REGULATIONS - 2015

DEPARTMENT OF
MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS - FIRST YEAR

B.E. – MECHANICAL ENGINEERING
COLLEGE VISION

- Transforming lives through quality Education and research with human values.

COLLEGE MISSION

- To maintain excellent infrastructure and highly qualified and dedicated faculty.

- To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit.

- To promote the values of ethical behavior and commitment to the society.

- To partner with academic, industrial and government entities to attain collaborative research.
VISION

- Producing globally competitive Mechanical Engineers with social responsibilities.

MISSION

- Imparting quality education by providing excellent Teaching-learning environment.
- Inculcating qualities of continuous learning, professionalism, team spirit, communication skill and leadership with social responsibilities.
- Promoting leading edge research and development through collaboration with academia and industry.

Program Educational Objectives (PEO)

Programme educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

After 3 to 5 years of completion of our graduation our,

1. Graduates will have successful profession in Mechanical or allied Industries or Research/Academics or business enterprise.
2. Graduates will have the attitudes and abilities of leaders to adapt the changing global scenario.
Program Outcomes (PO)

After the successful completion of Mechanical Engineering Program, the graduates will be able to,

- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization in Mechanical Engineering to the solution of complex engineering problems.
- Identify, formulate, research literature, and analyze complex problems in Mechanical Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- Design solutions for complex Mechanical Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex Mechanical Engineering Problems.
- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Mechanical Engineering activities with an understanding of the limitations.
- Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
# B.E. – MECHANICAL ENGINEERING

## REGULATIONS – 2015

### FIRST YEAR CURRICULUM AND SYLLABUS

#### SEMESTER – I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Category</th>
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Total 16 2 6 20

#### PRACTICAL COURSES

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#### PRACTICAL COURSES

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Total 20 4 4 24

MAC - Mandatory Course, CFC - Common Foundation Course, SFC - Specific Foundation Course, PCC – Programme Core Course, XEC - X Stands for P or O (PEC – Programme Elective Course, OEC – Open Elective Course)

*Common to all B.E. / B.Tech., Programmes*
### Question pattern

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### FORMAT FOR COURSE CODE

- **1 5 M E 2 3 C**
  - **1** - Compulsory Course
  - **5** - Course Sequence Number
  - **M** - Semester Number
  - **E** - Branch Name
  - **2 3 C** - Year of Regulation

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15SH11C TECHNICAL ENGLISH (Common to all B.E. / B.Tech. Degree Programmes) 3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO1: acquire the basics of English communication skills. (K3)
- CO2: apply the basic language skills to understand various aspects of technical writing. (K3)
- CO3: understand main ideas, specific details and implied meaning while listening and develop the factual & imaginative information. (S4)
- CO4: coordinate and communicate in a wide range of situation. (S4)
- CO5: integrate and apply the acquired skills in real life situation. (S4)

UNIT I
Parts of Speech - Sentence Structure (SV/SVO/SVC/SVIODO) - Identifying the kinds of sentences (Statement, Interrogative, Imperative, Exclamatory & Negative) - Informal writing (Diary writing & letter to friend/ parent/siblings) - Self Introduction - Listening for general information.

UNIT II
Transformation of words into different grammatical forms- Converting one kind of sentence into another sentence (Statement, Interrogative, Imperative, Exclamatory & Negative) - Technical Vocabulary - Tense Usage (Present tense- Past tense - Future tense - Writing passages in all tenses) - Letter writing (Permission letter & Requisition letter) - Listening for specific information.

UNIT III
Personality Adjective - Concord - Letter Writing: Invitation / Acceptance letters - Itinerary Writing (with valued points/ situation) - Phonetics (Vowels - Consonants - Diphthongs) - Listening and filling up the information - Process Description (with valued points).

UNIT IV
IF Conditionals - British & American Vocabulary - Letter Writing (Declining / Thanking letters) - Email writing (with valued points) - Instruction Writing - Listening and giving opinion on the pictures.

UNIT V
Reading comprehension - Error Spotting (Article, Preposition, Modals and Concord) - Presenting article based on newspaper reading- Situational Conversation - Listening and writing dialogues – Checklists.

