

**COURSE STRUCTURE & SYLLABUS**  
**For**  
**AUTOMOBILE ENGINEERING**  
*(Applicable for batches admitted from 2016-2017)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

## I Year -I Semester

| S.No.                | Subjects                                 | L  | T  | P  | Credits   |
|----------------------|--|----|----|----|-----------|
| 1-HS                 | English – I                              | 4  | -- | -- | 3         |
| 2-BS                 | Mathematics - I                          | 4  | -- | -- | 3         |
| 3-ES                 | Engineering Chemistry                    | 4  | -- | -- | 3         |
| 4-BS                 | Engineering Mechanics                    | 4  | -- | -- | 3         |
| 5-BS                 | Computer Programming                     | 4  | -- | -- | 3         |
| 6-ES                 | Environmental Studies                    | 4  | -- | -- | 3         |
| 7-HS                 | Engineering/Applied Chemistry Laboratory | -- | -- | 3  | 2         |
| 8-BS                 | English-Communication Skills Lab - I     | -- | -- | 3  | 2         |
| 9-ES                 | Computer Programming Lab                 | -- | -- | 3  | 2         |
| <b>Total Credits</b> |  |    |    |    | <b>24</b> |

## I Year - II Semester

| S.No.                | Subjects   | L  | T  | P  | Credits   |
|----------------------|--|----|----|----|-----------|
| 1-HS                 | English – II                                     | 4  | -- | -- | 3         |
| 2-BS                 | Mathematics – II (Mathematical Methods)          | 4  | -- | -- | 3         |
| 3-BS                 | Mathematics – III                                | 4  | -- | -- | 3         |
| 4-ES                 | Engineering Physics                              | 4  | -- | -- | 3         |
| 5-HS                 | Basic Electrical and Electronics Engineering     | 4  | -- | -- | 3         |
| 6-ES                 | Engineering Drawing                              | 4  | -- | -- | 3         |
| 7-BS                 | English - Communication Skills Lab - II          | -- | -- | 3  | 2         |
| 8-HS                 | Engineering /Applied Physics Lab                 | -- | -- | 3  | 2         |
| 9-ES                 | Engineering Physics – Virtual Labs - Assignments | -- | -- | 2  | --        |
| 10                   | Engg.Workshop & IT Workshop                      | -- | -- | 3  | 2         |
| <b>Total Credits</b> |  |    |    |    | <b>24</b> |

## II Year - I Semester

| S.No.                | Subjects                                  | L  | T  | P  | Credits   |
|----------------------|---|----|----|----|-----------|
| 1                    | Metallurgy & Materials Science            | 4  | -- | -- | 3         |
| 2                    | Mechanics of Solids                       | 4  | -- | -- | 3         |
| 3                    | Thermodynamics                            | 4  | -- | -- | 3         |
| 4                    | Automotive Engines                        | 4  | -- | -- | 3         |
| 5                    | Computer aided Engineering Practice       | 4  | -- | -- | 3         |
| 6                    | Managerial Economics & Financial Analysis | 4  | -- | -- | 3         |
| 7                    | Electrical & Electronics Engg-lab         | -- | -- | 3  | 2         |
| 8                    | Mechanics of Solids & Metallurgy Lab      | -- | -- | 3  | 2         |
| <b>Total Credits</b> |   |    |    |    | <b>22</b> |

## II Year - II Semester

| S.No.                | Subjects                                 | L  | T  | P  | Credits   |
|----------------------|--|----|----|----|-----------|
| 1                    | Kinematics of Machinery                  | 4  | -- | -- | 3         |
| 2                    | Thermal Engineering - I                  | 4  | -- | -- | 3         |
| 3                    | Fluid Mechanics & Hydraulic Machines     | 4  | -- | -- | 3         |
| 4                    | Production Technology                    | 4  | -- | -- | 3         |
| 5                    | Industrial Engineering and Management    | 4  | -- | -- | 3         |
| 6                    | Machine Drawing                          | 4  | -- | -- | 3         |
| 7                    | Thermal Engg.-lab                        | -- | -- | 3  | 2         |
| 8                    | Fluid Mechanics & Hydraulic Machines lab | -- | -- | 3  | 2         |
| <b>Total Credits</b> |  |    |    |    | <b>22</b> |

### III Year - I Semester

| S.No.                | Subjects                           | L  | T  | P  | Credits   |
|----------------------|------------------------------------|----|----|----|-----------|
| 1                    | Dynamics of Machinery              | 4  | -- | -- | 3         |
| 2                    | Fuels and Combustion               | 4  | -- | -- | 3         |
| 3                    | Design of Machine Elements         | 4  | -- | -- | 3         |
| 4                    | Vehicle Transport Management       | 4  | -- | -- | 3         |
| 5                    | Heat Transfer                      | 4  | -- | -- | 3         |
| 6                    | Automotive Engines Lab & Fuels Lab | -- | -- | 3  | 2         |
| 7                    | Heat Transfer-Lab                  | -- | -- | 3  | 2         |
| 8                    | Production Technology Laboratory   | -- | -- | 3  | 2         |
| 9                    | IPR & Patents                      | -- | 2  | -- | --        |
| <b>Total Credits</b> |                                    |    |    |    | <b>21</b> |

### III Year - II Semester

| S.No.                | Subjects  | L  | T  | P  | Credits   |
|----------------------|---|----|----|----|-----------|
| 1                    | Machine Tools & Metrology   | 4  | -- | -- | 3         |
| 2                    | Instrumentation & Control Systems   | 4  | -- | -- | 3         |
| 3                    | Automotive Electrical and Electronics   | 4  | -- | -- | 3         |
| 4                    | Alternative Energy Sources for Automobiles  | 4  | -- | -- | 3         |
| 5                    | <b>OPEN ELECTIVE</b><br>1. Electronic Instrumentation<br>2. Data Base Management Systems<br>3. Computer Graphics<br>4. Green Engineering Systems<br>5. Offroad Vechiles.<br>6. Automotive Emissions and Pollution Control | 4  | -- | -- | 3         |
| 6                    | Automotive Electrical And Electronics Lab   | -- | -- | 3  | 2         |
| 7                    | Metrology & Machine Tools-Lab   | -- | -- | 3  | 2         |
| 8                    | Auto Scanning & Vehicle Testing-Lab   | -- | -- | 3  | 2         |
| MC                   | Professional Ethics & Human Values  | -- | 3  | -- | --        |
| <b>Total Credits</b> |   |    |    |    | <b>21</b> |

### IV Year - I Semester

| S.No.                | Subjects  | L  | T  | P  | Credits   |
|----------------------|---|----|----|----|-----------|
| 1                    | Automotive Chassis and Suspension   | 4  | -- | -- | 3         |
| 2                    | Vehicle Dynamics  | 4  | -- | -- | 3         |
| 3                    | CAD/CAM   | 4  | -- | -- | 3         |
| 4                    | Finite Element Methods  | 4  | -- | -- | 3         |
| 5                    | <b>Elective I</b><br>1. Vehicle Body Engg. & Safety<br>2. Industrial Robotics<br>3. Automotive Aerodynamics                 | 4  | -- | -- | 3         |
| 6                    | <b>Elective II</b><br>1. Micro Processors & Micro Controllers<br>2. Computational Fluid Dynamics<br>3. Condition Monitoring | 4  | -- | -- | 3         |
| 7                    | Automobile Chassis Lab & Instrumentation Lab  | -- | -- | 2  | 2         |
| 8                    | CAD/CAM-Lab   | -- | -- | 2  | 2         |
| <b>Total Credits</b> |   |    |    |    | <b>22</b> |

