0 | Credit 3 |

PRE-REQUISITE:

Basic knowledge on intermediate Physics including mechanics, modern Physics, optics, wave motion, electricity and magnetism.

OBJECTIVE:

The objective of this course is to attract the students towards detail understanding of concepts, fundamentals and applications of Physics enriching engineering and its emerging branches. It makes students conceive new ideas to have theoretical and experimental knowledge to be applied in academics, designs and research.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

DETAILED SYLLABUS:

Module I

OSCILLATIONS& WAVES: (08 HOURS)

Simple Harmonic Oscillation: velocity of motion, acceleration, time period, frequency, phase; damped harmonic oscillation: Differential equation of damped vibration, logarithmic decrement, Forced oscillation, resonance, velocity resonance and amplitude resonance, coupled oscillation, Normal coordinates and normal frequencies, In- phase and out-Phase Oscillation, Concept of wave and wave equation, Velocity of transverse vibration in a stretched string. Superposition principle.

Module II

WAVE OPTICS:(08 HOURS)

Concept of interference, two sources interference pattern, Bi-prism, Fringe width, Newton's ring & measurement of wavelength and refractive index. Diffraction: Huygen's principle, Fresnel's Diffraction and Fraunhoffer's diffraction, Half period zone, Zone plate, construction, principle, multiple foci, comparison ofzone plate with convex lens, Fraunhoffer's diffraction of Single slit, intensity distribution.

Module III

LASER and FIBRE OPTICS : (08 HOURS)

Atomic excitation and energy states, Interaction of external energy with atomic energy states, Absorption, spontaneous emission and stimulated emission, Population inversion, Pumping mechanism, optical pumping, Electrical Pumping, Components of laser system, active medium, population inversion, Ruby laser, Helium-Neon laser (basic concepts, energy level diagram and Engineering application only),Structure of optical fibre, Principle of propagation and numerical aperture, Acceptance angle, classification of optical fibre (Single mode and Multimode, SINand GRIN), FOCL (Fiber Optic Communication Link)

SOLID STATE PHYSICS: (04 HOURS)

Crystalline and Amorphous solid, unit cell, lattice parameter, Miller Indices, Bragg's law, Fermi level and Fermi distribution Functions, Band theory of Solids(Qualitative),Classification of materials: metals, semiconductor and insulator in terms of band theory.

Module IV

ELECTROMAGNETISM: (06 HOURS)

(Student will be familiarized with some basic used in vector calculus prior to Development of Maxwell's electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should suffice) Introduction; Scalar & vector fields, Gradient Of Scalar Field, divergence and curl of Vector Field, Gauss divergence theorem, Stokes theorem (Only Statements, noproof), Gauss's law of electrostatics in free space and in a medium (Onlystatements), Faraday's law of electromagnetic induction (Only statements), Displacement

current, Ampere's circuital law, Maxwell's equation in Differential andIntegral form, Electromagnetic wave equation in E and B, Electromagnetic Energy,Poynting theorem and Poynting vector(no derivation)

## Module V

## QUANTUM PHYSICS: (08 HOURS)

Elementary concepts of quantum physics formulation to deal with physical systems. Need for Quantum physics- historical overviews (For concept), Einstein equation, de Brogliematter waves, Compton Scattering, Pair production (no derivation), Uncertainty Principle, Application of Uncertainty Principle, Non-existence of electrons in the Nucleus, Ground state energy of a harmonic oscillator.Basic Features of Quantum Mechanics: Transition from deterministic to Probabilistic,Wave function, probability density, Normalization of wave function (Simple problem),operators, expectation values (Simple problem), Schrodingerequation-Time dependent and time independent equations.

Applications of quantum mechanics: Free Particle, Potential step, Particle in a box.

## Text Books:


1. Engineering Physics by D.R. Joshi, Mc GrawHill
2. Principle of Physics Vol. I & Vol. II by Md. M. Khan & S. Panigrahi(Cambridge Univ.Press).
3. Lectures on Engineering Physics by L. Maharana, Prafulla ku. Panda, Sarat Ku. Dash, Babita Ojha(Pearson)
4. Engineering Physics by D.K. Bhattacharrya and PoomTondon , Oxford UniversityPress


## Reference Books:


1. Optics - A. K.Ghatak
2. Introduction to Electrodynamics - David J. Griffiths, PHI Publication
3. Concepts of Modern Physics – ArthurBeiser.
4. Physics-I for engineering degree students - B.B. Swain andP.K.Jena.


### ONLINE RESOURSES

https://nptel.ac.in/courses/115/106/115106119/
https://nptel.ac.in/courses/122/106/122106034/
https://nptel.ac.in/courses/115/105/115105099/

## COURSE OUTCOMES OF ENGINEERING PHYSICS : 20BTMETBS202

## Intended Learning Outcomes/ Course Outcomes (CO)

Upon completion of the subject, students will be able to

1. Learn vibrations and oscillatory systems. It helps in understanding multiple oscillatory systems and complex oscillations. It adds in developing ideas of wave propagation and superposition principle

2. Know the benefits the understanding of light and its wave nature in different experimental demonstration of interference. Diffraction in solids will help in dealing with XRD and structure of materials.

3. Make a clarity of making out crystal structures and crystallography to learn about different materials and characteristics of solids.

4. Different LASER'S like Ruby, He-Ne and S.C. Lasers will help to develop multiple ideas of its application. Principle of optical fibres will help to know new generation optical fibres in communication systems.

5. Gain some fundamental knowledge about electromagnetism. It will familiarize with some basic used in vector calculus prior to development of Maxwell's electromagnetic wave equations.

6. Dealwith elementary concepts of quantum physics formulation with physical systems and to gain knowledge on applied quantum physics.

It will help in solving problems using Schrödinger wave equation and to acquire knowledge about application of Quantum mechanics.

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| 1st& 2ndSemester | 20BTMEPBS102 / 20BTMEPBS202 | ENGINEERING PHYSICS LAB | L-T-P 0-0-2 | Credit 1 |

PRE-REQUISITE:

Basic knowledge of measurements, errors and uses of different measuring instruments like vernier calipers, screw gauge and spherometer is required. Students are supposed to be aware of the fundamental principles of lens, oscillation, waves, electronics and mechanics..

OBJECTIVES:

To make students engage in learning the experimental aspects of Physics with hands-on experience in precision measurements, experiments of optics, electronics and mechanics.

Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

DETAILS SYLLABUS OF ENGINEERING PHYSICS LABORATORY - 20BTMEPBS202

A student is expected to perform ten experiments form the list given below.

1. Determination of Young's modulus by Searle's method.

2. Determination of Young's modulus by bending of beams.
3. Determination of Rigidity modulus by static method.
4. Determination of surface tension by capillary rise method.
5. Determination of acceleration due to gravity by Bar pendulum.
6. Verification of laws of vibration of string using sono meter.
7. Determination of wave length of light by Newton's ring apparatus.
8. Determination of wavelength of laser source by diffraction rating method.
9. Determination of grating element of a diffractiongrating.
10. Plotting of characteristic curve of a PN junctiondiode.
11. Plotting of characteristic curves ofBJT.
12. Study of HallEffect.
13. Study of RCcircuit.
14. Determination of unknown resistance using MeterBridge.
15. Energy gap determination by Four-Probemethod.

## Text Books:

1. Engineering Practical Physics, by S.Panigrahi and B. Mallick, (CENGAGE learning)
2. Practical Physics, by Dr. Rajendra Singh, J. N. Jaiswal

## Reference Books :

1. Practical Physics, by Savinder Singh
2. A Text-book of Practical Physics byDr. William Watson

## Course Outcomes:

Engineering Physics Laboratory:
Intended Learning Outcomes/ Course Outcomes (CO)
Upon completion of the subject, students will be able to.

1. Know the accuracy and precision in measurement.
2. know how to calculate Young's modulus, rigidity modulus of a wire and to understand the concept of vibration mechanism.
3. Determine the surface tension of liquid and to understand fluid properties.
4. To experiment with wave nature of light in diffraction through a grating.
5. To know the variation of I ~V of PN junction and BJT.
6. To determine the wavelength of light using Newton's ring.

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| 1st& 2nd Semester | 20BTMETBS103 / 20BTMETBS203 | ENGINEERING CHEMISTRY | L-T-P 3-0-0 | Credit 3 |
|---|---|---|---|---|

## Course Objectives

The main objective of the course is to impart knowledge on the fundamental concepts of chemistry involved in application of several important engineering materials that are used in the industry/day-to-day life.

The course aims to impart the basic understanding about the chemical behavior of fuels, alloy systems, corrosion, instrumental method of analysis and nanomaterials.
It also aims to develop selection of ideal engineering materials and its application in suitable engineering field.

## Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

## Module-1

### Energy Sciences:

Types of fuels, Calorific value, Determination of Calorific value by using Dulong's formula, Combustion and its calculations, Solid fuel: Coal analysis (Proximate and ultimate analysis), Elementary ideas on some gaseous fuels (Natural gas, Water gas, Producer gas, LPG) (Synthesis is excluded), Liquid fuels: IC - engine fuel, concept of knocking, antiknocking, octane number and cetane number, Fractional Distillation of petroleum, introductory idea about Cracking of heavy oils; 12 hrs.

## Module-2

### Instrumental Techniques:

Spectroscopy: Selection ruleLambert Beer's Law, Principles and applications of UV-Visible MolecularAbsorption Spectroscopy; Chromophores, Auxochrome . Effect ofconjugation on chromophores, , Basic Principles and application of rotationaland vibrational Spectroscopy , selection rule of UV-visible, vibrational and rotational spectroscopy.

## Module-3

### Corrosion Science:

Definition and scope of corrosion, Dry and wet corrosion; Direct chemical corrosion, Electrochemical corrosion and its mechanisms; Types of electrochemical corrosion, (differential aeration, galvanic,& concentration cell Corrosion); Typical Electrochemical corrosion like Pitting, Waterline; Factors affecting corrosion, Protection against corrosion : Modifying the environment, Use of Inhibitors, Cathodic Protection: Sacrificial anode method, Impressed current Cathodic protection. Anodic &cathodic coating. 10 hrs

## Module-4

### Phase rule & Phase diagram

Statement of Gibb's phase rule and explanation of the terms involved, Advantages and imitations of phase rule, Phase diagram of one component system – water and sulpur system, Condensed phase rule, Phase diagram of two component system – Eutectic system: Bi-Cd, Pb-Tin system 7 Hrs

## Module-5

### Nanomaterials

Introduction, Top-down and Bottom-up approach, Classification on dimension(1D, 2D, 3D and 0D), Characteristic, properties & application: Carbon nanotube , Nanowire, Application of Nanomaterial : Catalysis, Medicine, Bio nanomaterials. 6Hrs

### Text Books:


1. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, Pearson India.
2. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication. Reference Books:
3. Textbook of nanoscience and Nanotechnology, McGraw Hill Education (India)Pvt. Ltd., 2012.
4. Fundamentals of Molecular Spectroscopy by Banwell, Tata McGraw Hill Education.
5. Quantum Chemistry by Ira N. Levine, Pearson 7th Edition.
6. Molecular Spectroscopy, Ira N. Levine, John Wiley and Sons


### Reference Books:


1. R1. S. Chawla, Engineering Chemistry, Dhanpat Rai & Co.
2. R2. S. K. Bhasin and S. Rani, Engineering Chemistry, 3rd Edition, Dhanpat Rai & Co, 2012.
3. Introductory to Quantum Chemistry by A. K. Chandra. , 4th Edition, McgrawHill Education.
4. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, Third Edition.
5. Engineering Chemistry (NPTEL web-book) by B. L. Tembe, Kamaluddin and M. S. Krishan.


### Online Resources:

1. https://www.metrohm.com/en/industries/petro-lubricants/: Lubricant analysis according to international standards
2. http://www.eco-web.com/edi/01759.html: Efficient Wastewater Treatment: The field for analytical and monitoring

### Course Outcomes

On successful completion of the course, the student will be able to:

CO1 : Classify various fuels based on combustion parameters and understand the working principle of various batteries.

CO2 : Apply the concept of molecular spectroscopy to analyze organic compounds using spectrophotometer .