L: 45 TOTAL: 45 PERIODS

Suggested Activity: Each student should read the suggested fiction for oral assignment

TEXT BOOKS

REFERENCES

Listening files: Audio files from net sources, Softwares: ODLL, Globerena.
COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: make use of orthogonal transformation. (K3)
CO 2: use the basic concepts of three dimensional geometry in engineering. (K2)
CO 3: obtain maxima and minima of real valued functions. (K3)
CO 4: solve ordinary differential equations. (K3)
CO 5: solve partial differential equations. (K3)

UNIT I MATRICES 15

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Independency and dependency of Eigen vectors – Properties of Eigen values and Eigen vectors (excluding proofs) - Diagonalisation of a matrix by orthogonal transformation- Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation and its nature.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 15

Direction cosines and Direction ratios - Planes and Lines - Equations of plane and line - Intersection of two planes - Shortest distance between two lines - Equation of a sphere - Plane section of a sphere - Tangent Plane - Orthogonal spheres.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 15

Euler's theorem on homogeneous functions of two variables - Taylor's Series - Jacobians - Maxima and Minima - Constrained Maxima and Minima by the method of Lagrange multipliers.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 15

Solutions of higher order linear differential equations with constant coefficients - Cauchy’s and Legendre’s linear equations - Solutions of simultaneous first order linear equations with constant coefficients - Method of variation of parameters.

UNIT V PARTIAL DIFFERENTIAL EQUATIONS 15


TEXT BOOKS


REFERENCES

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: summarize the properties and structures of solids. (K2)
CO 2: define the principles of acoustics and ultrasonics and apply the ultrasonic methods for industrial and medical field. (K1)
CO 3: choose the appropriate Laser technique for industrial and medical applications. (K3)
CO 4: describe the different types, fabrication, losses of optical fibers and their applications in communication and instrumentation.(K1)
CO 5: explain the physical properties of photons & electrons and their applications in different electron microscopes.(K2)

UNIT I PROPERTIES OF MATTER AND CRYSTAL PHYSICS 9

Hooke’s law - Types of moduli of elasticity - Determination of Rigidity modulus and Young’s modulus - I shaped Girders.
Miller indices – d spacing - Characteristics of SC, BCC, FCC and HCP structures.

UNIT II ACOUSTICS AND ULTRASONICS 9


Ultrasonics: Production - magnetostriction generator - piezoelectric generator, Properties - Cavitations - Velocity measurement - acoustic grating, Industrial applications - Medical application - Sonograms.

UNIT III LASER SYSTEM AND APPLICATIONS 9


UNIT IV FIBER OPTICS AND ITS APPLICATIONS 9

Numerical aperture and Acceptance angle - Types of optical fibers - Double crucible technique – Splicing - Loss in optical fiber - Fiber optical communication system - Applications - Fiber optic sensors - Endoscope.

UNIT V QUANTUM PHYSICS 9

Photo electric effect - Matter Waves - Davisson and Germer experiment - Heisenberg’s Uncertainty principle - Schrodinger’s wave equation - particle in one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: identify suitable water treatment techniques for industrial and domestic purpose. (K3)
CO 2: explain the type of corrosion and corrosion control methods. (K2)
CO 3: select the polymer for specific application. (K3)
CO 4: explain nano materials preparation. (K2)
CO 5: outline the principle and instrumentation of various analytical techniques. (K2)

UNIT I WATER TREATMENT

UNIT II CORROSION AND ITS CONTROL
Chemical corrosion – electrochemical corrosion – mechanism – different types of electrochemical corrosion – factors influencing corrosion – corrosion control methods.

UNIT III ENGINEERING POLYMERS

UNIT IV NANO MATERIALS
Nanoparticles – synthesis of CNT – precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation – toxic effect of nano materials- properties and applications.