### IV Year - II Semester

| S.No.                | Subjects   | L  | T  | P  | Credits   |
|----------------------|--|----|----|----|-----------|
| 1                    | Automotive Control Systems   | 4  | -- | -- | 3         |
| 2                    | Vehicle Maintenance  | 4  | -- | -- | 3         |
| 3                    | Product Design and Assembly Automation   | 4  | -- | -- | 3         |
| 4                    | <b>Elective III</b><br>1. Automotive Safety<br>2. Automotive Manufacturing Systems<br>3. Automobile Air Conditioning | 4  | -- | -- | 3         |
| 5                    | Seminar  | -- | 3  | -- | 2         |
| 6                    | Project  | -- | -- | -- | 10        |
| <b>Total Credits</b> |  |    |    |    | <b>24</b> |

**Total Course Credits = 48+44 + 42 + 46 = 180**

## SYLLABUS

**I Year - I Semester**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>4</b> | <b>0</b> | <b>0</b> | <b>3</b> |

### **ENGLISH - I**

#### **Introduction:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

#### **Objectives:**

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

#### **LISTENING SKILLS:**

##### **Objectives:**

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

#### **SPEAKING SKILLS:**

##### **Objectives:**

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

## **READING SKILLS:**

### **Objectives:**

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

## **WRITING SKILLS:**

### **Objectives:**

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

### **Methodology:**

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

### **Assessment Procedure: Theory**

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.

4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%  
(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches) and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17  
(R-16 Regualtions)

**DETAILED TEXTBOOK:**

**ENGLISH FOR ENGINEERS AND TECHNOLOGISTS**, Published by **Orient Blackswan Pvt Ltd**

**NON-DETAILED TEXTBOOK:**

**PANORAMA: A COURSE ON READING**, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

**UNIT I:**

1. 'Human Resources' from English for Engineers and Technologists.

**OBJECTIVE:**

To develop human resources to serve the society in different ways.

**OUTCOME:**

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**UNIT 2:**

1. 'Transport: Problems and Solutions' from English for Engineers and Technologists.

**OBJECTIVE:**

To highlight road safety measures whatever be the mode of transport.

**OUTCOME:**

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**UNIT 3:**

1. 'Evaluating Technology' from English for Engineers and Technologists.

**OBJECTIVE:**

To highlight the advantages and disadvantages of technology.

**OUTCOME:**

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**UNIT 4:**

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

**OBJECTIVE:**

To bring into focus different sources of energy as alternatives to the depleting sources.

**OUTCOME:**

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**UNIT 5:**

1. 'Our Living Environment' from English for Engineers and Technologists.

**OBJECTIVE:**

To highlight the fact that animals must be preserved because animal life is precious.

**OUTCOME:**

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama: A Course on Reading

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**UNIT 6:**

1. 'Safety and Training' from English for Engineers and Technologists.

**OBJECTIVE:**

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

**OUTCOME:**

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama: A Course on Reading

**OBJECTIVE:**

To develop extensive reading skill and comprehension for pleasure and profit.

**OUTCOME:**

Acquisition of writing skills

**NOTE:**

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

**OVERALL COURSE OUTCOME:**

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

## **MODEL QUESTION PAPER FOR THEORY**

### **PART- I**

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

### **PART-II**

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A, B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

## MATHEMATICS-I

(Common to ALL branches of First Year B.Tech.)

### Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

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

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

### UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories-Electrical circuits- Chemical reactions.

### UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ - Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

### UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

### UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

### UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

### UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type  $e^{ax+by}$ ,  $\sin(ax+by)$ ,  $\cos(ax+by)$ ,  $x^m y^n$ . Classification of second order partial differential equations.

**Text Books:**

1. **B.S.Grewal**, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

**Reference Books:**

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9<sup>th</sup> edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

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### ENGINEERING CHEMISTRY

(CE, ME, PCE, PE, Met.E, Mining, Automobile, Aeronautical, Chemical, Bio.Tech.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

#### Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace and automotive industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Water is a basic material in almost all the industries, more so where steam is generated and also where it is supplied for drinking purposes.
- Materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries are introduced. Also lubrication is introduced.

#### UNIT I: HIGH POLYMERS AND PLASTICS

**Polymerisation:-** Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – **Plastics** as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates

**Elastomers :-** Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.

**Composite materials** & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

#### UNIT II: FUEL TECHNOLOGY

**Fuels** – Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas, LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

**Explosives:-** Rocket fuels

### UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

**Corrosion :-** Definition – Theories of Corrosion (chemical & electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating).

### UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

**Nano materials:-** Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

**Liquid crystals:-** Introduction – Types – Applications

**Super conductors:-**Type –I, Type II – Characteristics and applications

**Green synthesis:-** Principles - 3or 4 methods of synthesis with examples – R<sub>4</sub>M<sub>4</sub> principles

### UNIT V: WATER TECHNOLOGY

**Hard water:-** Reasons for hardness – units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime – Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes- Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and Electro Dialysis.

### UNIT VI: CHEMISTRY OF ENGINEERING MATERIALS AND FUEL CELLS

**Refractories:** - Definition, characteristics, classification, properties, failure of refractories

**Lubricants:** - Definition, function, Theory and mechanism of lubricants, properties (Definition and importance)

**Cement:** - Constituents, manufacturing, hardening and setting, deterioration of cement

**Insulators:** - Thermal and electrical insulators

**Fuel cells:** - Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells

**Outcome:** The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. The impurities present in raw water, problems associated with them and how to avoid them are understood. The advantages and limitations of plastic materials and their use in design would be understood. The commonly used industrial materials are introduced.

**Standard Books:**

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

**Reference Books:**

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

I Year - I Semester

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

## ENGINEERING MECHANICS

(Common to all branches)

**Objectives:** The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

### UNIT – I

**Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.**

Introduction to Engg. Mechanics – Basic Concepts.

**Systems of Forces:** Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

**Friction:** Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

### UNIT II

**Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

### UNIT – III

**Objectives : The students are to be exposed to concepts of centre of gravity.**

**Centroid:** Centroids of simple figures (from basic principles ) – Centroids of Composite Figures

**Centre of Gravity:** Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

### UNIT IV

**Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.**

**Area moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of**

**Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

### UNIT – V

**Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.**

**Kinematics:** Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

## UNIT – VI

**Objectives: The students are to be exposed to concepts of work, energy and particle motion**

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

### Text Books :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4<sup>th</sup> Edn - , Mc Graw Hill publications.

### References :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11<sup>th</sup> Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6<sup>th</sup> Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5<sup>th</sup> Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5<sup>th</sup> Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5<sup>th</sup> Edn – Schaum’s outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

