KUMARAGURU COLLEGE OF TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)
COIMBATORE – 641049

REGULATIONS 2017

CURRICULUM

I - II Semesters

Department of Automobile Engineering
# Kumarakulam College of Technology, Coimbatore – 641 049
## Regulations 2017
### B.E Automobile Engineering
#### Curriculum

#### Semester-I

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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**Total Credits:** 22
**Total Periods per week:** 27

#### Semester-II

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**Total Credits:** 24
**Total Periods per week:** 31

Version 1 (17.8.17)
Semester 1
U17ENI1201 – ENGLISH FOR COGNIZANCE

(Common to all branches of Engineering and Technology)

COURSE OUTCOMES
After the course the Student will be able to:

CO1: Understand and appreciate vocabulary and syntax with accuracy and clarity.
CO2: Communicate effectively by using appropriate grammar and technical parlance in a range of academic scenarios.
CO3: Interpret and critically evaluate discourses related to functional English.
CO4: Comprehend critical text leading to academic articulation.
CO5: Disseminate professional information through appropriate means of communication.
CO6: Demonstrate an understanding for innovative language learning strategies and write texts applying registers formats and language appropriate to the context.

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Course Assessment methods

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<td>1. Course-end survey</td>
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Version 1 (17.8.17)
AUDITORY PERCEPTION

Listening for understanding & information - short announcements, short conversations, telephonic conversation; Listening to British, American, Australian and Neutral Accent of Indian English; Listening and synthesizing information; Listening to TED/INK Talks (General); Critical review of short films, documentaries.

ORAL FLUENCY


FOUNDATIONS OF ACADEMIC WRITING

Plan and write a library-based coursework assignment on an Engineering topic. Read academic textbooks and journal articles. Research and analyse scientific data and express understanding. Procuring information - Identifying research papers in a specific discipline, reading abstracts of research papers, reading the abstract of projects, reading articles from journals and publications and documenting/archiving information.

TRAITS OF RESEARCH WRITING

Reading research articles and summarizing. Review of Secondary sources - Writing an abstract - Writing an introduction to a paper in academic writing - Avoiding plagiarism – Bibliography – International Academic Styles of writing a research paper - Peer Evaluation.

PROCESS OF PREPARING A RESEARCH ARTICLE

Research Projects – Converging areas of interest into field of research - Identifying the problem of research – Formulating hypothesis – Research Objectives – Literature Review – Identifying the research gap - Research methodology – Requirements – Plan of work – Result and Discussion – Conclusion – References – Appendices.

L: 0 P: 60 Total: 60 Hours

Reference Books:


Course Outcomes
After successful completion of this course, the students should be able to

CO1 : Identify eigen values and eigen vectors, apply Cayley Hamilton theorem and convert quadratic form to canonical form.  

CO2 : Determine the radius, centre, circle of curvature of functions  

CO3 : Discover the evolutes of curves and the envelope of a family of curves.  

CO4 : Solve first order ordinary differential equation and apply in some physical situations.  

CO5 : Solve higher order ordinary differential equations and apply the knowledge to physical situations  

CO6 : Evaluate the total derivative of a function, expand the given function as series and locate the maximum and minimum for multivariate functions.  

Pre-requisites:
Nil

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<tr>
<th>COs</th>
<th>CO/PO Mapping</th>
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<td>(S/M/W indicates strength of correlation)</td>
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Course Assessment methods

Direct
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

Indirect
1. Course-end survey

MATRICES  9 + 3 Hours

GEOMETRICAL APPLICATIONS OF DIFFERENTIAL  4 + 1 Hours
CALCULUS
Curvature – Radius, Centre and Circle of curvature in Cartesian, Parametric and Polar form
EVOLUTES AND ENVELOPES  
5 + 2 Hours 
Evolute – Envelope of family of curves with one and two parameters – Evolute as the envelope of normals – properties of evolute and envelope.

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS  
9 + 3 Hours 
Leibnitz’s equation – Bernoulli’s equation – Equations of first order and higher degree - Clairauts form – Applications: Orthogonal trajectories and Newton’s law of cooling

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS  
9 + 3 Hours 
Linear equations of second and higher order with constant coefficients – Euler’s and Legendre’s linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients - Application - Mass-spring mechanical system. (Differential equations and associated conditions should be given).

FUNCTIONS OF SEVERAL VARIABLES  
9 + 3 Hours 

Theory: 45 Tutorial: 15 Practical: 0 Project: 0 Total: 60 Hours

REFERENCES

E books and online learning materials

Online Courses and Video Lectures:
www.mathworld.wolfram.com
http://nptel.ac.in

Version 1 (17.8.17)
Course Outcomes

After successful completion of this course, the students should be able to

CO1: Various engineering subjects and applications.