UNIT V ANALYTICAL TECHNIQUES
Principle, instrumentation and applications of UV-Visible and IR spectroscopy; chromatography: instrumentation and working of gas chromatography and HPLC; conductivity measurements – pH measurements – applications.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
INTRODUCTION TO ENGINEERING

(Commmon to all B.E./B.Tech. Degree Programmes)

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO 1: recognizes the needs of engineering and should be able to acquaint with various fields of engineering and technology. (A4, K2)

CO 2: practices how to be successful in work and life in general. (K2, S3, A5)

CO 3: feels proud to be an engineering student. (A4)

CO 4: appreciates the initial career profiles of engineers. (A3)

CO 5: prepares for an Engineering Career. (A5)

CO 6: should be able to appreciate creative thinking means to provide engineering solution (K2, A3)

CO 7: should be able to appraise the values of Outcome Based Education and Choice Based Credit System. (K2, A2)

UNIT I

HISTORY OF ENGINEERING AND INTRODUCTION TO ENGINEERING PROFESSION


Introduction to Engineering Profession: Engineering work is all around you - Engineering as a profession and common traits of Good Engineers – History of Engineering Disciplines – Functions of Engineering.

UNIT II

CAREER PATHS OF ENGINEER AND PREPARING FOR AN ENGINEERING CAREER

Career Paths for Engineers: The corporate ladder, The independent entrepreneur, Employment Opportunities in Government, The military, Engineering and social service abroad, The Engineering Professor, Graduate work outside of engineering, A mix of two or more of the first six options.


UNIT III

PROFILES OF ENGINEERS


UNIT IV

OVERVIEW OF OBE AND CBCS

Graduate attributes of Washington Accord – Programme Specific Criteria (PSC) – Programme Educational Objectives (PEOs) – Programme Outcomes (POs) – Course Outcomes (COs) – CBCS : Course categories - Scheme of instruction, Assessment and Evaluation.

UNIT V

LEARNING AND CREATIVE THOUGHT

Introduction: The successful engineering student - the engineering curriculum - curriculum planning and management - adapting to the college classroom.

The learning process: the nature of learning - information processing and memory - determinants of efficient learning - practical suggestions for learning.

Differences in the way people think: The four-quadrant model of thinking - hindrances to problem solving.
On Creativity: What is creativity? - the nature of creativity - characteristics of creative people - the creative process - overcoming obstacles to creative thinking.

L: 30 TOTAL: 30 PERIODS

REFERENCES

WEB RESOURCES
www.ieagreements.org/IEA-Grad-Attr-Prof-Competencies.pdf
COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: use the drawing instruments effectively. (K2, S4, A3)
CO 2: draw the projections of points, straight lines, planes. (K2, S3, A3)
CO3: construct the projections of various solids in different positions. (K3, S3, A3)
CO 4: draw the sectional views of various solids and construct the true shape of the section. (K3, S3, A3)
CO 5: identify and draw the surface areas of simple solids. (K3, S3, A3)
CO 6: draw perspective views of simple solids and draw the orthographic views of simple objects. (K3, S3, A3)

UNIT I  PROJECTION OF POINTS, LINES AND PLANE SURFACES  12
Drawing Instruments- IS specifications on lines- drawing sheets- Printing letters and dimensioning- scales - First angle projection. (Not for examination).
Projections of points and straight lines located in the first quadrant-Determination of true lengths and true inclinations. Projections of regular polygonal surfaces and circular lamina inclined to both reference planes

UNIT II  PROJECTION OF SOLIDS  12
Projections of simple solids - axis inclined to one reference plane - change of position method.

UNIT III  SECTION OF SOLIDS  12
Sectioning of simple solids - cutting planes inclined to one reference plane and perpendicular to the other.

UNIT IV  DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS  12
Development of lateral surfaces of simple and truncated solids - Principles of isometric projection and view of simple solids - truncated prism and pyramids.

UNIT V  PERSPECTIVE PROJECTIONS AND ORTHOGRAPHIC PROJECTIONS  12
Perspective projection of cube, prisms and pyramids by visual ray method and vanishing point method. Orthographic projection – simple objects with straight and curved surfaces.

L: 30 P: 30 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: demonstrate the properties of light waves. (K2, S3)
CO2: interpret the production of ultrasounds and how the velocity of ultrasounds varies with respect to medium. (K2, S3)
CO3: illustrate the mechanical and electrical properties of materials. (K2, S3)

LIST OF EXPERIMENTS
1. Determination of thickness of a thin wire – Air wedge method.
2. Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
3. Determination of Dispersive power of a prism using Spectrometer.
5. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.
10. Determination of temperature coefficient of resistance.