I Year - I Semester

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## COMPUTER PROGRAMMING

### Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

### UNIT-I:

**History and Hardware** - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

### UNIT-II:

**Introduction to C Programming**- Identifiers, The main () Function, The printf () Function

**Programming Style** - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

**Assignment** - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

### UNIT -III:

**Control Flow-Relational Expressions - Logical Operators:**

**Selection:** if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

**Repetition:** Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

### UNIT-IV

**Modular Programming:** Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

## **UNIT-V:**

### **Arrays & Strings**

**Arrays:** One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

**Strings:** String Fundamentals, String Input and Output, String Processing, Library Functions

## **UNIT-VI:**

### **Pointers, Structures, Files**

**Pointers:** Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

**Structures:** Derived types, structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

**Data Files:** Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

### **Outcomes:**

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

### **Text Books:**

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

### **Reference Books:**

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

**I Year - I Semester**

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## **ENVIRONMENTAL STUDIES**

### **Course Learning Objectives:**

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

### **Course Outcomes:**

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

### **Syllabus:**

**UNIT – I Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

**Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT – II Natural Resources:** Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

**UNIT – III Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

**UNIT – IV Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

**UNIT – V Social Issues and the Environment:** Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act - Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

**UNIT – VI Environmental Management:** Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

**Text Books:**

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2<sup>nd</sup> Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

**Reference:**

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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**ENGINEERING / APPLIED CHEMISTRY LABORATORY**

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na<sub>2</sub>CO<sub>3</sub> solution.
3. Determination of alkalinity of a sample containing Na<sub>2</sub>CO<sub>3</sub> and NaOH.
4. Determination of KMnO<sub>4</sub> using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
6. Determination of Copper using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

**Outcomes:** The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

### **Reference Books**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

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### **ENGLISH - COMMUNICATION SKILLS LAB- I**

**PRESCRIBED LAB MANUAL FOR SEMESTER I:**

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

**OBJECTIVES:**

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

**OUTCOME:**

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

**UNIT 1:**

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks  
Practice work.

**UNIT 2:**

1. Responding to Requests and asking for Directions  
Practice work.

**UNIT 3:**

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing  
Practice work.

**UNIT 4:**

1. Letters and Sounds  
Practice work.

**UNIT 5:**

1. The Sounds of English  
Practice work.

**UNIT 6:**

1. Pronunciation
2. Stress and Intonation  
Practice work.

**Assessment Procedure: Laboratory**

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

**The rubric to assess the learners:**

| Body language       |             | Fluency & Audibility | Clarity in Speech | Neutralization of accent | Appropriate Language |                          | Total 10 marks | Remarks |
|---------------------|-------------|----------------------|-------------------|--------------------------|----------------------|--------------------------|----------------|---------|
| Gestures & Postures | Eye Contact |                      |                   |                          | Grammar              | Vocabulary & expressions |                |         |
|                     |             |                      |                   |                          |                      |                          |                |         |

- **Lab Assessment: Internal (25 marks)**

1. Day-to-Day activities: 10 marks
2. Completing the exercises in the lab manual: 5 marks
3. Internal test (5 marks written and 5 marks oral)

- **Lab Assessment: External (50 marks)**

1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording).
2. Oral: Reading aloud a text or a dialogue- 10 marks
3. Viva-Voce by the external examiner: 20 marks

**Reference Books:**

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

**I Year - I Semester**

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## **COMPUTER PROGRAMMING LAB**

### **OBJECTIVES:**

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

### **Programming**

#### **Exercise - 1 Basics**

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

#### **Exercise - 2 Basic Math**

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

#### **Exercise - 3 Control Flow - I**

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

#### **Exercise – 4 Control Flow - II**

- a) Write a C Program to Find Whether the Given Number is
  - i) Prime Number
  - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

#### **Exercise – 5 Functions**

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

#### **Exercise – 6 Control Flow - III**

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

### **Exercise – 7 Functions - Continued**

Write a C Program to compute the values of  $\sin x$  and  $\cos x$  and  $e^x$  values using Series expansion. (use factorial function)

### **Exercise – 8 Arrays**

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

### **Exercises - 9 Structures**

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

### **Exercise - 10 Arrays and Pointers**

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

### **Exercise – 11 Dynamic Memory Allocations**

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

### **Exercise – 12 Strings**

- a) Implementation of string manipulation operations **with** library function.
  - i) copy
  - ii) concatenate
  - iii) length
  - iv) compare
- b) Implementation of string manipulation operations **without** library function.
  - i) copy
  - ii) concatenate
  - iii) length
  - iv) compare

### **Exercise -13 Files**

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

### **Exercise - 14 Files Continued**

- a) Write a C program merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

## **OUTCOMES:**

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

## **Note:**

- a) All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) The Lab record must be a print of the LATEX (.tex) Format.**

**I Year - II Semester**

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## **ENGLISH -II**

### **Introduction:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

### **Objectives:**

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

### **LISTENING SKILLS:**

#### **Objectives:**

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

### **SPEAKING SKILLS:**

#### **Objectives:**

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

## **READING SKILLS:**

### **Objectives:**

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

## **WRITING SKILLS:**

### **Objectives:**

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

### **Methodology:**

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

### **Assessment Procedure: Theory**

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%  
(80% for the best of two and 20% for the other)  
Assignments= 5%  
End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches) and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

**DETAILED TEXTBOOK: ENGLISH ENCOUNTERS** Published by **Maruthi Publishers**.

**DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS** Published by **Cenguage learning**

The course content along with the study material is divided into six units.

#### **UNIT 1:**

1. ' The Greatest Resource- Education' from English Encounters

##### **OBJECTIVE:**

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

##### **OUTCOME:**

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

##### **OBJECTIVE:**

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

##### **OUTCOME:**

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

#### **UNIT 2:**

1. ' A Dilemma' from English Encounters

**OBJECTIVE:** The lesson centres on the pros and cons of the development of science and technology.

**OUTCOME:** The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

##### **OBJECTIVE:**

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

##### **OUTCOME:**

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

#### **UNIT 3:**

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

**OBJECTIVE:** The lesson depicts of the symptoms of Cultural Shock and the aftermath consequence

##### **OUTCOME:**

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

##### **OBJECTIVE:**

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

##### **OUTCOME:**

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

**UNIT 4:**

1. 'The Lottery' from English Encounters.

**OBJECTIVE:**

The lesson highlights insightful commentary on cultural traditions.

**OUTCOME:**

The theme projects society's need to re-examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

**OBJECTIVE:**

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

**OUTCOME:** The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

**UNIT 5:**

1. 'The Health Threats of Climate Change' from English Encounters.

**OBJECTIVE:**

The essay presents several health disorders that spring out due to environmental changes

**OUTCOME:**

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. 'Prafulla Chandra Ray' from The Great Indian Scientists.

**OBJECTIVE:**

The lesson gives an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

**OUTCOME:**

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

**UNIT 6:**

1. 'The Chief Software Architect' from English Encounters

**OBJECTIVE:**

The lesson supports the developments of technology for the betterment of human life.

**OUTCOME:**

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. 'Srinivasa Ramanujan' from The Great Indian Scientists.

**OBJECTIVE:**

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

**OUTCOME:**

The lesson provides inspiration to the readers to think and tap their innate talents.