CO2: Crystal structure identification of engineering materials

CO3: Application of lasers and optical fibers in engineering and technology

CO4: Perceive the basics of quantum and its applications

CO5: Understand the concepts of production and detection of ultrasonic waves for various applications.

CO6: Acquire the knowledge of various materials testing procedures.

Pre-requisites:

NIL

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Course Assessment methods

Direct
4. Continuous Assessment Test I, II
5. Assignment; Journal paper review, Group Presentation, Project report, End Semester Examination

Indirect
1. Course-end survey

**CRYSTAL PHYSICS**

9 Hours


**APPLIED OPTICS**

9 Hours


**QUANTUM PHYSICS**

9 Hours

Introduction - Planck’s quantum theory of black body radiation (derivation) – photo electric effect(Qualitative only) – Compton effect (derivation) and experimental verification of Compton effect – De-Broglie’s concept - Schrodinger wave equation – time independent and time dependent equations (derivations) – physical significance of wave function – particle in a box (one dimensional case) – electron microscope – scanning electron microscope – transmission electron microscope.

**ULTRASONICS**

6 Hours

Ultrasonics: Production of ultrasonics: magnetostriction oscillator - piezo electric method – properties –detection – acoustic grating – application of Ultrasonic’s in automotive industries

**MATERIALS TESTING**

12 Hours

| Theory: 45 | Tutorial: 0 | Practical: 0 | Project: 0 | Total: 45 Hours |

REFERENCES

Course Outcomes
After successful completion of this course, the students should be able to

**CO1:** Discuss Basic concepts of electrochemistry involved in battery assembly (K2)
**CO2:** Apply the principle of electrochemistry and assemble a battery (K4)
**CO3:** Defend the Corrosion problems (K2)
**CO4:** Summarize different types of fuels and lubricants (K2)
**CO5:** Discuss basic concepts of combustion (K3)
**CO6:** Outline the principles and instrumentation of spectroscopic techniques involved in material characterization (K2)

Pre-requisites:
NIL

### CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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### Course Assessment methods

**Direct**

1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable)
3. End Semester Examination

**Indirect**

1. Course-end survey

### ELECTROCHEMISTRY
9 Hours

**Electrodes:** Standard and Reference electrode (Hydrogen and Calomel) - Types of electrodes (Metal - Metal ion; Metal - Metal insoluble salt, Redox electrode) - Ion selective (glass electrode) - Determination of pH, pO₂, pCO₂ - Classification of electrochemical cell.

### CORROSION SCIENCE
6 Hours
**Corrosion:** Principles and Mechanism of electrochemical corrosion - Factors influencing corrosion.

**Types of corrosion:** Galvanic corrosion - Differential aeration corrosion (pitting corrosion, water line corrosion) - Stress corrosion.

ENERGY STORING DEVICES 12 Hours
Batteries: Factors for selection of batteries - Rating calculation using datasheet. Primary Battery (Alkaline battery) - Secondary Battery (Lead acid storage battery, Nickel - Cadmium battery, Lithium ion battery and Lithium polymer battery) - Nuclear battery - Nano Battery
Flow battery: Introduction - Construction of Types of fuel cell

FUELS: COMBUSTION AND LUBRICANTS 9 Hours
Lubricants: Classification - Functions - Properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud and pour point) - Semi solid lubricant (greases with calcium based, sodium based, lithium based) - solid lubricants (graphite, molybdenum disulphide).

SPECTROCHEMICAL TECHNIQUES IN MATERIAL CHARACTERISATION 9 Hours
Introduction to spectroscopy - Beer Lambert’s Law.
Principle, instrumentation (block diagram only) and applications of: Colorimetric analysis (Estimation of concentration of Ferrous and copper ions in solutions), IR spectroscopy, Flame photometry, XRD, SEM.

| Theory: 45 | Tutorial: 0 | Practical: 0 | Project: 0 | Total: 45 Hours |

REFERENCES
3. Derek Fletcher and Frank C Walsh., Industrial Electrochemistry, Blackie Academic and Professional, London, 1993
U17MET1101  ENGINEERING GRAPHICS

Course Outcomes
After successful completion of this course, the students should be able to

CO1: Construct various plane curves.
CO2: Construct projection of points and projection of lines.
CO3: Develop projection of surfaces and solids.
CO4: Solve problems in sections of solids and development of surfaces.
CO5: Apply the concepts of isometric, and perspective projections
CO6: Apply free hand sketching in engineering practice.