P:15 TOTAL: 15 PERIODS

PART B - ENGINEERING CHEMISTRY LABORATORY

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: estimate the amount of hardness of the water sample (K5, S3)
CO 2: determine the rate of corrosion (K5, S3)
CO 3: synthesize a polymer and to determine molecular weight of the polymer (K6, S3)
CO 4: synthesize silver nano particles (K6,S6)
CO 5: quantify different ions by different analytical techniques (K5,S3)

LIST OF EXPERIMENTS
1. Estimation of hardness of water sample by EDTA method
2. Rate of corrosion- weight loss method
3. Synthesis of urea-formaldehyde resin
4. Determination of molecular weight of a polymer – Oswald’s viscometer
5. Synthesis and characterization of silver nano particles.
6. Estimation of iron (Fe^{2+}) in water sample by dichrometry
7. Estimation of hydrochloric acid by conductometric method
8. Estimation of mixture of acids by conductometric method

P: 15 TOTAL: 15 PERIODS

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.
REFERENCES
PART A - MECHANICAL LABORATORY

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: prepare basic carpentry jobs (at least three joints). (K3,S2,A2)
CO 2: prepare the welded joint (minimum three) using arc and gas welding. (K3,S2,A2)
CO 3: Machine metals using lathe, shaper and drilling machine (each one job). (K3,S2,A2)

UNIT I  CARPENTRY PRACTICES
Study of carpentry tools – preparation of joints like half lap, Tee and dove tail in wood.

UNIT II  WELDING
Study of welding tools – Preparation of welded joints with Mild steel specimen like lap, butt and tee joints using ARC and Gas welding. (any one exercise should be given using Gas welding among three)

UNIT III  BASIC MACHINING PRACTICES
Simple turning and taper turning using lathe – use of shaper and drilling machine for basic operations (Minimum three exercises should be given for students)

P: 15  TOTAL: 15 PERIODS

TEXT BOOK

REFERENCES
PART – B ELECTRICAL AND ELECTRONICS LABORATORY

COURSE OUTCOMES
Upon completion of this course, the students will be able to,

CO 1: develop simple residential wiring circuits. (K6)
CO 2: calculate the basic electrical quantities. (K4)
CO 3: identify the value of resistance using appropriate methods. (K4, A4)
CO 4: realize the fundamentals of Boolean algebra using digital logic gates. (A4)
CO 5: practice soldering to design PCB for electronic circuits. (A5)

I. ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
5. Measurement of energy using single phase energy meter.

II. ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO
2. Study of logic gates AND, OR, XOR and NOT.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

P: 15 TOTAL: 15 PERIODS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: contribute the lingual power to frame sentences in different context. (A2)
CO 2: write effectively in any Professional context. (A2)
CO 3: acquire the skills related to Group discussion. (A2)
CO 4: communicate and respond in different social and professional contexts. (A3)
CO 5: recall the acquired skills in solving competitive exam. (K3)

UNIT I
Phrasal Verbs (Based on root words: call, come, get, look, put, run, and take) - Foreign Words and Phrases (from the given list) - Listening to audio files and finding the technical words and framing different sentences - Channel conversion- Descriptive writing on various charts.

UNIT II
Idioms and Phrases (with animal names from the given list) - Report writing (types-structure-stages in report writing- model report) - Job Application Letter with curriculum vitae.

UNIT III
One word substitution (from the list given) Group Discussion (Why is GD a part of selection process? - Structure of GD – Strategies in GD – Team Work - Body Language - Video Samples-GD).

UNIT IV
Choosing a suitable connotation (from the given list) - Note making – Preparing Circular and Minutes of meeting – Listening to TED Talks – Giving opinion on the given TED Talks and interviewing the TED talkers.

UNIT V
Error Spotting (Tense, Relative Pronouns, Conjunctions, Sentence Structure, Adverb Placement) - Sentence Completion - Reading comprehension.

Activity: Each student should read the suggested fiction for oral assignment.