**NOTE:**

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

## **MODEL QUESTION PAPER FOR THEORY**

### **PART- I**

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

### **PART-II**

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

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## **MATHEMATICS – II (MATHEMATICAL METHODS)**

### **Course Objectives:**

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

### **Course Outcomes: At the end of the Course, Student will be able to:**

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

### **UNIT I: Solution of Algebraic and Transcendental Equations:**

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

### **UNIT II: Interpolation:**

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

### **UNIT III: Numerical Integration and solution of Ordinary Differential equations:**

Trapezoidal rule- Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

### **UNIT IV: Fourier Series:**

Introduction- Periodic functions – Fourier series of  $\pi$ -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

### **UNIT V: Applications of PDE:**

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

### **UNIT VI: Fourier Transforms:**

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

**Text Books:**

1. **B.S.Grewal**, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

**Reference Books:**

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3<sup>rd</sup> Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

**Course Objectives:**

|                             | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|-----------------------------|----------|----------|----------|----------|
| <b>I Year - II Semester</b> | <b>4</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**MATHEMATICS-III**

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

**Course Outcomes: At the end of the Course, Student will be able to:**

1. Determine rank, Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

**UNIT I: Linear systems of equations:**

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan-Gauss Jacobi and Gauss Seidal methods. Applications: Finding the current in electrical circuits.

**UNIT II: Eigen values - Eigen vectors and Quadratic forms:**

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

**UNIT III: Multiple integrals:**

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

**UNIT IV: Special functions:**

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

**UNIT V: Vector Differentiation:**

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Applications: Equation of continuity, potential surfaces

**UNIT VI: Vector Integration:**

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Applications: Work done, Force.

**Text Books:**

1. **B.S.Grewal**, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

**Reference Books:**

1. **Greenberg**, Advanced Engineering Mathematics, 2<sup>nd</sup> edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7<sup>th</sup> edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 3 |

### ENGINEERING PHYSICS

( ME, CE, PE, PCE, MET.E, MINING, AUTOMOBILE, CHEMICAL, AERONAUTICAL, BIO.TECH)

**OBJECTIVES:** *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart concepts of Optical Interference, Diffraction and Polarization required to design instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the Structure-property relationship exhibited by solid crystal materials for their utility.*
- *Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.*
- *To explore the Nuclear Power as a reliable source required to run industries*
- *To impart the knowledge of materials with characteristic utility in appliances.*

#### UNIT-I

**INTERFERENCE:** Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

#### UNIT-II

**DIFFRACTION:** Fraunhofer diffraction at single slit cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

#### UNIT-III

**POLARIZATION:** Types of Polarization-production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter)

**LASERS:** Characteristics– Stimulated emission – Einstein’s Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

#### UNIT-IV

**ACOUSTICS:** Reverberation time - Sabine’s formula – Acoustics of concert-hall.

**ULTRASONICS:** Production - Ultrasonic transducers- Non-Destructive Testing –Applications.

#### UNIT-V

**CRYSTALLOGRAPHY & X-RAY DIFFRACTION:** Basis and lattice – Bravais systems- Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (h k l) planes – Bragg’s law.

**NUCLEAR ENERGY – SOURCE OF POWER:** Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

## **UNIT-VI**

**MAGNETISM:** Classification based on Field, Temperature and order/disorder –atomic origin – Ferromagnetism- Hysteresis- applications of magnetic materials (Para & Ferro)..

**DIELECTRICS:** Electric Polarization – Dielectrics in DC and AC fields – Internal field – Clausius Mossoti Equation - Loss, Breakdown and strength of dielectric materials – Ferroelectric Hysteresis and applications.

*Outcome: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study Acoustics, crystallography magnetic and dielectric materials enhances the utility aspects of materials.*

### **Text Books:**

1. A Textbook of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand & Company Ltd., (2014)
2. Physics for Engineers by M.R.Srinasan, New Age international publishers (2009)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

### **Reference Books:**

1. Applied Physics by P.K.Palanisamy , Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, Newage international publishers (2008)

I Year - II Semester

| L | T | P | C |
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## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

### Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

### Learning Objectives:

- To learn the basic principles of electrical circuit law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines & Transformers.
- To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
- To learn the operation of PNP and NPN transistors and various amplifiers.

### UNIT - I

#### Electrical Circuits:

Basic definitions - Types of network elements - Ohm's Law - Kirchhoff's Laws - Inductive networks - Capacitive networks – Series - Parallel circuits - Star-delta and delta-star transformations.

### UNIT - II

#### Dc Machines:

Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications – Three point starter - Speed control methods of DC motor – Swinburne's Test.

### UNIT - III

#### Transformers:

Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests - Efficiency and regulation.

### UNIT - IV

#### AC Rotating Machines:

Principle of operation and construction of alternators– Types of alternators – Principle of operation of synchronous motor - Principle of operation of 3-Phase induction motor – Slip-torque characteristics - Efficiency – Applications.

### UNIT V

#### Rectifiers & Linear ICs:

PN junction diodes - Diode applications(Half wave and bridge rectifiers).Characteristicsof operation amplifiers (OP-AMP) - application of OP-AMPs (inverting, non-inverting,integrator and differentiator).

### UNIT VI

#### Transistors:

PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CE amplifier - Concepts of feedback amplifier.

**Learning Outcomes:**

- Able to analyse the various electrical networks.
- Able to understand the operation of DC generators, 3-point starter and DC machine testing by Swinburne's Test.
- Able to analyse the performance of single-phase transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to analyse the operation of half wave, full wave bridge rectifiers and OP-AMPs.
- Able to explain the single stage CE amplifier and concept of feedback amplifier.

**Text Books:**

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9<sup>th</sup> edition, PEI/PHI 2006.

**Reference Books:**

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group
2. Basic Electrical Engineering by M.S. Naidu and S. Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2<sup>nd</sup> edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2<sup>nd</sup> edition
5. Industrial Electronics by G.K. Mittal, PHI

I Year - II Semester

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## ENGINEERING DRAWING

*Objective: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.*

### UNIT I

**Objective:** To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

**Polygons:** Constructing regular polygons by general methods, inscribing and describing polygons on circles.

**Curves:** Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

### UNIT II

**Objective:** To introduce the students to use scales and orthographic projections, projections of points & simple lines.

**Scales:** Plain scales, diagonal scales and vernier scales

**Orthographic Projections:** Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP, VP or PP)

### UNIT III

**Objective:** The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT

### UNIT IV

**Objective:** The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

### UNIT V

**Objective:** The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

### UNIT VI

**Objective:** The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Text Books:**

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

**Reference Books:**

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

**I Year - II Semester**

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| <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**ENGLISH-COMMUNICATIONS SKILLS LAB-II**

**PRESCRIBED LAB MANUAL FOR SEMESTER II:**

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

**OBJECTIVES:**

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

**OUTCOME:**

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

**UNIT 1:**

1. Debating  
Practice work

**UNIT 2:**

1. Group Discussions  
Practice work

**UNIT 3:**

1. Presentation Skills  
Practice work

**UNIT 4:**

1. Interview Skills  
Practice work

**UNIT 5:**

1. Email,
2. Curriculum Vitae  
Practice work

**UNIT 6:**

1. Idiomatic Expressions
2. Common Errors in English  
Practice work

**Reference Books:**

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

**(Any 10 of the following listed experiments)**

**I Year - II Semester**

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| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**ENGINEERING / APPLIED PHYSICS LAB**