CO3 : Utilize the knowledge of electrochemistry and corrosion science in preventing engineering equipments from corrosion.

CO4 : To understand the microstructure of a given alloy systems and eutectic systems under a given set of conditions.

CO5: Discuss the benefits and applications of nano materials.

CO6: Compare and contrast thechemical behavior and physical properties of common substances.

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| 1st& 2nd Semester | 20BTMEPBS103 / 20BTMEPBS203 | ENGINEERING CHEMISTRY LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

## Objectives :

In this laboratory the engineering students are provided with the basic practical knowledge on Analysis of Portable & waste water, sample ore analysis, characterisation of lubricating oils, introducing the students to some theoretical topics through instrumental method of analysis such as PH measurement, Viscocity and flash point measurement &weight measurement.

## Pre-Requisites :

Student should have the knowledge of balancing equations, principle of titrations, titrant, titrand, preparation of standard solutions, concentration of a solution, indicators used in a titration, principle of reduction-oxidation reactions, handling of instruments like pH meter & accurate measurement of sample by using electronic balance

## Teaching Scheme :

Regular laboratory experiments conducted under supervision of the teacher. Demonstration will be given for each experiment.

## Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

## Detailed Syllabus

At least 10 Experiments

1 Estimation of calcium in limestone powder
2 Determination of dissolved oxygen in supplied water.
3 Determination of Total hardness of water sample by EDTA method
4 Determination of alkalinity of water.
5 Determination of available chlorine of bleaching powder/residual chlorine in tap water
6 Determination of Flash-point/fire point of a lubricant by Pensky-Martein's apparatus.
7 Determination of kinematic viscosity and Viscosity Index of a lubricant by Redwood viscometer.
8 Standardization of KMnO4 using sodium oxalate.
9 Determination of Ferrous ion in a given sample of Mohr,s salt
10 Determination of the partition coefficient of a substance between two immiscible liquids.
11 Determination of Acid value of oil.
12 Determination of concentration of a colour substance by Spectrophotometer
13 Green synthesis of noble metal/oxide based nanoparticles
14 Determination of the partition coefficient of a substance between two immiscible liquids.
15 Proximate analysis of coal sample.
16 Determination of iodine value of oil/fat.

## Text Books:

T1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, 2015.
T2. S. S. Dara, Engineering Chemistry, 12th Edition, S. Chand Publisher, 2014.
Reference Books:
R1. S. Chawla, Essentials of Experimental Engineering Chemistry, Dhanpat Rai & Co.
R2. S. K. Bhasin and S. Rani, Laboratory Manual on Engineering Chemistry, 3rd Edition, Dhanpat Rai & Co, 2012.

## Online Resources:

1. https://www.metrohm.com/en/industries/petro-lubricants/: Lubricant analysis according to international standards
2. http://www.eco-web.com/edi/01759.html: Efficient Wastewater Treatment: The field for analytical and monitoring

## Course Outcomes

The student at the end of the course will

CO1 learn and apply basic techniques used in chemistry laboratory for small/large scale water analyses/purification
CO2 be able estimate the ions/metal ions present in domestic/industry waste water.
CO3 utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification and spectroscopy.
CO4 able to analyze and gain experimental skill.
CO5 Test the quality of an oil/fat by measuring its iodine or acid value by means of amount of unsaturation for various industrial use.
CO6 Verify quality of a lubricant by means of its viscocity or flash point which gives their nature & flammability for various industrial applications

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|---|---|---|---|---|
| 1st& 2nd Semester | 20BTMETES101 / 20BTMETES201 | BASIC ELECTRICAL ENGINEERING | L-T-P 3-1-0 | Credit 3 |

## Pre-Requisites:

Basic knowledge of intermediate Physics, knowledge of basic Mathematics suchas Calculus, Ordinary Differential Equations, Matrices etc.

## Course Objectives:

- To provide an understanding of basics of Electricity and Magnetism.
- The course will cover the basics of DC & AC networks,principle of operation of different electrical machines.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

Module-1 (12 Hours)

Fundamentals of Electric Circuits:

Charge & current, Voltage & current sources, Electrical circuit elements (R, L and C) and their characteristics, Kirchoff's current and voltage laws;Star-Delta Conversion, Current Division and Voltage Division, Resistive Network Analysis: Node voltage & Mesh current analysis, Node voltage and mesh current analysis with controlled sources,Thevenin's Theorem, Norton's Theorem, Principle of superposition.Maximum power transfer theorem.

Module-2 (6 Hours)

AC Circuits:

Complex Algebra, Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting ofR, L, C, and RL, RC, RLC combinations (series and parallel).

Module-3 (4 Hours)

Three Phase AC:

Three phase balanced circuits, Comparison between single phase and three phase circuits, voltage andcurrent relations in star and delta connections. Power measurement by wattmeter method,Brief introduction to generation, Transmission and Distribution of electrical power, Earthing& electrical safety

Module-4 (8 Hours)

Magnetic Circuits:

MMF, flux, reluctance, magnetic circuit and magnetic reluctance, Magnetic materials, BH characteristics and Hysteresis loss, Series and parallel magnetic circuits.Ideal and practical transformer, e.m.f. equation of transformer, Equivalent circuit, open circuit and short circuit test(no problem),Auto-transformer

Module-5

Electrical Machines (6 hours)

Construction andprinciple of operation of DC machines(Generator and Motor),emf equation. Types of DC Generators and Motors,Back emf, applications. synchronous generator(construction and principle of operation)

Brief idea about Induction Motors(construction and principle of operation), slip,Torque-slip characteristics.

Text Books:

1. G.Rizzoni, Principles and Applications of Electrical Engineering, 5th Edition, McGraw Hill, 2006

2. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
3. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison WelseyLongman Inc., 1995

Reference:

1. B. L. Theraja and A. K. Theraja, Textbook of Electrical Technology (Vol-I), 23rd Edition, S. Chand &Co.Ltd., 2002.
2. J.B. Gupta, “Fundamentals of Electrical Engineering and Electronics” S.K. Kataria& SonsPublications, 2002
3. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition, PHI

Course Outcomes:

- To analyze Electrical circuits to compute and measure the parameters of Electrical Energy.
- To comprehend the working principles of Electrical DC Machines.
- To comprehend the working principles of electrical AC machines.

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| 1st& 2nd Semester | 20BTMEPES101/ 20BTMEPES201 | BASIC ELECTRICAL ENGINEERING LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

Any Eight

1. Verification of theorems (Norton,Thevenin,Superposition).
2. Connection and measurement of power consumption of a fluorescent lamp.
3. Power and phase measurements in three phase system by two wattmeter method .
4. V-I characteristics of incandescent lamps and time-fusing current characteristics of a fuse.
5. Connection and testing of a single-phase energy meter.
6. Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.
7. Calculation of no load losses of a single-phase transformer.
8. Measurement of Field and Armature Resistance of a DC Shunt Motor.
9. Study of House wiring.

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| 1st& 2nd Semester | 20BTMETES102 / 20BTMETES202 | BASIC ELECTRONICS ENGINEERING | L-T-P 3-0-0 | Credit 3 |
|---|---|---|---|---|

Objectives :

- knowledge of the basic principles of electronic components and circuits operation,
- calculation and measurement of various parameters for electronic circuits,
- Knowledge of basic Digital electronics and communication in electronic field,
- This course will also help students to understand basic concepts of communication systems, VLSI design, Internet of Things etc.

Pre-Requisites :

Knowledge on structure of solid, Energy band gap, Basic of Semiconductors, Intrinsic and Extrinsic semiconductors in Physics of Higher Secondary Science level.

Teaching Scheme :

Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

Module-1 (10 Hours)

Junction Diode, Principle of Diodes, V-I characteristics of junction diode, AC and DC Resistance of Diode, Diode Current Equation, Equivalent circuit of Diode, Breakdown Mechanism, Zener diode and applications, Rectifier circuit, Clipper and Clamper Circuit.

Module-2 (10 Hours)

Bipolar Junction Transistor: Transistor Operation, Current Equation in transistors, CB, CE, CC Configurations and their Characteristics, Load line Analysis, DC Biasing.

Module-3 (6 Hours)

Feedback Amplifiers: Principle, Types, Advantages and Disadvantages of Feedback, Different Negative Feedback Topologies. Oscillators – Barkhaunsen's criteria for oscillation. Field Effect Transistor (FET): Construction, Characteristics of Junction FET (JFET), Depletion and Enhancement type Metal Oxide Semiconductor FET (MOSFET), Fixed and Voltage divider Biasing Configurations, Introduction to Complementary MOS (CMOS) circuits

Module-4 (10 Hours)

Digital Electronic Principles: Number System, Number System Conversion, BCD arithmetic, Hexa decimal arithmetic, Binary arithmetic, Representation of Negative numbers, Complement arithmetic,Logic Gates, Realization of different gates using NAND and NOR gates. Boolean algebra –

Laws and Rules, De Morgan's theorem, Standard forms of Boolean expressions, Realization of Boolean expressions using AOI logic and NAND /NOR logic.

Module-5 (4 Hours)

Communication Systems: Signals, Frequency spectrum of signals, Analog and digital signals, Elements of Communication Systems, Modulation: Amplitude Modulation, AM Detection (Demodulation), Frequency and Phase Modulation. Modulation: A comparison. Introduction to Microprocessor, Microcontroller, Embedded System, Internet of Things (IOT).

Total = 40 Hours

Text Books


1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education.
2. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press.
3. Microprocessors and Interfacing, Programming & Hardware - Douglas V. Hall, McGraw Hill Education Pvt Ltd., 3rd edition.


Reference Books


1. Agarwal and J. Lang, Foundations of Analog and Digital Electronic Circuits, 1st Edition, Morgan Kaufmann, 2005.


CO1 Familiarize with different semiconductor device with their applications
CO2 Familiarize with different types of transistors with their configurations
CO3 Idea about the different feedback circuits
CO4 Familiarize with JFET, MOSFET, MOS with their applications
CO5 Knowledge about number systems, basic gates and logical expression.
CO6 To be aware with basic communication system including modulations


2. V. K. Mehta and Rohit Mehta, Principles of Electronics, 3rd Edition, S. Chand Publishing, 1980.


Online Resources

1. http://www.electrical4u.com/circuit-analysis.htm
2. http://www.allaboutcircuits.com
3. https://www.electronics-tutorials.ws/
4. https://www.edx.org/course/circuits-electronics-1-basic-circuit-mitx-6-002-1x-0

Course outcomes: At the end of this course, the students will be able to:

Program outcomes relevant to the course:

PO1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems in electronics and communication engineering.

PO2 **Problem analysis**: Identify, formulate, review research literature, and analyze complex electronics and communication engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **Design/development of solutions**: Design solutions for complex electronics and communication 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 related to electronics and communication including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Program Specific Outcomes (PSO) relevant to the course:

PSO1 Should be able to understand the concepts of Electronics & Communication engineering and their applications in the field of semiconductor technology, consumer electronics, communication/ networking and other relevant areas.

PSO3 Should have the capability to analyze, comprehend, design & develop electronic instruments, Display devices for a variety of engineering applications and thus demonstrating professional ethics & concern for societal well-being.

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| 1st& 2nd Semester | 20BTMEPES102 / 20BTMEPES202 | BASIC ELECTRONICS ENGINEERING LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

## Objectives

Know broadly the concepts and functionalities of the electronic devices, tools and instruments. Understand general specifications and deploy ability of the electronic devices, and assemblies. Develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications.

## Pre-Requisites

Knowledge on intrinsic and extrinsic semiconductors, Physics and Chemistry of Higher Secondary Science level.

## Teaching Scheme

Regular laboratory experiments to be conducted under the supervision of teachers and demonstrators with the help of ICT, as and when required along with pre-lab session and demonstration for each experiment.

## Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

**Assignment/Experiment**

1 Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multi-meter).

2 Study and use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.

3 V-I characteristics of semiconductor diode and determining its DC and AC resistances.

4 Study of half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectified output.

5 Implementation of clipper circuits, both positive clipper and negative clipper. Observe its output waveforms and compare them with theoretical analyzed results.