TEXT BOOK

REFERENCES

Listening files: Audio files from net sources and softwares: ODLL, Globerena.
COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. CO 1: solve algebraic and transcendental equations using numerical methods. (K3)
2. CO 2: interpolate and approximate the polynomial. (K2)
3. CO 3: perform numerical differentiation and integration. (K3)
4. CO 4: find the solution of ordinary differential equation using numerical methods. (K1)
5. CO 5: classify and solve partial differential equations. (K2)

UNIT I SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 15


UNIT II INTERPOLATION WITH EQUAL AND UNEQUAL INTERVALS 15


UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 15

Algorithm and simple problems on Trapezoidal rule - Simpson’s rules - Weddle’s rule - Derivatives using Forward and Backward difference Formulæ - Romberg integration - Double integration using Trapezoidal and Simpson’s rules.

UNIT IV NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 15


UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 15

Classification of Partial Differential Equations of second order - Algorithms and problems on finite difference solution of one dimensional heat equation by explicit and implicit methods - One dimensional wave equation and two dimensional Laplace and Poisson equations.

TEXT BOOKS


REFERENCES

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: express the thermal properties materials. (K2)
CO2: explain the electrical properties of conducting and semiconducting materials. (K2)
CO3: summarize the physics underlying the magnetic and superconducting behaviour of materials. (K2)
CO4: predict the mechanism by which the electric field interacts with dielectric material and their applications. (K2)
CO5: illustrate the advanced materials’ properties which are used in engineering applications and devices. (K2)

UNIT I THERMAL PROPERTIES OF MATERIALS 9
Modes of heat transfer - Rectilinear flow of heat along a metal bar - Methods of radial flow of heat - (i) spherical shell method and (ii) Flow of heat along the wall of a cylindrical tube - thermal conductivity of a poor conductor - Lee’s disc method, Black body radiation – Planck’s Theory.

UNIT II CONDUCTING MATERIALS AND SEMICONDUCTORS 9
Conductors:
Semiconductors:
Types of Semiconductors - Intrinsic and Extrinsic Semiconductors – Definition - Hall effect.

UNIT III MAGNETIC MATERIALS AND SUPERCONDUCTORS 9
Magnetic materials:
Superconductors:
BCS Theory, Properties - Meissner effect – Isotopic effect, Type I and Type II superconductors Applications of superconductors – Cryotron, SQUID, Magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9
Types of dielectric materials - polar and non-polar dielectrics - Types of Polarization – electronic, ionic, orientation and space charge polarization - frequency and temperature dependence of polarization, internal field - Clausius – Mosotti relation - dielectric loss and dielectric breakdown - Applications of dielectric materials - Ceramic materials - properties and applications.

UNIT V ADVANCED ENGINEERING MATERIALS 9
Shape memory alloys (SMA) - Nano materials - Solar cell – Biomaterials – Preparation, Properties and Applications.

TEXT BOOKS

REFERENCES
15ME24C CHEMISTRY FOR MECHANICAL ENGINEERING

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: apply the concept of phase rule to alloys (K3)
CO 2: apply the principles of electrochemistry in electroplating and electrochemical machining (K3)
CO 3: design an energy storage device (K6)
CO 4: summarize different types of fuels and flue gas analysis (K2)
CO 5: select proper engineering materials for desired engineering application (K3)

UNIT I PHASE RULE AND ALLOYS 9

UNIT II ELECTROCHEMISTRY AND ITS APPLICATION 9

UNIT III BATTERIES AND FUEL CELL 9
Principle and working of alkaline battery, NICAD battery, lead acid battery, lithium battery – solar cell – fuel cell: H2-O2, PEMFC, MOFC and SOFC.

UNIT IV FUELS AND COMBUSTION 9

UNIT V ENGINEERING MATERIALS 9

TEXT BOOKS

REFERENCES
15ME25C        C PROGRAMMING FOR ENGINEERS        L  T  P  C
(Common to all B.E. / B.Tech Degree Programmes)  3  0  0  3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: recognize the system fundamentals and the role of hardware components of the Computer. (K3)
CO2: apply the basic concepts and solve simple problems by analyzing the logics of conditional statements and looping constructs. (K3)
CO3: handle similar types of data using array and utilize their functionality. (K3)
CO4: appreciate the call by value and call by reference features in functions. (K5)
CO5: design programs involving their own derived data types, pointers, memory allocation concepts. (K4)
CO6: handle the file contents with access permissions. (K3)

UNIT I   COMPUTER FUNDAMENTALS                                                                   10
Classification of Computers – Basic Computer organization – Number Systems – Problem

UNIT II  BASIC C PROGRAMMING                                                                   9
Overview of C Program – Constants, Variables and Data Types – Operators and Expressions –
Managing Input and Output operations – Decision Making and Branching –Decision making and
Looping.