**Objective:** *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

**LIST OF EXPERIMENTS:**

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

**Outcome:** *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

I Year - II Semester

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**ENGINEERING / APPLIED PHYSICS - VIRTUAL  
LABS – ASSIGNMENTS**

**(Constitutes 5% marks of 30marks of Internal-component)**

**Objective:** *Training Engineering students to prepare a technical document and improving their writing skills.*

**LIST OF EXPERIMENTS**

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

**URL:** [www.vlab.co.in](http://www.vlab.co.in)

**Outcome:** *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - II Semester

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 2 |

## ENGINEERING WORKSHOP & IT WORKSHOP

### ENGINEERING WORKSHOP

**Course Objective: To impart hands-on practice on basic engineering trades and skills.**

**Note: At least two exercises to be done from each trade.**

**Trade:**

|                     |  |
|---------------------|--|
| <b>Carpentry</b>    | 1. T-Lap Joint<br>2. Cross Lap Joint<br>3. Dovetail Joint<br>4. Mortise and Tenon Joint  |
| <b>Fitting</b>      | 1. Vee Fit<br>2. Square Fit<br>3. Half Round Fit<br>4. Dovetail Fit  |
| <b>Black Smithy</b> | 1. Round rod to Square<br>2. S-Hook<br>3. Round Rod to Flat Ring<br>4. Round Rod to Square headed bolt                                     |
| <b>House Wiring</b> | 1. Parallel / Series Connection of three bulbs<br>2. Stair Case wiring<br>3. Florescent Lamp Fitting<br>4. Measurement of Earth Resistance |
| <b>Tin Smithy</b>   | 1. Taper Tray<br>2. Square Box without lid<br>3. Open Scoop<br>4. Funnel   |

### IT WORKSHOP

#### OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. **System Assembling, Disassembling and identification of Parts / Peripherals**

2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

### 3. MS-Office / Open Office

- a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
- b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
- c. **Power point** - features of power point, guidelines for preparing an effective presentation.
- d. **Access**- creation of database, validate data.

4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewall settings.  
Installing application software, system software & tools.

5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.

6. **Trouble Shooting**-Hardware trouble shooting, Software trouble shooting.

7. **MATLAB**- basic commands, subroutines, graph plotting.

8. **LATEX**-basic formatting, handling equations and images.

### OUTCOMES:

- Common understanding of concepts, patterns of decentralization implementation in Africa †
- Identified opportunities for coordinated policy responses, capacity building and implementation of best practices †
- Identified instruments for improved decentralization to the local level †
- Identified strategies for overcoming constraints to effective decentralization and sustainable management at different levels

### TEXT BOOKS:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition By Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education.

II Year - I Semester

| L | T | P | C |
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## METALLURGY & MATERIALS SCIENCE

**Course Objective:** To understand the basic fundamentals of Material science and Physical metallurgy. The basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

### UNIT – I

**Learning Objective:** To know the basic concepts of bonds in metals and alloys. To understand the basic requirements for the formation of solid solutions and other compounds.

**Structure of Metals and Constitution of alloys:** Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

### UNIT –II

**Learning objectives:** To understand the regions of stability of the phases that can occur in an alloy system in order to solve the problems in practical metallurgy.

**Equilibrium Diagrams :** Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cus-Sn and Fe-Fe<sub>3</sub>C.

### UNIT –III

**Learning objectives:** To study the basic differences between cast irons and steels, their properties and practical applications.

**Cast Irons and Steels:** Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

### UNIT – IV

**Learning objectives:** To study the affect of various alloying elements on iron-iron carbide system. To understand the various heat treatment and strengthening processes used in practical applications.

**Heat treatment of Alloys:** Effect of alloying elements on Fe-Fe<sub>3</sub>C system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

### UNIT – V

**Learning objectives:** To study the properties and applications of widely used non-ferrous metals and alloys so as to use the suitable material for practical applications.

**Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

## UNIT – VI

*Learning objectives: To study the properties and applications of ceramic, composite and other advanced materials so as to use the suitable material for practical applications.*

**Ceramic and composite materials:** Crystalline ceramics, glasses, cermaets, abrasive materials, nanomaterials – definition, properties and applications of the above.

Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

### TEXT BOOKS:

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland -Thomson.

### REFERENCES :

1. Material Science and Metallurgy – Dr. V.D.kodgire.
2. Materials Science and engineering - Callister & Baalabrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publications

II Year - I Semester

| L | T | P | C |
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**MECHANICS OF SOLIDS**  
(Common to Mechanical, Aeronautical & Automobile Engineering)

**Objective:** The students completing this course are expected to understand the basic terms like stress, strain, Poisson's ratio...etc and different stresses induced in beams, thin cylinders, thick cylinders, columns. Further, the student shall be able to understand the shear stresses in circular shafts.

**UNIT – I**

**Objective:** After studying this unit student will know the basic terms like stress, strain Poisson's ratio...etc and stresses in bars of varying cross sections, composite bars, thermal stress in members, stresses on inclined planes with analytical approach and graphical approach, strain energy under different loadings and also problem solving techniques.

**SIMPLE STRESSES & STRAINS :** Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

**UNIT – II**

**Objective:** After studying this unit student will know the construction of shear force diagrams and bending moment diagrams to the different loads for the different support arrangements and also problem solving techniques.

**SHEAR FORCE AND BENDING MOMENT :** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III**

**Objective:** After studying this unit student will know the bending and shear stress induced in the beams which are made with different cross sections like rectangular, circular, triangular, I, T angle sections and also problem solving techniques.

**FLEXURAL STRESSES :** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

**SHEAR STRESSES:** Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

**UNIT – IV**

**Objective:** After studying this unit student will know how to finding slope and deflection for different support arrangements by Double integration method, Macaulay's method and Moment-Area and also problem solving techniques.

**DEFLECTION OF BEAMS :** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams. Statically Indeterminate Beams and solution methods.

#### **UNIT – V**

*Objective: After studying this unit student will know how a cylinder fails, what kind of stresses induced in cylinders subjected to internal, external pressures and also problem solving techniques.*

**THIN CYLINDERS:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

**THICK CYLINDERS:** –lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.

#### **UNIT –VI**

*Objective: After studying this unit student will know shear stresses induced in circular shafts, discussing columns in stability point of view and columns with different end conditions.*

**TORSION:** Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

#### **COLUMNS:**

Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula,

#### **TEXT BOOKS:**

1. Strength of materials /GH Ryder/ Mc Millan publishers India Ltd
2. Solid Mechanics, by Popov
3. Mechanics of Materials/Gere and Timoshenko, CBS Publishers

#### **REFERENCES :**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timshenko
5. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

II Year - I Semester

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## THERMODYNAMICS

### Course Objectives:

To impart the knowledge of the thermodynamic laws and principles so as to enable the student to prepare an energy audit of any mechanical system that exchange heat and work with the surroundings.

### UNIT – I

**Objectives:** The student should be able to understand the basic concepts like thermodynamic system, its boundary and related fundamental definitions. Distingvion between point function and path function shall be made with respect to energy, work and Heat.

**Introduction: Basic Concepts :** System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I

### UNIT II

**Objectives:** To learn the first law of thermodynamics, which is also the energy conservation principle, and should be able to apply to different thermodynamic systems. To understand the concept of equality of temperature and the principle of operation of various temperature measuring devices. To learn the applications of steady flow energy equation to the various mechanical components.

Joule’s Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation. PMM-I, throttling and free expansion processes – deviations from perfect gas model – vander Waals equation of state – compressibility charts – variable specific heats – gas tables.