6 Study of static characteristics of BJT in CE configuration.

7 DC biasing() of the transistor in CE configuration and determination of its operating point.

8 Studies on logic gates truth table verification of various gates, implementation of EXNOR and

9 Design of Half Adder and FULL Adder using gates.

10 Studies on Op-Amp applications (Inverting, non-inverting, integrating differentiating configurations) recording of the input-output waveforms.

## Text Books:

T1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education.

T2.A. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press.

Reference Books:

R1.V. K. Mehta and R. Mehta, Principles of Electronics, 3rd Edition, S. Chand Publishing, 1980.

## Online Resources:

1.http://vlab.co.in/ba labs all.php?id=1

2.http://iitg.vlab.co.in/?sub=59&brch=165

## Course Outcomes:

At the end of this course, the students will be able to:

CO1 Familiarize with various electronic components, measuring instruments

CO2 Acquire knowledge of characteristics of diodes and design, testing

CO3 Acquire knowledge of characteristics of transistors and design, testing & implementation of transistors in various applications

CO4 Develop understanding of digital logic gates and design & test digital circuits for various applications using logic gates.

CO5 Gain understanding of operational amplifiers (Op-Amp) and design & testing of electronic circuits for various applications using Op-Amp.

CO6 implementation of Diode in various applications RECTIFIER & CLIPPER

## Program outcomes relevant to the course:

PO1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems in electronics and communication engineering.

PO2 **Problem analysis**: Identify, formulate, review research literature, and analyze complex electronics and communication engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **Design/development of solutions**: Design solutions for complex electronics and communication 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 related to electronics and communication 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 Electronics and communication 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.

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.

**Program Specific Outcomes (PSO) relevant to the course:**

PSO1 Should be able to understand the concepts of Electronics & Communication engineering and their applications in the field of semiconductor technology, consumer electronics, communication/ networking and other relevant areas.

PSO2 Should have an ability to apply technical knowledge and usage of modern hardware tools related to Electronics & Communication engineering for solving real world problems.

PSO3 Should have the capability to analyze, comprehend, design & develop electronic instruments,Display devices for a variety of engineering applications and thus demonstrating professional ethics & concern for societal well-being.

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|---|---|---|---|---|
| 1st& 2ndSemester | 20BTMETES103 / 20BTMETES203 | BASIC MECHANICAL ENGINEERING | L-T-P 3-0-0 | Credit 3 |

**Prerequisites:**

Basics of Physics, Basics of Chemistry, Mathematics

Course Objective:
This course aims to expose the students to the thrust areas in Mechanical Engineering and their relevance by covering fundamental concepts.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

Course Contents:

Module I (8 Hours)

Concurrent forces on a plane – Composition and resolution of forces and equilibrium ofconcurrent coplanar forces, Methods of moment, Friction

Module II (8 Hours)

Centre of gravity- centroids of composite plane figureand curves, Moments of Inertia- Plane figure with respect to an axis in its plane and perpendicular to theplane- parallel axis theorem,
Plane trusses- method of joints and method of sections,

Module III (8 Hours)

Rectilinear Translation Kinematics- Principles of Dynamics, D'Alemberts Principles. Momentum and impulse, Work and Energy, impact. Curvilinear translation, projectile- D'Alemberts Principle in curvilinear motion, Moment of momentum, Kinetics of Rotation of rigid body

Module IV (08 Hours)

Application of Thermodynamics: I.C. Engines, Refrigerators and Steam Generators- Classification of Boilers only, Boiler Mountings and Accessories, Condensers- Function of condenser in a Steam Power Plant, Steam Turbine- Principle of Operation, Classification of Steam Turbines. (Brief Description of different components of above mentioned systems and working principles only)

Fasteners and Power transmission devices:

Forms of Screw Threads, Single-start and multiple-start threads, Right-hand and Left-hand threads, Different types of Nuts, Bolts & Rivets and their applications, Automobile Power Transmission System – Clutch and Gear Box. Automobile Braking System- Classification, Main Components, Hydraulic Braking System. (working principles with schematic diagram only).

Module V (08 Hours)

Basic manufacturing Processes:

Foundry Practices- Pattern, Mould & Casting, Mechanical working of metals - Sheet metal works. (Elementary ideas only)

Hydraulic Machines:

Hydraulic Turbines- Classifications and Applications.
Hydro Electric Power Plants (Schematic diagram of layouts & component description).
Hydraulic Pumps- Centrifugal Pump and Reciprocating Pump (Brief Description of different components of above mentioned systems and working principles with Schematic diagram only).

Text books-

1. Engineering Mechanics by S Timoshenko, D.H Young and J.V. Rao, McGraw Hill
2. Thermal Engineering by P. L. Ballaney, Khanna Publishers
3. Fluid Mechanics & Hydraulic Machines by Dr R. K. Bansal, Laxmi Publications.
4. Elements of Workshop Technology- Volume-I by S. K. HAJRACHOUDHURY,A. K. HAJRACHOUDHURY; Media Promoters & Publishers Pvt. Ltd.
5. Machine Drawing by N. D. Bhatt ;Charotar Publishing House
6. A Course in Automobile Engineering by R. P. Sharma ;Dhanpat Rai & Sons.
7. Basic Mechanical Engineering by A R Israni, P K Shah, B. S. Publications

Reference books

1. Manufacturing Technology by P.N.Rao, Tata McGraw Hill publication.
2. Manufacturing Science by A.Ghosh and A K Malick, EWP
3. A Text Book of Production Engineering by P.C.Sharma, S.Chand
4. Engineering Mechanics by K.L. Kumar, McGraw Hill
5. Basic Mechanical Engineering by .D. Mishra, P.K Parida, S.S.Sahoo, India TechPublishing company.
6. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey

Course Outcomes

CO1 To be able to understand fundamentals statics, friction, truss, CG and MI
CO2 To be able to principle of dynamics, work, energy, impact, rotational and curvilinear motion.
CO3 To be able to understand application of Thermodynamics,: I.C. Engines, Refrigerators and Steam Generators- Steam Power Plant, Steam Turbine
CO4 To be able to understand the application of Screw Threads, Nuts, Bolts & Rivets, Clutch and Gear Box and Braking System
CO5 To be able to understand Foundry Practices- Pattern, Mould & Casting, Mechanical working of metals - Sheet metal works.

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|---|---|---|---|---|
| 1st& 2nd Semester | 20BTMEPES103 / 20BTMEPES203 | BASIC MECHANICAL ENGINEERING LAB | L-T-P 0-0-2 | Credit 1 |

(Minimum 8 experiments/studies should be conducted)

1. To study Four stroke (a) Petrol engine and (b) Diesel engine.
2. To study Two stroke (a) Petrol engine and (b) Diesel engine
3. To study the working and construction details of Cochran and Babcock and Wilcox Boiler.
4. To study a hose-hold Vapour Compression Refrigeration System.
5. To study constructional features and working of Pelton wheel turbine,
6. To study constructional features and working of Francis turbine
7. To study constructional features and working of Kaplan turbine.

8. To study the construction and working of Centrifugal pump.
9. To study the working of Single Plate Clutch.
10. To study construction and working principle of different types of Gears.
11. To study power transmission system of an Automobile.

Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

Course Outcomes

CO1 To be able to understand different components and its function of an automobile.
CO2 To be able to understand different types of boiler and its construction.
CO3 To be able to understand the principle of vapour compression refrigeration system.
CO4 To be able to understand the different types of hydraulic turbine and pump and its construction.
CO5 To be able to understand principle and working of different types of gear, clutch.

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| 1st& 2nd Semester | 20BTMETES104 / 20BTMETES204 | BASIC CIVIL ENGINEERING | L-T-P 3-0-0 | Credit 3 |
|---|---|---|---|---|

COURSE OBJECTIVES:

(1) To understand the Importance of Civil Engineering
(2) To have knowledge of Various Construction Materials and their uses.
(3) To learn basics of Surveying for layout of structures on ground.
(4) To understand the fundamentals of foundations of structures
(5) To understand basics of sources of water and its use in Irrigation Engineering
(6) To acquire Basic Knowledge of various Transportation Systems

Evaluation Scheme

| Teacher's Assessment | Written Assessment | Total |
|---|---|---|

| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
|---|---|---|---|---|---|
| 05 | 05 | 05 | 25 | 60 | 100 |

MODULE- I (12 hours)

Introduction and Scope of Civil Engineering. Broad disciplines of Civil Engineering; Development of various materials of construction and methods of construction.

Building Material and Building Construction:

Bricks: Brick and its use, Types of bricks, qualities of a good bricks, Tests for Bricks, Stone: Classification, Composition and their Characteristics, Types of Building stones, Cement: Uses of cement, Types of cement, Tests for cement, Mortar and Concrete: Ingredients of concrete, Workability, Compaction of concrete, Concrete mix design, Grade and strength of Concrete. Fundamentals of R.C.C., Pre-stressed concrete. Types of steels used in civil engineering works, Building Components, Stone masonry, Brick masonry, Type of roofs and flooring,

MODULE-II (8 hours)

Surveying: Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, Compass surveying: Use of prismatic compass, bearing of a line. General Layout of Buildings, Local attraction, Introduction surveying instruments, Level Instruments, Theodolites, EDM and Total Station.

MODULE-III (6 hours)

Geotechnical Engineering:

Fundamental of soil and its classification, Foundations: Types of shallow and deep foundations with sketches.

MODULE-IV (6 hours)

Water Resources Engineering: Sources of water and Irrigation Engineering: Hydrological Cycle, Rain gauges, Averaging Precipitation, Introduction of Hydraulics structure like canals, siphons, weirs, dams etc. and their purpose

MODULE-V (8 hours)

Transportation Engineering: Modes of transportation, Introduction to highway engineering, rail engineering, Airport engineering, Waterways, Traffic engineering, urban engineering

TEXT BOOKS

Basic Civil Engineering, S. Gopi, Pearson
Surveying and Levelling by R. Subramanian, Oxford University Press
Building Material and Construction, G C Sahu, Joygopal Jena, McGraw Hill
Water Resource Engineering, N.N. BasakMcGraw Hill

REFERENCE BOOKS

i. Engineering Materials, S.C. Rangwala, Charotar Publishing House
ii. Surveying Vol-1 by R Agor, Khanna Publishers
iii. Basic Civil Engineering, M.S. Palanichamy, McGraw Hill

E-Resources:
1.https://nptel.ac.in/courses/105/102/105102088/

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| 1st& 2nd Semester | 20BTMEPES104 / 20BTMEPES204 | BASIC CIVIL ENGINEERING LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

(Minimum 8 experiments /studies)

1. Water absorption and efflorescence of bricks
2. Compressive strength of brick
3. Consistency of cement
4. Setting time of cement
5. Compressive strength of concrete
6. Tensile strength of reinforcing steel
7. Linear measurement by chain
8. Bearing of a line using compass
9. Levelling Instruments
10. Study of Total Station

Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

Beyond Syllabus: (As per availability of time)

1. Workability of Concrete
2. Use of Theodolite
3. Tensile and compressive strength of Cement

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| 1st& 2nd Semester | 20BTMEPES105 / 20BTMEPES105 | ENGINEERING GRAPHICS & DESIGN LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

(Minimum 8 Sheets)

COURSE OBJECTIVES:

1. To create awareness and emphasize the need for Engineering Graphics in all the branches of engineering.
2. To follow basic drawing standards and conventions.
3. To develop skills in three- dimensional visualization of engineering component,
4. To solve specific geometrical problems in plane geometry involving lines, plane figures
5. To produce orthographic projection of engineering components working from pictorial drawings.

## Evaluation Scheme

| Quality of job | Understanding of the job and related theory | Quality of report and Viva – Voce | Total |
|---|---|---|---|
| 50 | 30 | 20 | 100 |

**Prerequisites:**
Basic understanding of Geometry

1. Principles of Engineering Graphics and their significance, usage of various drawing instruments, lettering, dimensioning principles. (1 Sheet)
2. Orthographic Projections: Projection of points and straight lines. (2 Sheets)
3. Projections of Planes. (1 Sheet)
4. Projection of Solids. (1 Sheet)
5. Section of Solids. (1 Sheet)
6. Principles of Isometric projection. (1 Sheet)
7. Development of surface and intersection of surfaces. (2 Sheets)
8. Introduction to AUTOCAD tools. (1 Sheet)

### TEXT BOOKS:


1. N. D. Bhat, M. Panchal, Engineering Drawing, Charotar Publishing House, 2008.
2. M. B. Shah, B. C. Rana, Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3. R. K. Dhawan, A Text Book of Engineering Drawing, S. Chand Publications, 2007.