Pre-requisites:
Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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Course Assessment methods

Direct
1. Continuous Assessment Test I, II (Theory component)
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component)
4. Model examination (lab component)
5. End Semester Examination (Theory and lab component)

Indirect
1. Course-end survey

PLANE CURVES, PROJECTION OF POINTS AND LINES  6+3 Hours
Importance of graphics in design process, visualization, communication, documentation and drafting tools. Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points. Projections of straight lines located in first quadrant - determination of true length and true inclinations.

**PROJECTIONS OF SURFACES AND SOLIDS**

6+3 Hours

Projections of plane surfaces - polygonal lamina and circular lamina, located in first quadrant and inclined to one reference plane. Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane.

**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**

6+3 Hours

Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

**PICTORIAL PROJECTIONS**

6+3 Hours

Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms and pyramids when its base resting on the ground by vanishing point method.

**FREE-HAND SKETCHING**

6+3 Hours

Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning. Sketching pictorial views from given orthographic views.

| Theory: 30 | Tutorial: 15 | Practical: 0 | Project: 0 | Total: 45 Hours |

**REFERENCES**

Course Outcomes
After successful completion of this course, the students should be able to

CO1: Explain the basics of problem solving techniques
CO2: Select appropriate data types and control structures for solving a given problem
CO3: Illustrate the representation of arrays, strings and usage of string operations
CO4: Illustrate the importance of pointers and functions
CO5: Explain the fundamentals of structures and unions
CO6: Explain the fundamentals of file handling

Pre-requisite: Nil

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Course Assessment methods:

Direct
1. Continuous Assessment Test I, II (Theory Component)
2. Assignment (Theory Component)
3. Group Presentation (Theory Component)
4. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component)
5. Model examination (lab component)
6. End Semester Examination (Theory and lab component)

Indirect
1. Course-end survey

Theory Component contents

FUNDAMENTALS OF PROBLEM SOLVING
9 Hours
Programs and Programming – Classification of Programming Languages based on Generations – Structured Programming Concept – Algorithm – Flowchart – Pseudo code

STRUCTURED PROGRAMMING
9 Hours
Introduction to C Programming – Operators and Expressions – Data Input and Output – Control Statements
ARRAYS AND STRINGS

Defining an array – Processing an array – Passing arrays to functions – Multidimensional Arrays

Defining a string – NULL character – Initialization of Strings – Reading and Writing Strings – Processing Strings – Character Arithmetic – Searching and Sorting of Strings – Library functions for strings

FUNCTIONS, STORAGE CLASSES AND POINTERS


STRUCTURES, UNIONS AND FILES

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types (Typedef) – Unions

Files: Opening and Closing a Data File – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing a file randomly using fseek

REFERENCES


Lab Component

List of Experiments

1. Writing algorithms, flowcharts and pseudo codes for simple problems.
2. Programs on expressions and conversions
3. Programs using if, if-else, switch and nested if statements
4. Programs using while, do-while, for loops
5. Programs on one dimensional arrays, passing arrays to functions and array operations
6. Programs using two dimensional arrays, passing 2D arrays to functions
7. Programs using String functions
8. Programs using function calls, recursion, call by value
9. Programs on pointer operators, call by reference, pointers with arrays
10. Programs using structures and unions.
11. Programs on file operations and modes.
12. Working with text files, random files and binary files

Theory: 0     Tutorial: 0     Practical: 30     Project: 0     Total: 30 Hours
REFERENCES
Course Outcomes

After successful completion of this course, the students should be able to

CO1: Determine different physical properties of a material like thermal conductivity, thickness of the material.

CO2: Perform experiments involving the physical phenomena like interference and diffraction

CO3: Apply physical theories in real life situations by also taking into account its limitation.

Pre-requisites:

NIL

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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Course Assessment methods

Direct

1. Pre-or Post-experiment Test/Viva; Experimental Report for each experiment; Model Examination
2. End Semester Examination

Indirect

1. Course-end survey
List of Experiments

1. Determine thermal conductivity of the given cardboard by Lee’s disc method.
2. Determine the thickness of a thin sheet by air wedge method.
3. Determine the co-efficient of viscosity of the given liquid by Poiseuille’s flow method.
4. Determine the value of acceleration due to gravity by compound pendulum.
5. Calculate the solar panel efficiency by using lux meter.
6. Determine the wavelengths of the violet, blue, green and yellow in mercury spectrum using spectrometer grating method (the green spectral line for which the wavelength is 5461 Å).
7. Determine Young’s modulus of the given bar using non-uniform bending method.
8. Calculate the frequency of the given tuning fork by longitudinal and transverse mode of vibrational methods.
9. Determine the velocity of ultrasonic sound and compressibility of the given liquid by using ultrasonic interferometer.
10. By using semiconductor laser determine:

| Wavelength of LASER using grating. |
| Acceptance angle & numerical aperture of optical fiber (grating element: N=5,00,000 lines/meter). |

**Theory: 0  Tutorial: 0 Practical: 30  Project: 0  Total: 30 Hours**

**REFERENCES**

1. Laboratory Manual of Engineering Physics by Dr. Y. Aparna & Dr. K. Venkateswara Rao (V.G.S Publishers)
Course Outcomes
After successful completion of this course, the students should be able to
CO1: Select the various tools and equipment’s used in the fabrication workshop.
CO2: Develop various models in carpentry and fitting
CO3: Make components using sheet metal work.
CO4: Select the various tools and joints for different applications in plumbing.
CO5: Demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) and test the components.
CO6: Estimate DC and AC Voltage and currents using appropriate measuring instruments.