### UNIT – III

**Objectives:** To understand the second law statements and the associated terms and should be able to apply the principles to heat engines. Should be able to analyse the concepts of Carnot cycle, entropy, availability and irreversibility. Should be able to understand the use of Maxwells relations and thermodynamic functions.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot’s principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

#### UNIT IV

**Objectives:** should understand the process of steam formation and its representation on property diagrams with various phase changes and should be able to calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

#### UNIT – V

**Objectives:** Should be able to use Psychrometric chart and calculate various psychrometric properties of air.

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

#### UNIT - VI

**Objectives:** To understand the concept of air standard cycles and should be able to calculate the efficiency and performance parameters of the systems that use these cycles.

**Power Cycles :** Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

**Refrigeration Cycles :** Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

#### TEXT BOOKS :

1. Engineering Thermodynamics, PK Nag 4<sup>th</sup> Edn, TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles, 7<sup>th</sup> Edn - McGrawHill

#### REFERENCES :

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics – J.P.Holman, McGrawHill
3. Basic Engineering Thermodynamics – A.Venkatesh – Universities press.
4. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
5. Thermodynamics – W.Z.Black & J.G.Hartley, 3<sup>rd</sup> Edn Pearson Publ.
6. Engineering Thermodynamics – D.P.Misra, Cengage Publ.
7. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

II Year - I Semester

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## AUTOMOTIVE ENGINES

**Course Objectives:** To make the student learn and understand the basic principles involved in the working of internal combustion engines, and their parts ,combustion phenomenon and principles, speed controllers and lubrication systems.

### UNIT-I

**Objectives:** To make the students understand the development in internal combustion engines, classification and constructional details in detail.

**Introduction:** Historical development of Automobiles, Different Types of Automotive Power plants, principles of I.C engine operation and classification of engines, supercharging and turbo charging.

**Two stroke and four stroke engines:** different types of scavenging systems, scavenging efficiency. Valve and Port timing diagrams, special types of I.C engines like Sterling, Wankle rotary, variable compression ratio engines and Variable valve timing engines.

**Automobile Engine Components:** Engine Classification. Function, Materials, Constructional details and Manufacturing process of various engine components.

### UNIT-II

**Objectives:** To make the students understand the fuel admission in SI Engines and related systems.

**Carburetion:** Air fuel mixture requirements in SI Engines, fundamental of carburetion flow characteristics of carburetion, methods of mixture correction, calculation of throat and jet sizes of a carburetor, Types of carburetors and working. Gasoline direct injection, timed and continuous injection systems, multipoint fuel injection systems. Advantages of petrol injection, Electronic fuel injection system, MPFI, SFI, Single point injection system, Multi point fuel injection system.

### UNIT III

**Objectives:** To make the students understand the fuel admission in CI Engines and understand the functioning of various components involved in fuel injection in CI engines.

**Fuel injection in CI Engines:** Fuel filters, transfer pumps, injection pumps. Injection nozzles, their functions. Diesel fuel pumps: Jerk type principle Delivery characteristics of fuel pumps, Functions and types of Governors-Mechanical, Pneumatic. Characteristic injection lag effect of injection, pressure waves in fuel lines, Inline pumps(Plunger & Barrel), Rotary distributor pumps-Mechanical & Electronic governors. Electronic diesel control-Common Rail diesel injection, Unit Injection

**Fuel spray characteristics:** Types of injection nozzles and their characteristics, Multihole, pintle and Pintaux nozzles. Unit injectors.

#### **UNIT – IV**

**Objectives:** To make the students understand the combustion phenomenon in SI Engines and learn about the fuel characteristics.

**Combustion in S.I. Engines :** Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and Detonation (explanation of ) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types, Types of spark plug.

#### **UNIT – V**

**Objectives:** To make the students understand the combustion phenomenon in CI Engines and learn about the fuel characteristics and Intake & Exhaust system.

**Combustion in C.I. Engines :** Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence –Swirl and squish, open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

**Intake & Exhaust System:** Intake & exhaust system circuits, Types of filters, Mufflers. Function of Turbochargers and intercooler, Types. Use of Selective catalytic reduction (SCR) and Exhaust gas recirculation(EGR) in exhaust system.

#### **UNIT – VI**

**Objectives:** To make the students understand the importance of lubrication and cooling system for effective functioning of internal combustion engines.

**Lubrication Systems:** Functions of the lubrication system, Characteristics of lubricant. classification of lubricating oils, lubrication standards, Lubrication circuit, Petrol lubrication, Splash lubrication, wet sump lubrication, dry sump lubrication. Oil filters, oil pumps, crankcase ventilation, oil additives.

**Cooling Systems:** Functions of the coolant system, Air and water cooling systems, Cooling Circuit, Characteristics of coolant. Thermo syphon and forced cooling systems. Electromagnetic fan clutch, Viscous fan clutch. Function of Thermostat.

#### **Text Books:**

1. ML Mathur & RPSharma -A course in Internal combustion Engines - Dhanpat Rai
2. I.C. Engines / V. GANESAN/ TMH
3. K Newton and Steeds -The Motor Vehicle, SAE Publications

#### **References Books:**

1. B.P. Obert I C Engines & Air Pollution – Harper & Row Publications
2. Bosch Gasoline Engines management – Bosch Publications
3. Bosch Diesel Engine management – Bosch Publication
4. Bosch Automotive Hand book – Bosch Publication

II Year - I Semester

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## COMPUTER AIDED ENGINEERING DRAWING PRACTICE

**Course Objective:** To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

### UNIT-I:

**Objective:** The knowledge of projections of solids is essential in 3D modeling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection.

**PROJECTIONS OF SOLIDS:** Projections of Regular Solids inclined to both planes – Auxiliary Views.

### UNIT-II:

The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

**SECTIONS OF SOLIDS:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**DEVELOPMENT AND INTERPENETRATION OF SOLIDS:** Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

### UNIT-III:

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

**INTERPENETRATION OF RIGHT REGULAR SOLIDS:** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

**PERSPECTIVE PROJECTIONS:** Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

*In part B computer aided drafting is introduced.*

### UNIT IV:

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

**INTRODUCTION TO COMPUTER AIDED DRAFTING:** Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

### UNIT V:

By going through this topic the student will be able to understand the paper-space environment thoroughly.

**VIEW POINTS AND VIEW PORTS:** view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete , joint , single option.

**UNIT VI:**

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.

**COMPUTER AIDED SOLID MODELING:** Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

**TEXT BOOKS :**

1. Engineering drawing by N.D Bhatt , Charotar publications.
2. Engineering Graphics, K.C. John, PHI Publications

**REFERENCES:**

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD , K.venkata reddy/B.S . publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:

- a) Two hours-Conventional drawing
- b) Two hours – Computer Aided Drawing

II Year - I Semester

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## MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

### Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

### UNIT-I

#### Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

### UNIT – II

#### Production and Cost Analyses:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

### UNIT – III

#### Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

### Unit – IV

#### Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

### UNIT – V

#### Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

## UNIT – VI

**Capital and Capital Budgeting:** Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

### Course Outcome:

- \*The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- \* One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- \*The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

### TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. ‘Managerial Economics and Financial Analysis’, Ravindra Publication.

### REFERENCES:

2. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7<sup>th</sup> Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Univerties press, 2015

II Year - I Semester

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### **ELECTRICAL & ELECTRONICS ENGG.LAB**

#### **Section A: Electrical Engineering:**

##### **Learning Objectives:**

- To predetermine the efficiency of dc shunt machine using Swinburne's test.
- To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
- To obtain performance characteristics of DC shunt motor & 3-phase induction motor.
- To find out regulation of an alternator with synchronous impedance method.
- To control speed of dc shunt motor using speed control methods.
- To find out the characteristics of PN junction diode & transistor
- To determine the ripple factor of half wave & full wave rectifiers.