### REFERENCE BOOKS:


1. E. French, C. J. Vierck, R. J. Foster, Graphic Science and Design, 4th Edition, McGraw- Hill.
2. W. J. Luzadder, J. M. Duff, Fundamentals of Engineering Drawing, 11th Edition, PHI, 1995.
3. K. Venugopal, Engineering Drawing and Graphics, 3rd Edition, New Age International, 1998.


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|---|---|---|---|---|
| | 20BTMEPES206 | | 0-0-2 | 1 |

Objective:

workshop Practice lab deals with different processes by which component of machines or equipments are made. Its purpose is to equip the trainee with knowledge, skill and attitude that enable them to perform basic workshop tasks.

FITTING PRACTICE

1. Use of hand tools in fitting, preparing a male female joint of M.S. or making a paper weight of Mild steel.

WELDING PRACTICE

2. Welding practice (Basic Theory to be explained prior to practice):
   A. Gas welding & Electric Arc welding practice.
   B. A joint such as a Lap joint, a T- joint or a Butt joint is to be prepared or to make furniture.

MACHINING PRACTICE

3. Machining (Basic Theory to be explained prior to practice):
   A. Stepped cylindrical Turning of a job and thread –cutting in lathe.
   B. Shaping
   C. Milling

Evaluation Scheme

| Quality of job | Understanding of the job and related theory | Quality of report and Viva – Voce | Total |
|---|---|---|---|
| 50 | 30 | 20 | 100 |

Outcomes:

Intellectual skills, Cognitive strategy, verbal information, motor skills and attitude

Course Outcomes

CO1 To be able to use various fitting tools and able to perform fitting operation.
CO2 To be able to understand principle of gas welding and able to perform gas welding operation.
CO3 To be able to understand principle of arc welding and able to perform arc welding operation.
CO4 To be able to understand different parts of a lathe and able to perform turning, facing, threading, tapering using lathe.
CO5 To be able to understand different parts of a shaping and milling machine and able to perform shaping and milling operation.

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|---|---|---|---|---|
| 1st Semester | 20BTMETHS101 | FUNCTIONAL ENGLISH | L-T-P 2-0-0 | Credit 2 |

Course Objectives

This subject aims to:

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.
- To help students in improving their accent, overall presentation skills to enhance their employability.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

MODULE 1 Effective Reading Skills

Process of Reading, Global and Local Comprehension, Sub skills of Skimming, Scanning, Inferencing, Guessing word-meaning, Using appropriate speed for various kinds of reading. Correction of Reading faults of Eye-fixation, Regression, Finger-pointing, Sub-vocalising, Reading aloud, and indiscriminate use of the Dictionary.

The module will acclimatize students with short stories of R. K Narayan, which will enable them to understand the nuances of reading and comprehension.

Text Book:

Malgudi Days by R.K Narayan

1. An astrologer's day
2. The missing mail
3. The doctor's word
4. Gateman's gift Links:

- https://pdfroom.com/books/malgudi-days-narayan-r-k/or5WWqZn5qD
- https://www.press.umich.edu/9441812/building_academic_reading_skills_book_1_2nd_edition/?s=look_inside
- https://www.jmu.edu/valleyscholars/files/studyreadingskills.pdf
- https://files.eric.ed.gov/fulltext/ED583494.pdf

MODULE 2

Nitty Gritty of Writing in English

Writing Process, Paragraph writing, Summarizing, Blogging, Paraphrasing, Précis-writing, Essay writing and Reading Comprehension.

The module will familiarize students with the nitty gritty of writing in English by drawing from the referred text books.

Text Books:

1. The Submerged Vallley and Other Stories by Manoj Das
2. Real Writing with Readings by Susan Anker

Link:

https://ebin.pub/the-submerged-valley-and-other-stories.html

## MODULE 3

The Quintessence of Effective Pronunciation

Introduction to Phonetics: IPA, Received Pronunciation, Phonetic and Non-Phonetic Writing Systems; IPA:

Vowels and Consonants, MTI, Problem sounds; Stress, Intonation, Rhythm, Strong and Weak forms. The module will familiarize students with the sounds of English language and help them to use it in day-today situations.

### Text Book:

1. Better English Pronunciation by J D O'Connor
2. Phonetics A Coursebook by Rachel Anne Knight

### Links:

- https://salahlibrary.files.wordpress.com/2017/03/a-practical-introduction-to-honetics.pdf
- https://bbooks.info/b/w/ef588b4a0491ac5e37669efa7c0d5476f92a872f/phonetics-for-dummies.pdf
- https://salahlibrary.files.wordpress.com/2018/10/d8b4d986d8a7d8aed8aa_d8a2d988d8a7.pdf

## MODULE 4

Applied Grammar

Articles, Prepositions, Subject-Verb agreement, State and Event verbs, Modals and Auxiliaries, Finite and Non-finite Verbs; Tenses; Vocabulary

The student will get a better understanding of the nuances and application of grammar and vocabulary in day-to-day usage.

### Text Books:

1. Oxford modern English Grammar
2. Destination B1 Grammar and Vocabulary with Answer Key (Malcolm Mann &Steve Taylore-Knowles)
3. English vocabulary in use (Michael MC Carthy)

### Links:

https://pdfroom.com/books/oxford-modern-english-grammar/KRd6oO79gZp/download

### Recommended Books:

1. Remedial English Grammar by F. T. Wood, Macmillan.
2. Essential English Grammar By Raymond Murphy, Cambridge University Press
3. The Visual Element in Language Teaching (Education Today Series) (ELT) by PIT CORDER
4. Introducing Applied Linguistics (Penguin modern linguistics texts) by S. Pit Corder
5. Advanced Grammar in Use with Answers, MARTIN HEWINGS
6. Phonetics for Dummies by William F. Katz

### Intended Learning Outcomes/ Course Outcomes (CO)

By the end of the course the student will be able to:

- Use English Language effectively in spoken and written forms.

- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultural scenarios.
- Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
- Understand the nuances of spoken English and to be effective speakers.

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| 1st Semester | 20BTMEPHS101 | FUNCTIONAL ENGLISH LAB | L-T-P 0-0-2 | Credit 1 |
|---|---|---|---|---|

1 "Find The Word" Reading Aloud Activity (Pair Work); "Reading Aloud" Task (Pair Work / Small Group Work); "Team Reading Aloud" – Pronunciation Reading (Whole Group); Key Word Bingo – Vocabulary Based Reading Activity (Individual)
Pre-Reading Activities
https://theidealteacher.com/21-mustuse-reading-activities-for-your-language

2 True or False? – Post-Reading Activity (Alone); Summarise The Text – Post Reading Activity (Individual); Re-write The Text – Reading Activity (Alone); Walking Text – Reading Comprehension Activity (Individual)
Post-Reading Activities
https://theidealteacher.com/21-mustuse-reading-activities-for-your-language

3 Filminute: One-minute films in different languages on different topics, can watch without sound too! - IDEAS FOR USE: 1. Watch film clip and describe in detail what happened; 2. Watch film clip and summarise; 3. Watch film clip and extend the story; 4. Listen to film clip without watching and imagine what the film is about and describe it.
Short video based – For Spontaneous Speaking & Writing in Language Learning
https://filminute.com/festival/

4 Picture interpretation: interpreting a given image and making a short presentation about the same.
Speaking Activity
https://ssol.tki.org.nz/Social-studies-110/Teaching-and-learning/Effectiveteaching-in-social-tudies/Teachingstrategies/writing_and_presenting_info rmation/Picture-interpretation

5 News Paper Article Analysis - (General Topics): Provide A Newspaper Article And Ask Students To Comprehend And Analyse And Then make a Presentation on it.
Listening, Speaking, Reading & Writing Based activity
https://cdn.ymaws.com/okpress.com/resource/resmgr/onf/nie/newspaper_ac tivities.pdf

6 Movie Talk Google Docs Database: Hundreds of short video clips and adverts with links and short descriptions of the clip content on a Google Doc. Most are French, Spanish, silent or with music only.
Short video based – For Spontaneous Speaking & Writing in Language Learning
https://docs.google.com/spreadsheets/d/1MjFKTuUu_fVwO30eJd9zGQliUIwNCO6VmT6kCZfI8V8

7 Digital Collage designing and presentation- students will design a collage in group based on a particular theme and will present it.
Speaking Activity
https://www.technokids.com/blog/app s/digital-collage-in-the-classroom/

8 Ppt-ask students to watch a web series of their choice. Give them few areas like Screenplay, Characterisation, Plot construction and ask them to make a power point presentation on it.
Listening, Speaking, Reading & Writing Based activity

9 Listening test: provide an audio clip and questions on it. Ask students to answer after listening to the audio. (Cambridge Assessment English content)
Listening, Reading & Writing Based activity
https://www.teachingenglish.org.uk/professional-development/podcast

10 Creavewri ng: students will be given a cue to write a short story.
Writing Activity
https://www-tc.pbs.org/now/classroom/acrobat/less on05.pdf

11 Grammar and Vocabulary Test
Writing Activity
https://toaz.info/doc-viewer

Evaluation Scheme

| Experiment (work) Planning and execution | Results and interpretation | Report | Viva-voce to experiment | Total |
|---|---|---|---|---|
| 20 | 30 | 30 | 20 | 100 |

COURSE OUTCOMES

1. Understanding the sounds of English and using them in the right context.
2. Write paragraphs, stories etc. using short and crisp sentences.
3. Listen, speak, read & write the sounds of English using correct stress, tone and rhythm.
4. Language Skills- Grammar Exercises, Jumbled Sentences & correcting errors.
5. Writing- Paragraph & Precis Writing.
6. Role-Play- enacting ideas, themes(short duration & one-on-one activity)
7. Critical Appreciation - Article Analysis
8. Introducing Self & Others- Learning the nuances of Introduction, Asking questions and Overcoming stage fright.
9. Presentations- Power point Presentations on general topics, Book Review.

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| 1st Semester | 20BTMETES105 | PROGRAMMING FOR PROBLEM SOLVING USING C | L-T-P 3-0-2 | Credit 3 |
|---|---|---|---|---|

Course objectives: The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures. To make the student understand simple sorting and searching method

Unit-1

Basic of Computer and Introduction to the C Language (7 hours)

Components of a computer system, Fundamentals of Computing, Computer Languages, Problems, Algorithms, flowcharts, Pseudo-code. Compiler and interpreter.

Output statements, Literals, Identifiers, Variables, Datatypes, Number Systems & Conversion, Format specifiers, Input statements, Escape sequences, Constant, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Comments

Unit-2

Control Statements and Array (10 hours)

Decision making: if, if-else, nested if, else if ladder, switch, break statement, goto. Loop: while, do-while, for, continue, infinite loop, nesting of loops. Array: 1-D array creation and memory representation, Manipulating array elements, Linear Search, Binary Search, Bubble sort. 2-D array creation and memory representation, Programs on 2-D array.

Unit -3

Pointer, Function and String (10 hours)

Pointer: Declaring and initializing Pointer, dereferencing pointer, Pointer and Array, Pointer Arithmetic, sizeof() operator, constant pointer, pointer to constant, void pointer, Null Pointer, Array of pointers and pointer to array.

Functions: Types of functions, Parts of function, User defined functions,

Call by value and call by reference, Passing array to function, pointer to function, function returning pointer.

Recursion, programs on recursion.

C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

Unit-4

Dynamic memory allocation, Structure and Union (7 hours)

Dynamic memory allocation concept, heap area, malloc, calloc, free. Advantage of dynamic memory allocation wrt static allocation, Programs on dynamic memory allocation.

Structure and Union:Need of structure, Creating a structure, typedef, array of structures, pointer to structure, passing structure to function, returning structure from function, self-referential structure. Creating a union, difference between structure and union.

Enum creation, assigning value to enum variables.