UNIT III  ARRAYS AND FUNCTIONS                                                                9
Arrays: One dimensional arrays – Two dimensional arrays – Multi dimensional arrays. Character
arrays and Strings: Declaring and initializing String Variables – Comparison of two strings – String
handling functions. User defined Functions: Definition – Declaration – Function calls – Category of
Functions – Recursion - Storage Classes.

UNIT IV  STRUCTURES AND POINTERS                                                            9
Structures and Unions: Definition – Declaration – Accessing structures – Initialization of structures
– Arrays of structures – Arrays within Structure – Structures within Structures -Structures and
functions - Unions. Pointers: Initialization – Pointers and arrays- Array of pointers – Pointers as
function arguments – Pointers to functions – Pointers and Structure.

UNIT V FILES AND DYNAMIC MEMORY ALLOCATION                           8
File management in C – Defining and opening a file – closing a file - Input and Output operations
on file – Error handling during IO operations – Random access to files – Command line
Arguments. Dynamic memory allocation: Allocating a block of memory - Allocating a multiple block
of memory – Releasing the used space – Altering the size of a block

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
   Education Inc., 2005.
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: simplify and analyze real world problems using free body diagrams. (K4,S3,A2)
CO 2: apply the basic laws of mechanics to solve the problems on statics of particles and rigid bodies. (K3,S3,A2)
CO 3: predict centroid and moment of inertia of simple configurations. (K2,S3,A2)
CO 4: solve practical problems on Projectiles, Newton’s laws, work-energy and impulse momentum. (K3,S3,A2)
CO 5: apply the principles of friction to solve contact problems. (K3,S3,A2)

UNIT I  BASICS AND STATICS OF PARTICLES  15

UNIT II  EQUILIBRIUM OF RIGID BODIES  15
Free body diagram – Types of supports and their reactions – Moments and Couples – Moment of a force about a point and about an axis, Vectorial representation of moments and couples – Scalar components of a moment – Equilibrium of Rigid bodies in two dimensions.

UNIT III  PROPERTIES OF SURFACES  15
First moment of area of simple sections from integration – Second moment of simple plane area – Parallel axis theorem and perpendicular axis theorem.

UNIT IV  DYNAMICS OF PARTICLES  15

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  15

DEMONSTRATION
(Understanding the basic concepts of Engineering Mechanics both statics and Dynamics - Not included for the examination)
1. Idealization of Particles and Rigid bodies
2. Beam and Structures
3. Moment and Torque
4. Centroid
5. Kinematics of Rolling
6. Static and Dynamic friction.
7. General plane motion

TEXT BOOKS

REFERENCES
15ME27C  INTRODUCTION TO MECHANICAL ENGINEERING AND DESIGN  L T P C  2 0 0 2

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: recognize the scope Mechanical Engineering and its impact on society. (K2, A5)
CO 2: identify the thrust area and facilities available in the Mechanical Engineering. (K3, A5)
CO 3: summarize different fields of applications of Mechanical Engineering and its inter-relationship with other fields of science and engineering. (K2, A4)
CO 4: choose specific domain based on interest to set career path. (K5, A5)
CO 5: explain the concept of engineering design process. (K2, A3)

UNIT I  MECHANICAL DESIGN  6

UNIT II  MANUFACTURING AND INDUSTRIAL ENGINEERING  6
Overview of Manufacturing Processes and Technology, Computer Aided Manufacturing, Measurements and Metrology, Industrial Engineering.