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C.Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
  - a) Armature Voltage control
  - b) Field flux control method
6. Brake test on D.C. Shunt Motor.

#### **Section B: Electronics Engineering.**

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (Input and output)
3. Half wave rectifier with and with out filters.
4. Full wave rectifier with and with out filters.
5. CE amplifiers.
6. OP- Amp applications (inverting, non inverting, integrator and differentiator)

**Learning Outcomes:**

- Able to find out the efficiency of dc shunt machine without actual loading of the machine.
- Able to estimate the efficiency and regulation for different load conditions and power factors of single phase transformer with OC and SC test.
- Able to analyse the performance characteristics and to determine efficiency of DC shunt motor & 3-phase induction motor.
- Able to pre-determine the regulation of an alternator by synchronous impedance method.
- Able to control the speed of dc shunt motor using speed control methods.
- Able to find out the characteristics of PN junction diode & transistor
- Able to determine the ripple factor of half wave & full wave rectifiers.

II Year - I Semester

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### MECHANICS OF SOLIDS & METALLURGY LAB

**Course Objective: To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.**

**NOTE: Any 6 experiments from each section A and B.**

#### **(A) MECHANICS OF SOLIDS LAB :**

1. Direct tension test
2. Bending test on
  - a) Simple supported
  - b) Cantilever beam
3. Torsion test
4. Hardness test
  - a) Brinells hardness test
  - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

#### **(B) METALLURGY LAB:**

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

II Year - II Semester

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## KINEMATICS OF MACHINERY

**Objective:** The students completing this course are expected to understand the nature and role of the kinematics of machinery, the mechanisms and machines. The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications. It exposes the students to various kinds of power transmission devices like belt, rope, chain and gear drives and their working principles and their merits and demerits.

### UNIT – I

**Objective:** The objective of this unit is to make student understand the purpose of kinematics, Kinematic joint and mechanism and to study the relative motion of parts in a machine without taking into consideration the forces involved.

**MECHANISMS :** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

Grublers criterion, Grashoff's law, Degrees of freedom, Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

### UNIT – II

**Objective:** The objective of this unit is to make student understand various mechanisms for straight line motion and their applications including steering mechanism.

**LOWER PAIR MECHANISM:** Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Conditions for correct steering – Davis Steering gear, Ackerman's steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

### UNIT – III

**Objective :** The objective of this unit is to make student understand the velocity and acceleration concepts and the methodology using graphical methods and principles and application of four bar chain. To understand the application of slider crank mechanism etc. and study of plane motion of the body

**KINEMATICS:** Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain. Velocity and acceleration analysis of for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane motion of body:** Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

## UNIT – IV

**Objective** The objective of this unit is to make student understand the theories involved in cams. Further the students are exposed to the applications of cams and their working principles.

### CAMS

Definitions of cam and followers – their uses – Types of followers and cams – Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

**Analysis of motion of followers:** Roller follower – circular cam with straight, concave and convex flanks.

## UNIT – V

**Objective:** The objective of this unit is to make student understand gears, power transmission through different types of gears including gear profiles and its efficiency.

### Gears:

Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

## UNIT – VI

**Objective:** The objective of this unit is to make student understand various power transmission mechanisms and methodologies and working principles. Students are exposed to merits and demerits of each drive.

**Power Transmissions :** Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains-length, angular speed ratio, classification of chains.

Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

### TEXT BOOKS:

1. Mechanism and Machine Theory by Ashok G. Ambekar, PHI Publishers
2. Theory of Machines – S. S Rattan- TMH
3. Theory of machines and Mechanisms – J.J Uicker, G.R.Pennock & J.E.Shigley - Oxford publishers.

### REFERENCES:

1. Theory of Machines Sadhu Singh Pearsons Edn
2. Theory of machines and Machinery /Vickers /Oxford .
3. Theory of Machines by Thomas Bevan/ CBS
4. Kinematics of Machinery through Hyper Works – J.S. Rao – Springer Publ
5. Theory of Mechanisms and machines – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.

II Year - II Semester

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## THERMAL ENGINEERING – I

### UNIT – I

**Objectives:** To make the student learn and understand the reasons and affects of various losses that occur in the actual engine operation.

**Actual Cycles and their Analysis:** Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

### UNIT – II

**Objectives:** To familiarize the student with the various engine systems along with their function and necessity.

**I. C. ENGINES :** Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbocharging.

### UNIT – III

**Objectives:** To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.

**Combustion in S.I. Engines :** Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of ) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

**Combustion in C.I. Engines :** Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

### UNIT – IV

**Objectives:** To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.

**Measurement, Testing and Performance:** Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

## UNIT – V

**Objectives: To make students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors.**

**COMPRESSORS:** Classification positive displacement and rotodynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

**Reciprocating:** Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, undercooling, saving of work, minimum work condition for two stage compression.

## UNIT VI

**Objectives : To make students learn mechanical details, and to calculate power and efficiency of rotary compressors**

**Rotary (Positive displacement type) :** Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

**Dynamic Compressors:** Centrifugal compressors: Mechanical details and principle of operation velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

**Axial Flow Compressors:** Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations Polytopic efficiency.

## TEXT BOOKS:

1. I.C. Engines / V. GANESAN- TMH
2. Heat engines, vasandani & Kumar publications Thermal

## REFERENCES:

1. Thermal Engineering / RK Rajput/ Lakshmi Publications
2. IC Engines – M.L.Mathur &R.P.Sharma – Dhanpath Rai & Sons.
3. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick-2<sup>nd</sup>Edition-Wiley Publ
4. I.C. Engines - J.B.Heywood /McGrawHill.
5. Thermal Engineering – R.S.Khurmi & J.S.Gupta- S.chand Publ
6. Thermal Engineering / PL Ballaney Khanna Publishers

II Year - II Semester

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## FLUID MECHANICS & HYDRAULIC MACHINES

**Objective:** *The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.*

### UNIT I

**Objective:** *After studying this unit student will know the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques.*

**Fluid statics:** Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

### UNIT II

**Objective:** *In this unit student will be exposed to the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.*

**Fluid kinematics:** Introduction, flow types. Equation of continuity for one dimensional flow. circulation and vorticity. Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

**Fluid dynamics:** surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

### UNIT III

**Objective:** *At the end of this unit student will be aware of the concepts related to boundary layer theory, flow separation, basic concepts of velocity profiles, dimensionless numbers and dimensional analysis.*

**Boundary Layer Theory:** Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

**Dimensional Analysis:** Similitude and modeling – Dimensionless numbers

#### UNIT IV

*Objective: In this unit student will know the hydrodynamic forces acting on vanes and their performance evaluation.*

**Basics of turbo machinery:** hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

#### UNIT V

*Objective: At the end of this unit student will be aware of the importance, function and performance of hydro machinery.*

**Centrifugal pumps:** classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

**Reciprocating pumps:** Working, Discharge, slip, indicator diagrams.

#### UNIT VI

*Objective: After studying this unit student will be in a position to evaluate the performance characteristics of hydraulic turbines. Also a little knowledge on hydraulic systems and fluidics is imparted to the student.*

**Hydraulic Turbines:** classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube- theory- functions and efficiency.

**Performance of hydraulic turbines:** Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

#### TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.

#### REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiyah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements)
5. Fluid Mechanics and Hydraulic Machines by Domkundwar & Domkundwar, Dhanpatrai & Co.