Unit-5

Macro, Storage Class and File Handling (6 hours)

Macro: Macro expansion process, programs on Macro.

Storage class: auto, extern, static, register.

Command Line Argument.

File Handling: File opening modes, read and write text in file, file copy, reading and writing structure variables in a file, fseek, ftell.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

Reference Books:


1. Programming in C. P. Dey and M Ghosh, Oxford University Press.
2. ReemaThareja, Introduction to C Programming, 2nd Edition, Oxford University Press.
3. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
4. Problem solving with C, M.T.Somasekhara, PHI
5. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.


Online Resources:

https://nptel.ac.in/courses/106/105/106105171/
https://nptel.ac.in/courses/106/104/106104128/

Course outcomes:

Students will be able to:

CO1: Design simple algorithms for arithmetic and logical problems
CO2: Implement the algorithms to programs (in C language).
CO3: Carryout experiments and correct syntax and logical errors.
CO4: Implement conditional branching, iteration and recursion.
CO5: Analyzea problem , decompose into functions and synthesize a complete program using divide andConquer approach.
CO6: Apply arrays, pointers and structures to formulate algorithms and programs.
CO7: Apply programming to solve simple numerical method problems, differentiation of function and simple integration.

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|---|---|---|---|---|
| 1st Semester | 20BTMETES105 | PROGRAMMING FOR PROBLEM SOLVING USING C LAB | L-T-P 0-0-2 | Credit 1 |

**Course objectives:**

- To write, test, and debug simple C programs.
- To implement C programs with conditionals and loops.
- Use functions for structuring C programs.
- To understand and implement pointer and user defined data types
- To understand file concept and dynamic memory application
- To develop logic to solve problems using the programming

**Experiment**

Editing, compiling, executing, and debugging of simple C programs
Programs using operators and formatted input/output statements.

| | |
|---|---|
| 3,4 | Decision making using if, if-else, else-if ladder, nested if |
| 5 | Decision making using switch-case construct. |
| 6,7 | Loop control structure (while, do-while, for) with jump statements |
| 8 | Nested loops (printing various formats) |
| 9,10 | 1-D arrays including operation like searching, sorting, merging etc. |
| 11 | Handling 2-D arrays such as matrix operations |
| 12 , 13 | Programs on strings using various string handling functions (library functions) |
| 14, 15 | Designing user-defined functions. |
| 16 | Programs on recursion. |
| 17 | Designing user defined functions for string manipulation. |

18 Passing arrays (both 1D and 2D) to functions
19 , 20 Structure, array of structure, nested structure.
21 Dynamic memory management.
22 Self-referential structure (create and display operation of single linked list)
23 , 24 File handling - reading from and writing to files.
25 Command-line argument, pre-processor directives.

Course outcomes:

**CO1:** Read, understand and trace the execution of programs written in C language.
**CO2:** Develop programs using the basic elements like control statements, Arrays and String
**CO3:** Implement Programs with pointers, and learn to use the pre-processors, command line arguments etc.
**CO4:** Write the C code for a given algorithm
**CO5:** Write programs that perform operations using derived data types.
**CO6:** Write programs that perform various operations on files

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|---|---|---|---|---|
| 2nd Semester | 20BTMETBS204 | ENGINEERING MATHEMATICS - II | L-T-P 3-0-0 | Credit 3 |

Prerequisite

Matrix algebra, Determinants, Vector algebra.

CourseObjectives:

- TodiscusstheconceptsassociatedwithMatrix Algebra, Solution of system of linear equations, Vector Spaces.
- Todiscusstheconceptsof eigenvalues and eigenvectors, Real matrices, Complex matrices andDiagonalisation of Matrices.
- TodescribetheconceptsofVector differential calculus and its application.
- TopresenttheconceptsofVector integral calculus and its application.
- Topresenttheconcepts of Fourier series, Fourier Integral and Fourier transform.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

Module - 1 (8 hrs.)

Matrix Algebra, Solution of system of linear equations (Gauss Elimination), Rank and Inverse of matrices (Gauss-Jordan), Vector Space and its Examples.

Module - 2 (8 hrs.)

Eigen values and eigen vectors, Symmetric and skew-symmetric matrices, Orthogonal matrices, Complex matrices, Hermitian and skew matrices, Unitary matrices and similarity of matrices, Diagonalisation of Matrices.

Module - 3 (9hrs.)

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc Length, gradient, divergence, curl.

Module - 4 (10 hrs.)

Vector integral calculus: Line Integrals, Green Theorem, Surface integrals, Gauss theorem and Stokes Theorem.

Module - 5 (10 hrs.)

Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half range Expansion, Fourier Integral and Fourier transform.

Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig, 8th Edition, Willey.

References:

1. Higher Engineering Mathematics by B.V. Ramana, McGraw Hills Education.
2. Higher Engineering Mathematics by B.S. Grewal,, Khanna Publishers, 36th Edition, 2010.
3. Advance Engineering Mathematics by P.V.O'NEIL, CENGAGE.
4. A text book of Engineering Mathematics by N.P. Bali and Manish Goyal, , Laxmi Publications, Reprint, 2008.

Online Resources :

Linear algebra-https://onlinecourses.nptel.ac.in/noc21_ma50/preview

## CourseOutcomes:

Afterreadingthis subject,students willbeableto:

1. Apply the knowledge of Mathematics in Physical sciences and Engineering.
2. Modeling of Physical Problems to Mathematical problems.
3. Acquire knowledge of Double and Triple Integral and their applications in engineering subjects.
4. Acquire knowledge about Fourier series and Fourier transform.
5. Apply Knowledge vector calculus in engineering and physical sciences.
6. Acquire knowledge of Matrix Algebra, Determinants and their applications in engineering subjects.

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|---|---|---|---|---|
| 2nd Semester | 20BTMETHS201 | BUSINESS COMMUNICATION AND LIFE SKILLS | L-T-P 2-0-0 | Credit 2 |

Course Objectives

This subject aims to:

- Understand the concepts of business communication in a diverse workplace. It aims at building their business acumen in order to work in an inter-cultural environment.
- Improve the listening, conversation and writing skills of students, which would help them co-exist in the business world.
- Groom the learners as potential and prospective candidates to take on the present-day challenges in the job sector with their acquired soft skills.

Evaluation Scheme

| Teacher's Assessment | | | Written Assessment | | Total |
|---|---|---|---|---|---|
| Quiz | Surprise Test(s) | Assignment(s) | Mid-Term | End-Term | |
| 05 | 05 | 05 | 25 | 60 | 100 |

UNIT-1

Writing Business messages and Documents (10 hours)

1.1 Importance of written Business communication, Types of Business messages, Stages of writing business messages, Plagiarism

1.2 Business letters- Common components and Strategies of writing a letter, Types of Business Letters, Sales Letters

1.3 Writing effective Memos - Principles and fundamentals to be followed to draft Business Memos, Letters Versus Memos, Characteristics of Effective Memos, Form and Structure, Parts of a Memo, Writing Strategies, Model Memos

1.4 Business Reports - Nature and Significance, Types of Reports, Formats of Reports, Structure of a formal Business Report.

1.5 Business Proposals – Types, Structure of a Business Report. Model Business Proposals.

1.6 E-mail Writing - Advantages of E-mail, Characteristics of Successful E-mail Messages Formatting, E-mail Format, Standard E-mail Practices, E-mail Writing Strategies

UNIT-2

Communicating at Workplace (10 hours)

2.1 Effective Listening - Introduction, Active and Passive Listening, Process of Listening, Advantages of Listening, Types of Listening, Effective and Ineffective Listening Skills

2.2 Factors affecting Listening, Role of Listening in Leadership Styles, Six Styles of Leadership, Listening at Three Managerial Levels

2.3 Benefits of Listening for Leaders and Teams, Motivational Benefits of Listening in the Workplace, Poor Listening Habits, Strategies for Effective Listening

2.4 Business Conversations - Importance of Business Conversations and Essentials of a Business Conversation

2.5 Conversation Management - Use Verbal and Non-verbal Cues appropriately in Conversations - How to Identify Cues and Clues Signs and Signals; Stressful Conversations

2.6 Business Presentations - Planning, Preparing, Practicing, Performing, Reviewing, Emphatic Closing, Stage Fright

2.7 Business Meetings – Agenda, Minutes of a Meeting, Leading Effective Meetings

UNIT-3

Communication for Career Management (08 hours)

3.1 Cover letter, Resume and CV Writing - Types, Formats, Cover letter - Format of cover letters, solicited and un-solicited job applications.

3.2 Group Discussion - Benefits of a GD; Workplace GD Guidelines - Planning and Preparation, Organizer's Role, Procedure; Functional and Non-functional Roles in Group Discussions; Tips for Success in GDs

3.3 Interviews - Fundamental Principles of Interviewing; General Preparation for an Interview, Stage of an interview, Success in an interview, Types of interviews

3.4 Life Skills – Problem Solving, Time Management, Stress Management, Leadership, Emotional Intelligence

UNIT-4

Use of Technology in Communication (04 hours)

4.1 Technology in Business Communication - Advantages and Disadvantages of Technology, Changing Role of Technology in Communication

4.2 Classification of Various Technologies Available - Internet, Technology Tools, Collaborative Tools, Technology for Daily Use, Intranet and Communication; How much Technology does Your Company Need for Communicating? Latest Trends in Technology; Online Etiquettes

Intended Learning Outcomes/ Course Outcomes (CO)

- Upon completion of the subject, students will be able to:
- Understand and learn different formats of business correspondence at the workplace through which communication takes place.
- Understand the importance of writing an effective Resume and Cover letter in the professional world and its uses.
- Learn the concept and the use of oral presentation to improve professional presentation and the importance of Personal Interview.
- Learn the concept and procedure of Group Discussion.
- Build qualities like Teamwork and leadership. Learning effective time management skills and assertiveness.
- Learn the nuances of effective listening and conversation and use them in their professional life.

Text Books:

1. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Effective Technical Communication by M. Ashraf Rizvi, Mcgraw-Hill Education Recommended Books:
1. Basic Communication Skills by P.KiranmaiDutt, Geetha Rajeevan, Cambridge University Press Books
2. Business Communication- concepts, cases &applications, Chaturvedi & Chaturvedi, Pearson
3. Communication Technology by Everette M.Rogers,Free Press.
4. 101 Great Resumes. 5thJaico Impression. (2008). New Delhi: Jaico Publishing House.
5. Krannich, Caryl Rae &Krannich, Ronald L.. (2003). Nail the Job interview!
6. 101 Dynamite Answers to Interview Questions. (5th ed.). United States of America: Impact Publications.
7. Murphy, A. Herta; Hildebrandt, W. Herbert; Thomas, P. Jane. (2008) Effective Business Communication (7th, ed.). New Delhi: Tata Mc Graw – Hill Publishing Company Company Ltd.

Links:

- https://pdfroom.com/books/technical-communication-principles-and-practice/kZdowxNWdM8
- https://www.thebalancecareers.com/job-interview-questions-and-answers-2061204
- http://www.ascdegreecollege.ac.in/wp-content/uploads/2020/12/Business-Communicationby-P.-D.-Chaturvedi-Mukesh-Chaturvedig.pdf

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| 2nd Semester | 20BTMETES205 | PROGRAMMING FOR PROBLEM SOLVING USING PYTHON | L-T-P 3-0-0 | Credit 3 |

Course objectives:

- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.
- To use OOP concept such as class, object, inheritance in Python.

Prerequisites: Basic knowledge of programming

Unit-1 (7 hours)

Data, Expressions, Statements: Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments;

Unit-2 (10 hours)

Control Flow, Functions: Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Unit 3 (8 hours)

Lists, Tuples, Dictionaries: Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension;

Unit-4 (7 hours)

Files, Modules, Packages: Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages

Unit-5 (8 hours)

OOP Concepts: Basic Concepts of Object-Oriented Programming, Class, Objects and object instantiation, Class constructor, Class methods, creating more than one object of a class, Inheritance in Python Class.

Text Books:

T1: Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

T2: Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

R1: Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

R2: John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013

R3: Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

R4: Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.