UNIT III  THERMAL ENGINEERING  6

UNIT IV  EMERGING AREAS AND APPLICATIONS OF MECHANICAL ENGINEERING  6
Emerging areas and Research facilities available in Thermal, Design, Manufacturing and Industrial Engineering Domain.
Details of the applications of Mechanical Engineering and other engineering and science disciplines exemplifying the job potential. Examples to show and discuss: Transportation: Land - automobiles, bicycle, train, earthmovers, etc., Aerospace – aircraft etc., Sea – Ships etc., Energy: Conventional energy - thermal power, nuclear, hydel plant etc, Renewable energy - solar, wind, biomass etc., Process Industries: chemical, petrochemical, paper, pharmaceutical, fertilizer plants etc.

UNIT V  ENGINEERING DESIGN PROCESS  6

L: 30 TOTAL:30 PERIODS

TEXT BOOK

REFERENCES
COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: solve the given problem using the syntactical structures of C language. (K3)
CO 2: develop, execute and document computerized solution for various logic based
problems using the flow control features of C language. (K3)
CO 3: enhance the programming skills in C by discriminating constants, variables and
arrays and the functionality. (K3)
CO 4: learn about the connection between function return values and variables. (K5)
CO 5: develop programs using string manipulation and file manipulation functions. (K3)

Simple programs

1. Solve problems such as temperature conversion, student grading, interest calculation.
2. Solving the roots of a quadratic equation
3. Designing a simple arithmetic calculator. (Use switch statement)
4. Given distance traveled by a vehicle as \( d = ut + \frac{1}{2}at^2 \), where ‘u’ and ‘a’ are the initial
   velocity and acceleration. Calculate the distance traveled for different time intervals

Programs using different control structures

5. Performing the following operations:
   a. Generate Pascal’s triangle.
   b. Construct a Pyramid of numbers.

6. Generation of the first ‘n’ terms of the Fibonacci sequence and prime sequence.
8. Finding the 2’s complement of a binary number.

Programs using arrays

9. Performing the following operations:
   a. Matrix addition.
   b. Transpose of a matrix.
   c. Matrix multiplication by checking compatibility.

Programs using string manipulation

10. Performing the following operations to a string:
    a. To insert a sub-string into main string at a given position.
    b. To delete ‘n’ characters from a given position in a string.
    c. To replace a character of string either from beginning or ending or at a specified
        location.

Programs using functions

11. Performing the following operations: (Use recursive functions)
    a. To find the factorial of a given integer.
    b. To find the GCD (Greatest Common Divisor) of two given integers.
    c. To solve Towers of Hanoi problem.

Programs using files

12. Performing the Student Information Processing using Structures and File handling
    concepts.
PART A – PHYSICS LABORATORY

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: demonstrate the optical properties of waves. (K2, S3)
CO 2: analyze the characteristics of semiconducting materials and devices. (K3, S3)
CO 3: quantify the acceleration due to gravity (g). (K2, S3)
CO 4: analyze the thermal properties of materials. (K3, S3)

LIST OF EXPERIMENTS
1. (a) Determination of wave length of Laser source.
   (b) Particle size determination using Diode Laser.
   (c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2. Determination of Band Gap of a semiconductor material.
6. Determination of g using compound pendulum.
7. Determination of Hall Coefficient.
9. Characteristics of LED.
10. Study of V-I characteristics of a solar cell.

P: 15 TOTAL: 15 PERIODS

PART - B CHEMISTRY LABORATORY

COURSE OUTCOMES
Upon completion of this course, the student will be able to
CO 1: estimate the amount of ions by different analytical techniques. (K5, S3)
CO 2: produce a metal coating on the base metal. (K3, S6)
CO 3: synthesize biodiesel from waste vegetable oil. (K6, S3)
CO 4: estimate the free acid value and iodine value of given oil sample. (K5, S3)
CO 5: estimate viscosity index of liquid lubricants. (K5, S3)
CO 6: design an energy storage device. (K6, S6)

LIST OF EXPERIMENTS
1. Estimation of copper in brass by EDTA method.
2. Estimation of iron (Fe²⁺) in rust.
3. Estimation of iron (Fe³⁺) in ore by potentiometric method.
4. Estimation of amount of acid by pH metric method.
5. Electroplating of copper on mild steel plate.
7. Estimation of the amount of free acid of a given oil sample.
10. Simple project in designing energy storage device.

P: 15 TOTAL: 15 PERIODS

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.
REFERENCES