**II Year - II Semester**

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## **PRODUCTION TECHNOLOGY**

### **Course Objective:**

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, bulk forming, sheet metal forming and powder metallurgy and their relevance in current manufacturing industry; To introduce processing methods of plastics.

### **UNIT – I**

**CASTING** : Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

### **UNIT – II**

Methods of melting and types of furnaces, Solidification of castings, Solidification of pure metals and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, Basic principles and applications of Centrifugal casting, Die casting and Investment casting.

### **UNIT – III**

**Welding** : Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, Submerged arc welding, Inert Gas welding- TIG & MIG welding.

### **UNIT – IV**

Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, Weldability of metals, welding defects – causes and remedies – destructive and nondestructive testing of welds, Design of welded joints.

### **UNIT – V**

Plastic deformation in metals and alloys, Hot working and Cold working, Strain hardening and Annealing. Bulk forming processes: Forging - Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

Introduction to powder metallurgy – compaction and sintering, advantages and applications

## **UNIT – VI**

Sheet metal forming - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Springback and its remedies, Coining, Spinning, Types of presses and press tools.

High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations.

Processing of Plastics: Types of Plastics, Properties, Applications and their processing methods, Blow and Injection molding.

### **TEXT BOOKS:**

1. Manufacturing Processes for Engineering Materials - Kalpakjain S and Steven R Schmid- Pearson Publ , 5<sup>th</sup> Edn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH

### **REFERENCES :**

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd
2. Process and materials of manufacture- Lindberg- PHI
3. Production Technology- R.K. Jain- Khanna
4. Production Technology-P C Sharma-S. Chand
5. Manufacturing Processes- H.S. Shaun- Pearson
6. Manufacturing Processes- J.P. Kaushish- PHI
7. Workshop Technology /WAJ Chapman/CBS Publishers&Distributors Pvt.Ltd.

**Course out comes:** At the end of the course the student shall be able to:

1. Design patterns, Gating, runner and riser systems
2. Select a suitable casting process based on the component
3. Learn various arc and solid state welding processes and select a suitable process based on the application and requirements
4. Understand various bulk deformation processes
5. Understand various sheet metal forming and processing of plastics

II Year - II Semester

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## INDUSTRIAL ENGINEERING & MANAGEMENT

### Course Objectives:

1. To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering
2. To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To enable students to understand their role as engineers and their impact to society at the national and global context.

### UNIT – I

**INTRODUCTION:** Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

### UNIT – II

**PLANT LAYOUT:** Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

### UNIT – III

**OPERATIONS MANAGEMENT:** Importance, types of production, applications, workstudy, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs,

### UNIT – IV

**STATISTICAL QUALITY CONTROL:** Quality control, its importance, SQC, attribute sampling inspection with single and double sampling, Control charts –  $\bar{X}$  and R – charts  $\bar{X}$  AND S charts and their applications, numerical examples.

**TOTAL QUALITY MANAGEMENT:** zero defect concept, quality circles, implementation, applications, ISO quality systems. six sigma – definition, basic concepts

### UNIT – V

**RESOURCE MANAGEMENT:** Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

## **UNIT - VI**

**VALUE ANALYSIS:** Value engineering, implementation procedure, enterprise resource planning and supply chain management.

**PROJECT MANAGEMENT:** PERT, CPM – differences & applications, critical path, determination of floats, importance, project crashing, smoothing and numerical examples.

### **TEXT BOOKS:**

1. Industrial Engineering and management / O.P Khanna/Khanna Publishers.
2. Industrial Engineering and Production Management/Martand Telsang/S.Chand & Company Ltd. New Delhi

### **Reference Books:**

1. Industrial Management / Bhattacharya DK/Vikas publishers
2. Operations Management / J.G Monks/McGrawHill Publishers.
3. Industrial Engineering and Management Science/ T. R. Banga, S. C. Sharma, N. K. Agarwal/Khanna Publishers
4. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.
5. Statistical Quality Control /Gupta/Khanna Publishers
6. Industrial Engineering and Management /NVS Raju/Cengage Publishers

### **Course outcome:**

Upon successful completion of this course you should be able to:

1. Design and conduct experiments, analyse, interpret data and synthesize valid conclusions
2. Design a system, component, or process, and synthesize solutions to achieve desired needs
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
4. Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management

II Year - II Semester

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## MACHINE DRAWING

*Course Objective: The student will acquire knowledge of fastening arrangements such as welding, riveting the different styles of attachment for shaft. The student also is enabled to prepare the assembly of various machine or engine components and miscellaneous machine components.*

### **Machine Drawing Conventions :**

Need for drawing conventions – introduction to IS conventions

- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- Title boxes, their size, location and details - common abbreviations & their liberal usage
- Types of Drawings – working drawings for machine parts.

### PART-A

#### **I. Drawing of Machine Elements and simple parts**

**Objective: To provide basic understanding and drawing practice of various joint, simple mechanical parts**

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- Keys, cottered joints and knuckle joint.
- Riveted joints for plates
- Shaft coupling, spigot and socket pipe joint.
- Journal, pivot and collar and foot step bearings.

### PART-B

#### **II. Assembly Drawings:**

**Objective: The student will be able to draw the assembly from the individual part drawing.**

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- Engine parts –Gear pump, Fuel pump Petrol Engine connecting rod, piston assembly.
- Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
- Valves: spring loaded safety valve, feed check valve and air cock, Control valves

**NOTE :** First angle projection to be adopted. The student should be able to provide working drawings of actual parts. End semester examination for 70 Marks, Part A- 20 Marks (Answer two questions out of Three), Part B- 50 Marks (Assembly Drawing).

**TEXT BOOKS:**

1. Machine Drawing – N.Siddeswar, K.Kannaiah & V.V.S.Sastry - TMH
2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

**REFERENCES:**

1. Machine Drawing – P.S.Gill,
2. Machine Drawing – Luzzader
3. Machine Drawing – Rajput
4. Machine Drawing – N.D. Junnarkar, Pearson
5. Machine Drawing – Ajeeth Singh, McGraw Hill
6. Machine Drawing – KC John, PHI
7. Machine Drawing – B Battacharya, Oxford
8. Machine Drawing – Gowtham and Gowtham, Pearson

**II Year - II Semester**

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### **THERMAL ENGINEERING LAB**

**Course objective: To provide hands on experience in operating various types of internal combustion engines and understand their functioning and performance.**

1. I.C. Engines valve / port timing diagrams.
2. I.C. Engines performance test (4 -stroke diesel engines)
3. I.C. Engines performance test on 2-stroke petrol.
4. Evaluation of engine friction by conducting morse test on 4-stroke multi cylinder petrol engine.
5. Determination of FHP by retardation and motoring test on IC engine.
6. I.C. Engines heat balance.
7. Economical speed test of an IC engine.
8. Performance test on variable compression ratio engines.
9. Performance test on reciprocating air compressor unit.
10. Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines.

**II Year - II Semester**

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**FLUID MECHANICS & HYDRAULIC MACHINES LAB**

**Course Objective: To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.**

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.