Online Resources:

https://wiki.python.org/moin/BeginnersGuide
https://nptel.ac.in/courses/106/106/106106182/

Course outcomes:

CO1: To get familiar with python environment.
CO2: To implement control structures and user defined functions in python
CO3: To understand the use of tuples, lists or maps.
CO4: To implement file and exception handling in python programs
CO5: To implement basic OOP concepts in python

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|---|---|---|---|---|
| 2nd Semester | 20BTMEPES207 | PROGRAMMING FOR PROBLEM SOLVING USING PYTHON LAB | L-T-P 0-0-2 | Credit 1 |

**Course objectives:**

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.
- To use OOP concept such as class, object, inheritance in Python.

**Assignment/Experiment**

1 Editing, compiling, executing, and debugging of simple Python programs
2 Programs on decision control
3 Programs on iterative control
4 Programs on nested loops
5 Programs on user defines functions
6 Programs of String manipulations
7 Programs to use list, tuples & dictionary
8 Programs to read/write files and use command line arguments
9 Programs to create modules and packages
10 Programs to create classes and corresponding objects
11 Programs to implement inheritance

**Course Outcomes:**

CO1: Understand the basic concept of programming
CO2: Apply programming concept to solve problem
CO3: Develop logic for problem solving
CO4: Remember the python programming approach for problem solving
CO5: Design various model to handle and process data.

# 3rd And 4th Semester

| | | THIRD SEMESTER | | | | | FOURTH SEMESTER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Theory | | | C. Hrs | CR | Theory | | | C. Hrs | C |
| 5 | CORE | Subject | CODE | L-T-P | | CORE | Subject | CODE | L-T-P | |
| | ESC-VII | Data Structure | 20BTME TES306 | 3-0-0 | 3 | BSC-VI | Engineering Mathematics-III using PYTHON | 20BTM ETBS4 | 3-0-0 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | (Branch Specific) | 07 | | | |
| | HS-I1 | Operation Research | 20BTMETHS303 | 3-0-0 | 3 | PC-III | Applied Thermodynamics | 20BTMETPC405 | 3-0-0 | | |
| | BSC- V | Engineering Materials | 20BTMETBS305 | 3-0-0 | 3 | PC-IV | Fluid Mechanics | 20BTMETPC404 | 3-0-0 | | |
| | PC-I | Thermodynamics | 20BTMETPC301 | 3-0-0 | 3 | PC-V | Strength of Material | 20BTMETPC403 | 3-0-0 | | |
| | PC-II | Basic Manufacturing Processes | 20BTMETPC302 | 3-0-0 | 3 | OE-I | Universal Human Values- II | 20BTMEPOE401 | 3-0-0 | | |
| | HS-III | Engineering Economics and Costing/ Industrial Management | 20BTMETHS304 | 2-0-0 | 2 | HS-IV | Industrial Management/ Engineering Economics and Costing | 20BTMETHS405 | 2-0-0 | | |
| | BSC-VI | Career Advancement Skill-1 (Aptitude, Reasoning)/ (TOEFL, GRE,GATE) | 20BTMETBS306 | 1-0-0 | 1 | ESC-IX | Career Advancement Skill-2 (Computer Programming) | 20BTMEPES408 | 1-0-0 | | |
| | | SESSIONAL | | | | | SESSIONAL | | | | |
| | PCL-I | Manufacturing Practices Laboratory (W/S Pr.-II) | 20BTMEPPC301 | 0-0-2 | 1 | PCL-IV | Applied Thermodynamics Laboratory | 20BTMEPPC405 | 0-0-2 | | |
| | PCL-II | Machine Drawing | 20BTMEPPC302 | 0-0-2 | 1 | PCL-V | Material Testing Laboratory | 20BTMEPPC404 | 0-0-2 | | |
| | PCL-III | Programming Laboratory | 20BTMEPES306 | 0-0-2 | 1 | PSI-I | Skill Project-I *(Computational Project at NCSM Lab./ Small Household or Common Man Useable Project)* | 20BTMEPPI401 | 0-0-2 | | |
| | | NON CREDIT | | | | | NON CREDIT | | | | |
| | MC-III | Environmental Science | 20BTMETMC301 | 2-0-0 | 0 | MC-IV | Constitution of India | 20BTMETMC402 | 2-0-0 | | |
| | | | | 17-1-8 | 21 | | | | 17-1-8 | | |

**Total Credit – 2nd Year – 21 + 21 = 42**

# THIRD SEMESTER

| Type | Code | Thermodynamics | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | 20BTMETPC301 | | | | |

**Prerequisites:**Engineering Mathematics, Chemistry, Physics

**Course Objective:** To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective. To lay the groundwork for subsequent studies in such fields like heat transfer and to prepare the students to effectively use thermodynamics in the practice of engineering.

## Course Contents:

## Module-I: (07 hrs)

**Basic Concepts of Thermodynamics:**

Continuum and macroscopic approach; thermodynamic systems; Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. thermodynamic properties.Path and point functions. Concepts of heat and work, zeroth law of thermodynamics; concept of temperature. Properties of Ideal gas, Equation of state for ideal gas, Compressibility factor.

## Module –II (10 hrs)

**First Law of Thermodynamics:**

Concept of energy and various forms of energy; internal energy, enthalpy; specific heats; First law applied to elementary processes, closed systems, control volumes, steady and unsteady flow analysis.

## Module- III (08 hrs)

**Second Law of Thermodynamics:**

Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; reversible and irreversible processes; Carnot cycle and Carnot principles/theorems; Thermodynamic temperature scale, Third law of Thermodynamics

## Module –IV (08 hrs)

**Entropy**: Inequality of Clausius, Entropy: a property of a system, Entropy changes of a control mass in reversible and irreversible processes, Entropy change for solid, liquid and ideal gases. Entropy generation and Principle of increase in entropy.

**General Thermodynamic property relations:** The Maxwell relations, The Clapeyron equation, The TdS relations, Isothermal compressibility and volume expansivity, The Joule-Thomson coefficient.

## Module- V (07 hrs)

**Steam and it's Properties:**

Thermodynamic properties of pure substances in solid, liquid and vapor phases. Phase diagrams, p-v, p-T, T-s and h-s diagrams, Saturation pressure, Saturation temperature, Sensible heat, latent heat, triple point, critical point, dryness fraction, Use of Steam Table and use of Mollier chart.

**Text Books**

1. Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill
2.Thermodynamics Yunus A, Cengel, Michael A Boles, Tata McGraw Hill
3. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons4. 4. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI
5. Thermal Engineering by Mahesh M Rathore, Tata McGraw Hill

**Reference**

1. Engineering Thermodynamics by M.Achyuthan, PHI
2. Engineering Thermodynamics by Y.V.C. Rao, University Press
3. Thermodynamics and Thermal Engineering by Kothandaraman&Domkundwar, Dhanpat Rai
4. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
5. Steam Tables in SI Units by Ramalingam, Scitech

**Course Outcomes:**

Upon completion of the subject the students will be able to

| | |
|---|---|
| **CO1** | Understand terminology related to thermal engineering and illustrate concepts of equilibrium. To understand and evaluate Energy, work transfer and heat transfer and understand different types of thermodynamical work, modes of heat transfer. |
| **CO2** | Apply the First law of thermodynamics to analyze closed system and control volume, steady and unsteady flow |
| **CO3** | Apply the Second Law of Thermodynamics to evaluate the performance of thermal power plant, refrigerator and heat pump. |
| **CO4** | Analyzeprinciple of increase of entropy and evaluate thermodynamic relations |
| **CO5** | Understand the use of steam table and Mollier chart in solving two-phase thermal system problems. |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

| Type | Code | Engineering Materials | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| **BS** | **20BTMETBS305** | | | | |

**Objectives:**

1. Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
2. To provide a detailed interpretation of equilibrium phase diagrams
3. Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloys.

**Course Content:**

**Module-I (08 Hours)**

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

**Module-2 (08 Hours)**

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing; recovery; recrystalization and grain growth; hot working. Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order/ disorder transformation.

**Module-3 (10 Hours)**

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel. T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

**Module-4 (10 Hours)**

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

**Text Books:**

1. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
2. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
3. Physical Metallurgy: Principles and Practice by Ragahvan, PHI

**Reference Books**

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Elements of Material Science and Engineering, L.H.VanVlack, Addison Wesley
3. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
4. Elements of Materials Science & Engineering by Van Vlack, Pearson
5. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
6. Composite Material science and Engineering by K. K. Chawla, Springer
7. Material Science and Metallurgy, by U. C. Jindal, Pearson

## Course Outcomes:

Upon completion of the subject the students will be able to

| | |
|---|---|
| **CO1** | Illustrate phase diagram for multi component systems and explain the various |

| | |
|---|---|
| | microstructures of steel and cast iron. |
| **CO2** | Describe various types of heat treatment process and sketch isothermal transformation. |
| **CO3** | Compare the composition and properties of various ferrous and non-ferrous alloys. |
| **CO4** | Discuss properties and applications of polymers and composite materials. |
| **CO5** | Explain various mechanical testing methods of ferrous and non-ferrous materials. |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

| Type | Code | Basic | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| **PC** | **20BTMETPC302** | **Manufacturing Processes** | | | |

**Course objectives:**
To study various casting, welding and forming methods including advanced techniques, with emphasis on basic principles, limitations and application areas.

**Module-1 (12 hours)**
Types of patterns, Pattern materials and Pattern allowances. Molding Materials - sand molding, metal molding, investment molding, shell molding, Composition of molding sand, additives, Binders, Properties of molding sand and sand testing.
Melting furnaces - cupola, resistance furnace, induction and arc furnace, Solidification of castings, design of risers and runners, feeding distance, centre line freezing resistance chills and chaplets, Degasification and inoculation of metals.
Casting methods like continuous casting, centrifugal casting, disc casting, Casting defects.

**Module-2 (12 hours)**

Classification of welding processes, gas welding, electric arc, arc length, power sources, constant current and constant voltage power sources; ISI classification of coated electrodes;
Special welding methods: MMAW, GTAW, GMAW, GMAW-CO2 welding, submerged arc welding, electro-slag welding, electron beam welding, laser beam welding, ultrasonic welding and resistance welding, welding defects, arc blow, non-destructive examination of weldments.
Brazing and soldering.

**Module-3 (05 hours)**
Brief introduction to powder metallurgy processes.
Mechanism of plastic deformation, fundamentals of plasticity, Dependence of stress strain diagram on Strain rate and temperature. Hot and cold working of metals, classification of metal forming processes.

**Module-4 (04 hours)**
Rolling: Pressure and Forces in rolling, types of rolling mills, rolling defects,
Forging: Smith Forging, Drop and Press forging, M/c forging, Forging defects.

**Module-5 (05 hours)**
Extrusions: Direct, Indirect, Impact and Hydrostatic extrusion and their applications, Extrusion of tubes.
Wire drawing methods and variables in wire-drawing, Brief introduction to sheet metal working: Bending, Forming and Deep drawing, shearing, Brief introduction to explosive forming.

**Books:**
1. Manufacturing Technology by P.N.Rao, Tata McGraw Hill publication.
2. Welding Technology by R.A. Little, TMH
3. Manufacturing Science by A.Ghosh and A K Malick, EWP
4. Fundamentals of metal casting technology by P.C. Mukherjee, Oxford PIBI.
5. A Text Book of Production Engineering by P.C.Sharma, S.Chand.

## Course Outcomes:
At the end of the course, the student will be able to

| | |
|---|---|
| **CO1** | Explain the process of making patterns, preparation of sand mould, various special casting processes and casting defects. |
| **CO2** | Describe various fusion, friction and special welding processes, soldering and brazing processes. |
| **CO3** | Employ the appropriate metal forming techniques to produce components like hexagonal bolt, nut etc., |
| **CO4** | Illustrate the various sheet metal forming processes for a specific application. |
| **CO5** | Describe the properties and bonding techniques of plastics and various plastic melding techniques. |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| **HS** | **20BTMETHS303** | **Operation Research** | **3-0-0** | | |

**Module-I (10 Hours)**

Origin and Development of Operation Research, Nature and Characteristic Feature of Operation Research, Models in Operation Research, Applications of Operation Research.

**Linear Programming:** MathematicalFormulation of LPP, Graphical Solution Method,

**Module-II**

**The Simplex Method:** Applications of Simplex Method, Big-M Method,
**Duality in Linear Programming:** Duality theory and its application, Dual simplex method.

**Module -III (10 Hours)**

**Transportation problems:** Finding an initial basic feasible solution by Northwest Corner rule, Least Cost or Matrix Minima Method, Vogel's approximation method, Degeneracy in Transportation Problem, Transportation Algorithm (MODI Method), Unbalanced Transportation Problems.

**Module-IV**
**Assignment problems:** Introduction, Mathematical Formulation of an Asignment Problem, Hungarian Method for solution of Assignment problems.

**Sequencing Problems:** Introduction, Problems of Sequencing, Problems with n Jobs and Two Machines.

**Module-V**
**Queuing Theory:** Introduction,Queueing System, Characteristics of Queuing Systems, Symbols n Notations, Poisson Process and Exponential Distribution, Classification of Queues, Poisson Queues, The M/M/1 Queueing System, Waiting Time Distribution.

**Recommended text books**
1. A. Ravindran, D. T. Philips, J. Solberg, *" Operations Research- Principle and Practice*", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " *Optimization for Engineering Design*", PHI Learning Pvt Ltd

3. Kanti Swarup, P. K. Gupta, Man Mohan " Operations Research" , Sultan Chand & Sons, EDUCATIONAL PUBLISHER,

**Recommended Reference books:**

1. **S**tephen G. Nash, A. Sofer, *" Linear and Non-linear Programming*", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," *Engineering Optimization*", Second edition, Wiley India Pvt. Ltd
3. H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, "*Operations Research*", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, *" Operations Research*", Eighth Edition, TMH.
5. P.K.Gupta, D.S.Hira, "*Operations Research*", S.Chand and Company Ltd.

# INDUSTRIAL MANAGEMENT

**CODE - 20BTMETHS304**

## Module - I

**1.Basic Management Theory**: Definitions of Management, Characteristics of Management, Difference and Relationship between Administration, Management and Organization, Levels of Management, Stages of Evolution of Management, Modern Management Theories, Characteristics of Modern Management Thought.

**2. Functions of Management:** Motivating, Controlling, Coordinating, Communicating, Decision-making.

## Module - II

**3. Personnel Management**: Definition, Objectives of Personnel Management, Characteristics of Personnel Management, Functions of Personnel Management, Principles of Personnel Management, Organization of a Personnel Department, Development of Personal Policy, Manpower Planning, Recruitment, Scientific Selection,

**4. Training and Development:** Need for Training, Objectives of Training and Development, Benefits of Training,

## Module-III

**5. Job Evaluation:** Definitions, Objectives of Job Evaluation, Components of Job Evaluation.
Merit Rating: Definition, Benefits and Objectives of Merit Rating.

**6. Wages and Incentives:** Concept of Wages, Desirable Characteristics of Good Wage, Factors affecting Wages, Types of Wage Plans, Incentives, Wage Incentive Plans.

## Module - IV

**7. Marketing Management**: Definition of Marketing, Modern Concept of Marketing, Selling Concept and Marketing Concept, Marketing Functions, Marketing System.

8. **Financial Management**: Definition, Functions of Financial Management, Sources of Funds, Capital: Classification of Capital, Working Capital, Need for Working Capital, Assessment of Working Capital, Factors Affecting Working Capital, Capitalization, Sources of Finance.

## Module – V

9. **Industrial Psychology**: Scope of Industrial Psychology, Human Behaviour, Objectives of Industrial Psychology, Human Relations, Industrial Relations, Industrial Dispute, Trade Unions, Workers Participation in Management, Industrial Discipline.

**Text Books**:
1. Industrial Engineering & Production Management, M. Mahajan, Dhanpat Rai Publication.
2. Industrial Engineering & Management Science, T. R. Banga, N. K. Agarwal, S. C. Sharma, Khanna Publication.

**Reference Books**:
1. Personnel Management, A. Mannappa, M. S. Saiyadain.
2. Fundamentals of Financial Management, Prasanna Chandra, TMH.

## ENGINEERING ECONOMICS AND COSTING
## CODE-20BTMETHS304

**Course Objective**
1. Understand the theoretical and conceptual basis of economics upon which engineering projects analysis is built.
2. Possess a set of practical tools to make systematic and informative decisions when evaluating an engineering project with various uncertainties.
3. Have critical thinking skills, problem solving abilities, and familiarity with the project evaluations procedures essential to various engineering fields.
4. Be able to demonstrate the capacity for critical thought, team work, resourceful study, and effective communication.
5. Be able to use MS Excel for basic economic evaluation of a project

**Course Outcome**
CO1: Evaluate the economic theories, cost concepts and pricing policies
CO2: Understand the measures of national income, the functions of banks and concepts of globalization
CO3: Apply the concepts of financial management for project appraisal
CO4: Understand accounting systems and analyze financial statements using ratio analysis
CO5: Understand the impact of inflation, taxation, depreciation. Financial planning, economic basis for replacement, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and project-management problems

**MODULE 1** (10 Hours):
Engineering economics, it's Meaning and Scope, why Engineer needs to study economics, Time value of money, Interest, Simple and Compound interest, Nominal and Effective interest rate, Cash flow diagram, Interest formulas, Bases for comparison of Engineering alternative.
Evaluation of engineering projects - Private and Public project, Present worth method (NPV), Future worth method, Annual equivalent method, Rate of return method (IRR).
Evaluation of public alternative – Cost and benefit analysis, Benefit cost ratio.

**MODULE 2** (8 Hours):
Depreciation: Depreciation of capital assets, causes of depreciation, Methods of measuring depreciation, Straight line method, Declining balance method, Sum of year digits method (SOYD), Sinking fund method.
Break – even analysis: Linear break – even analysis, (Simple numerical problems to be solved).

**MODULE 3** (10 Hours):
Micro and Macroeconomics, Basic problem of economics, production Possibility curve, meaning of demand, Law of demand, Determinants of demand, Movement along the demand curve and shift in

the demand curve, Price elasticity of demand, Methods of measuring elasticity of demand, Income elasticity of demand, Cross elasticity of demand (Simple numerical problems to be solved).
Meaning of supply, Supply and stock, law of supply, determinants of supply.

**MODULE 4** (8 Hours):

Production: Production function, Short- run and long run, Law of variable proportion, law of return to scale.

Cost and revenue concept: Total cost, fixed cost, variable cost, marginal cost, total revenue, average revenue, marginal revenue, cost and output relationship in short-run.

Market: Basic understanding of different market structure, Types of market, monopoly, Oligopoly, monopolistic competition, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved).

**MODULE 5** (6 Hours):

Banking: Commercial bank, functions, Reserve Bank of India (RBI), functions.

Inflation: Meaning of inflation, types, causes, Measures to control inflation, Monetary and Fiscal policies.

National income: Definition, Concepts of national income, Gross-domestic product (GDP), Gross national product (GNP), methods of measuring national income, Output method,
Income method, Expenditure method.

**Text Books**

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, DevigaVengedasalam; KarunagaranMadhavan, Oxford University Press
3. Ahuja,H.L., "Principles of Micro Economics" , S.Chand& Company Ltd
4. Jhingan,M.L., "Macro Economic Theory"
5. Macro Economics by S.P.Gupta, TMH

**References**

1. Sasmita Mishra, "Engineering Economics & Costing ", PHI
2. Sullivan and Wicks, " Engineering Economy", Pearson
3. R.PaneerSeelvan, " Engineering Economics", PHI

# MACHINE DRAWING
## CODE -20BTMEPPC302

Orthographic and Sectional drawing of Machine components: (Any seven)

Screw threads, Screwed fastenings, Turn Buckle, Keys, Cotter joints and Knuckle joints; Pulley; Flanged coupling, Pedestal Bearing or Plummer Block.

Fundamentals of AutoCAD (Two classes)
1. Dimension & annotations
2. Use of Layers
3. Working with constraint in dimension
4. Creating assembly
5. Axi-symmetrical parts
6. Creating surface features
7. Working with bill of material

Drawing of the following using AUTOCAD: (Any two)

1. Projection of solids
2. Nut & bolt and Fasteners
3. Cotter joint
4. Expansion joint
5. Shaft coupling

**Text Books:**
1. Machine Drawing by N.D.Bhatt, V.M.Panchal, Charotar Publishing House.
2. Machine Drawing by N.D.Junarkar, Pearson Education
3. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, Pearson Education
4. Machine Drawing includes AutoCAD by Ajeet Singh, Tata MacGraw Hill

**Reference Books:**
1. Machine Drawing by K.L.Narayana, P.Kannaiah, K.Venkata Reddy, New Age International
2. Engineering Drawing and Graphics using AUTOCAD by T.Jayapoovan, Vikas Publishing
3. Engineering Drawing by N.D.Bhatt, Charotar
4. Engineering Drawing and Graphics + AutoCAD by K.Venugopal, New Age International

## BASIC MANUFACTURING PROCESS LAB

**CODE -20BTMEPPC301**

**Any Eight of the following experiments**

**1. Determination of grain size, clay content, permeability and green compressive strength of molding sand.**
**2. Foundry Practices**
**3. Preparation of a wood pattern.**
**4. Determination of strength of brazed and soldered joints**
**5. Practice and preparation of job in TIG/MIG welding**
**6. Practice and preparation of job in sheet metal using processes like forming and deep drawing.**
**8. Demonstration of different rolling mills**
**9. Demonstration of Extrusion processes**
**10. Study of microstructure of steel specimen**
**11. Study of non-traditional machining process any one (ultrasonic machining/ abrasive jet machining/ electro-discharge machining)**
**12. Determination of cutting forces in turning using lathe tool dynamometer**
**13. Determination of cutting forces in drilling using drilling tool dynamometer**
**14. Study on C. N.C. Machines and demonstration of making of job through CNC machine.**

# FOURTH SEMESTER

**SBJECT: APPLIED THERMODYNAMICS - 20BTMETPC405**
**SUBJECT CODE:SEMESTER: 4th**

**Prerequisites:** Thermodynamics,Engineering Mathematics
**Course Objective:** This course aims to provide a good platform to mechanical engineering students to understand, model and appreciate concept of dynamics involved in thermal energy

transformation. To present a wealth of real-world engineering examples to give students a feel for how thermodynamics is applied in engineering practice and to prepare them to carry out experimental investigation and analysis in practical thermo dynamical applications.

**Course Contents:**

## Module-I (6 hrs)

Availability Analysis: Available energy, Reversible work and Irreversibility, Availability and Second law efficiency, Exergy balance equation.

## Module-II (10 hrs)

**VapourPower Cycles**

The Carnot vapor cycle and its limitations, The Rankine cycle, Comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance.Means ofincreasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle,Cogeneration (Back pressure and Pass-out turbines), Characteristics of an Ideal working fluid in vapour power cycles.Binary vapour power cycles.Combinedcycle power generation systems,

## Module -III (08 hrs)

**Refrigeration Cycles**

Introduction, Unit of refrigeration, Coefficient of performance,Reversed Carnot Cycle, Temperature limitations, maximum COP, Bell Coleman cycle, Analysis of theoretical vapour compression cycle,Representation of cycle on T - S and p - h diagram, Simple saturation cycle, sub-cooled cycleand super-heated cycle, Effect of suction and discharge pressure on performance, Actualvapour compression cycle. Vapour Absorption refrigeration cycle.

## Module- IV (10 hrs)

**Psychrometrics:** Properties of air-vapour mixture, Law of water vapour-air mixture,Enthalpy of moisture, Psychrometric properties, Psychrometric chart, Property calculations of air vapour mixtures by using chart and expressions.Psychrometric process: Sensible heating,Sensible cooling, Humidification, Dehumidification,Mixture of air streams.

**Air Conditioning System:**Requirements of comfort air conditioning. Process in air conditioning: Summer air conditioning, Winter airconditioning and year-round air conditioning,

## Module- V (06 hrs)

**Reciprocating Air Compressors**: Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors

**Text Books**

1. Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill
2.Thermodynamics Yunus A, Cengel, Michael A Boles, Tata McGraw Hill
3. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons4. 4. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI
5. Thermal Engineering by Mahesh M Rathore, Tata McGraw Hill

**Reference**

1. Engineering Thermodynamics by M.Achyuthan, PHI
2. Engineering Thermodynamics by Y.V.C. Rao, University Press
3. Thermodynamics and Thermal Engineering by Kothandaraman&Domkundwar,Dhanpat Rai
4. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
5. Steam Tables in SI Units by Ramalingam, Scitech

**Course Outcomes:**

Upon completion of the subject the students will be able to

| | |
|---|---|
| **CO1** | **Understand exergy, 2nd law efficiency and evaluate availability of different thermodynamics cycles and processes** |
| **CO2** | **Analyze of vapour power cycles, refrigeration cycles and illustrate the method of improvement in efficiency of modern thermal powerplants** |
| **CO3** | Explain the basic principle and components of air refrigeration system and analyze the difference in working principle of vapour compression system and vapour absorption systems |
| **CO4** | Demonstrate the use of psychrometry and psychrometric properties in analyzing air conditioning systems |
| **CO5** | **Analyze and explain components and working of reciprocating air compressors and evaluate volumetric efficiency and FAD.** |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

## Practical (Hours per week): 2, Credit: 1
## Laboratory Experiments: (Minimum 6 experiments)

1. Study of steam power plant.

3. Determination of C.O. P on vapour compression refrigeration system

4. Determination of C.O.P of ice plant

4. Performance analysis of reciprocating air-compressor.

5. Performance analysis of Centrifugal / Axial Flow compressor.

6. Determination of performance characteristics of gear pump.

7. Measurement of steam quality using calorimeter

8. Verification of Joule-Thomson coefficient
9. Study of vapor absorption refrigeration system
10. Performance test on Air conditioning test rig

# Fluid Mechanics - 20BTMETPC404

**Prerequisites:**Engineering Mechanics, Engineering Physics,Engineering Mathematics.
**Course Objective:** This course aims to provide a good platform to mechanical engineering students to understand, model and appreciate concept of viscosity, compressibility, surface tension, capillarity involved in fluid flow. To present a wealth of real-world engineering examples to give students a feel for how fluid mechanics is applied in engineering practice and to prepare them to carry out experimental investigation and analysis in practical fluid flow applications.
**Course Content;**

**Module I (12 Lectures)**

Chapter-1 Introduction: Scope of fluid mechanics and its development as a science
Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Chapter-2 Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometers- simple, differential, mechanical gauges.

Chapter-3 Hydrostatic forces on submerged surface: force on a horizontal submerged plane surface, force on a vertical submerged plane surface, force on a inclined submerged plane surface and force on curved submerged surface.
Chapter-4 Buoyancy and floatation: Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

**Module II (6 Lectures)**

Chapter-5 Fluid kinematics: Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net: its characteristics and utility.

**Module III (7 Lectures)**
Chapter-6 Fluid dynamics : Introduction, Control Volume analysis of mass, Euler's equation along a streamline, energy equation, Bernoulli's theorem, Bernoulli's equation and its application to venture meter, orifice meter, pitot tube.

**Module IV (7 Lectures)**

Chapter-7 Flow through Pipes: Laws of Fluid Friction for Laminar Flow, Laws of Fluid Friction for Turbulent Flow, Head Loss due to Friction- Darcy-Weisbach Equation, Chezy's Formula, Minor

energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Chapter-8 Description of Boundary Layer, Boundary layer parameters, elementary turbulent flow, basics of compressible flow.

**Module V (8 lectures)**

Chapter-9 Dimensional Analysis and Hydraulic Similitude: Introduction, Dimensional Homogeneity, Methods of Dimensional analysis: Rayleigh's method, Buckingham's pi-theorem.

Chapter-10 Model Investigation: Prototype and model, Objective and importance of model studies, Applications of model studies,

Chapter-11 Similitude- Types of Similarities: Geometric Similarity, Kinematic Similarity. Dynamic Similarity.

Chapter-12 Force Ratios-Dimensionless numbers and their significance: Reynolds number, Froude number, Euler number, Mach number and Weber number,

Model Laws - Reynolds Model Law, Froude Model Law, Euler Model Law, Mach Model Law and Weber Model Law.

**Text Books**

**1. Fluid Mechanics and Hydraulic Machines, Modi & Seth**
**2. Introduction to Fluid Mechanics and Fluid Machines by S.K. Som and G. Biswas, TMH**
**3. Y. Cengel, J. M. Cimbala, Fluid Mechanics, 3e (Sie) - Fundamentals and Applications, Mc Graw Hill**
**4. Fluid Mechanics, A.K.Jain, Khanna Publishers**

**Reference Books:**

**1. Fluid Mechanics by A.K. Mohanty, PHI**
**2. Introduction to Fluid Mechanics by Fox, McDonald, Willey Publications**
**3. Engineering Fluid Mechanics by Garde et. al., Scitech**
**4. Fluid Mechanics and Fluid Power Engineering, by Dr D. S. Kumar, S.K. Kataria and Sons**
**5. Fluid Mechanics and Hydraulic Machines, by Dr R. K. Bansal, Laxmi Publications.**

**Course Outcomes:**

Upon completion of the subject the students will be able to

| | |
|---|---|
| **CO1** | Calculate fluid properties and characteristics of flow using mathematical knowledge. |
| **CO2** | Analysis of stability of immersed and floating bodies and determination of metacentric height. |
| **CO3** | Bernoulli's equation and its application to venture meter, orifice meter, pitot tube. |
| **CO4** | Compute loses in circular conduits using conservation laws. |
| **CO5** | Perform dimensional analysis of a given set of variables using Buckingham's $\pi$ theorem and relate the model and prototype. |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

# MECHANICS OF SOLID -

***Theory L/T (Hours per week): 3/0, Credit: 3***

**Course Objectives:**

1. To study about stresses, strains and deformation of various simple mechanical components under load
2. To study about theories of failure and the criteria for failure
3. To experimentally determine the mechanical properties of materials

**COURSE CONTENT:**

**MODULE - I (10 Lectures)**

**1. Concept of Stress:**

Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members : Composite bars in tension and compression - temperature stresses in composite rods, Concept of Statically indeterminate problems.

Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

**MODULE - II (6 Lectures)**

**2. Biaxial State of Stress :**

Analysis of Biaxial Stress. Plane stress, Principal plane, Principal stress, Mohr's Circle for Biaxial Stress

**3. Biaxial State of Strain:**

Two dimensional state of strain, Principal strains, Mohr's circle for strain, Calculation of principal stresses from principal strains, Strain Rossette.

**MODULE - III (8 Lectures)**

**4. Shear Force and Bending Moment Diagrams:**
Shear force and bending moment. Types of load and Types of support. Support reactions, Relationship between bending moment and shear force, Point of inflection. Shear Force and Bending Moment diagrams.

**5. Bending of Beams:**
Theory of simple bending of initially straight beams, Bending stresses Shear stresses in bending, Distribution of normal and shear stress, Composite beams.

**MODULE - IV (8 Lectures)**

**6. Deflection of Beams :**
Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

**7. Axisymmetric problems:**
Stresses in thin cylinders and thin spherical shells under internal pressure, wire winding of thin cylinders.Thick walled cylinder subjected to internal and external pressures, Compound cylinders, Shrink fit,

**MODULE - V (8 Lectures)**

**8. Torsion:**
Torsion in solid and hollow circular shafts, Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Strength of shafts in combined bending and twisting, Close - Coiled helical springs.

**TEXT BOOKS**
1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by R.Subramaniam, Oxford University Press

**REFERENCE BOOKS**
1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Mechanics of Materials by William F.Riley, Leroy D.Sturges and Don H.Morris, Wiley ( Student Edition)
4. Mechanics of Materials by James M. Gere, Thomson Learning

**Course Outcome:**
Upon successful completion of the course the students will be able to

| | |
|---|---|
| **CO1** | Compute Stress, Strain and Deformation in Axially loaded members |
| **CO2** | Analyse the effect of axial and shear stresses acting in various directions on different planes |
| **CO3** | Draw the shear force and bending moment diagrams for various beams and compute bending stress, and shear stress at various points in beams |
| **CO4** | Analyse stresses and deformation induced in circular shafts due to torsion |
| **CO5** | Experimentally determine various mechanical properties of materials |

| **CO-PO Matrices** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No** | **PO1** | **PO2** | **P03** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | | | | | | | | | | **2** | | **2** |
| **CO2** | | **2** | | | | | | **1** | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO3** | | | | | **2** | | | | | | | |
| **CO4** | **2** | | | **1** | | | | | | | | |
| **CO5** | | | **2** | | **3** | | | | | | | |
| **Avg.** | | | | | | | | | | | | |

| **CO-PSO Matrices** | | | |
|---|---|---|---|
| **Sl. No.** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | **2** | | |
| **CO2** | **1** | | |
| **CO3** | **2** | | |
| **CO4** | **1** | **1** | |
| **CO5** | **2** | **1** | |
| **Avg.** | | | |

**MECHANICS OF SOLID LABORATORY**

Practical L/T/P (Hours per week): 0/0/2, Credit: 1

Laboratory Experiments (Minimum 8 experiments)

1. Determination of tensile strength of materials by Universal Testing Machine
2. Determination of compressive strength of materials by Universal Testing Machine
3. Determination of bending strength of materials by Universal Testing Machine
4. Double shear test in Universal Testing Machine
5. Determination of Impact strength of material (Charpy and Izod)
6. Determination of Hardness strength of materials (Brinnel, Rockwell and Vickers)
7. Determination of Rigidity modulus of material 8. Determination of Fatigue strength of material
9. Estimation of Spring Constant under Tension and Compression.
10. Load measurement using Load indicator, Load Cells.
11. Strain measurement using Strain Gauge.
12. Stress measurement using strain rosette

**Subject: UNIVERSAL HUMAN VALUES- II (**Credits:02) - 20BTMEPOE401

(L-T-P-C : 2-0-0-2)

**Stream: B.Tech. All branches, Semester: Third Semester**

**OBJECTIVE:**

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society andnature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence
3. Strengthening ofself-reflection.
4. Development of commitment and courage toact

Pre-requisites: Universal Human Values 1 (desirable)( during 3 weeks of SIP )

**DETAILED SYLLABUS:**

The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process forself-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facility- thebasic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at variouslevels.

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

**Module 2: Understanding Harmony in the Human Being - Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient 'I' and the material'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity indetail
12. Programs to ensure Sanyam andHealth.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

**Module 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values ofrelationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values inrelationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive HumanGoals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order-

from family to worldfamily.

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. Discuss with scenarios. Elicit examples from students' lives

**Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

18. Understanding the harmony in theNature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and selfregulation innature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasivespace
21. Holistic perception of harmony at all levels ofexistence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

**Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

22. Natural acceptance of humanvalues
23. Definitiveness of Ethical HumanConduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic UniversalOrder

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above productionsystems.
26. Case studies of typical holistic technologies, management models and productionsystems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions andorganizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice Sessions eg. To discuss the conduct as an engineer or scientist etc.

**Text Book**

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

**Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. HumanValues,A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004. 3. The Story of Stuff(Book).
4.TheStoryofMyExperimentswithTruth-byMohandasKaramchandGandhi 5. Small is Beautiful - E. FSchumacher.
6. SlowisBeautiful-CecileAndrews
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi 11. India Wins Freedom - Maulana Abdul KalamAzad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland(English)

**COURSE OUTCOMES:**

| | |
|---|---|
| **Intended Learning Outcomes/ Course Outcomes (CO)** | By the end of the course, students are expected to become<br>1. More aware of themselves, and their surroundings (family, society, nature);<br>2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.<br>3. They would have better critical and analytical ability and sense of living in harmony.<br>4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).<br>5. 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 thisdirection. |

**MODE OF CONDUCT (L-T-P-C 2-0-0-2)**

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

***This course is to be taught by faculty from every teaching department, including HSS faculty.**
***Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.**

***ASSESSMENT:**

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.
Example:
Assessment by faculty mentor: 10 marks Self-assessment: 10 marks
Assessment by peers: 10 marks
Socially relevant project/Group Activities/Assignments: 20 marks Semester End Examination: 50 marks
The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.