Pre-requisites:
Nil

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Course Assessment methods

Direct
1. Pre-or Post-experiment Test/Viva; Experimental Report for each experiment; Comprehensive report / Model Examination
2. End Semester Examination

Indirect
1. Course-end survey

List of Experiments 30 Hours

GROUP – I
A. CIVIL ENGINEERING
1. Carpentry
   • Study of carpentry tools
   • Preparation of T joint
   • Preparation of dovetail joint

2. Plumbing
   • Study of pipeline joints

B. MECHANICAL ENGINEERING
1. Fitting
   • Study of fitting tools

Version 1 (17.8.17)
- Preparation of L joint
- Preparation of square joint

2. Sheet Metal Working
- Study of sheet metal working tools
- Preparation of cone
- Preparation of tray

GROUP - II (ELECTRICAL & ELECTRONICS ENGINEERING)
C. 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.

D. ELECTRONIC ENGINEERING PRACTICE
2. Study of CRO and Function generator.
3. PCB Design and Fabrication.
4. Soldering simple electronic circuits and checking continuity

| Theory: 0 | Tutorial: 0 | Practical: 30 | Project: 0 | Total: 30 Hours |
Course Outcomes
After successful completion of this course, the students should be able to

CO 1: Become an individual in knowing the self
CO 2: Acquire and express Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.
CO 3: Practice simple physical exercise and breathing techniques
CO 4: Practice Yoga asana which will enhance the quality of life.
CO 5: Practice Meditation and get benefited.
CO 6: Procure Self Healing techniques for propagating healthy society

Pre-requisites : NIL

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CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Course Assessment methods

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<td>1. Group Activity / Individual performance and assignment</td>
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<td>2. Assessment on Value work sheet / Test</td>
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<td>1. Mini project on values / Goodwill Recognition</td>
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Values through Practical activities: 30 hours

1. Knowing the self: Introduction to value education - Need & importance of Value education – Knowing the self – realization of human life – animal instinct vs sixth sense.
5. Fitness: Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadi suddhi pranayama – Silent sitting and listening to nature – Meditation.
REFERENCES

1. KNOW YOURSELF — SOCRATES – PDF format at

2. STEPS TO KNOWLEDGE: The Book of Inner Knowing – PDF format at

3. PROMOTING MENTAL HEALTH - World Health Organization – PDF format at
   www.who.int/mental_health/evidence/MH_Promotion_Book.pdf

4. LEARNING TO BE: A HOLISTIC AND INTEGRATED APPROACH TO
   VALUES – UNESCO PDF format at
   www.unesdoc.unesco.org/images/0012/001279/127914e.pdf

5. PERSONALITY DEVELOPMENT By SWAMI VIVEKANANDA
   www.estudantedavedanta.net/Personality-Development.pdf
Semester 2
Course Outcomes
After successful completion of this course, the students should be able to:

CO1  : Evaluate multiple integrals and apply them to find area, moment of inertia, centre of mass and volume

CO2  : Apply various vector differential operators and integral theorems for solving Engineering problems involving cubes and rectangular parallelepipeds.

CO3  : Construct analytic functions of complex variables and transform functions from z-plane and w-plane and vice-versa, using conformal mappings

CO4  : Use the fundamentals of residues, complex integration to evaluate real integrals

CO5  : Transform functions in time domain to frequency domain using Laplace transform

CO6  : Convert ordinary differential equations into algebraic equations using Laplace Transform and solve them using inverse Laplace transform

Pre-requisites:
Nil

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Course Assessment methods
Direct
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

Indirect
1. Course-end survey

MULTIPLE INTEGRALS  9 + 2 Hours
Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between cartesian and polar coordinates - Triple integration in cartesian coordinates – Application : Area as double integral — Moment of inertia - Centre of mass - Volume as triple integral.
VECTOR CALCULUS

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields - Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

ANALYTIC FUNCTION

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs) – Properties of analytic function – Construction of analytic function by Milne Thomson method – Conformal mapping : \( w = z + c \), \( cz \), \( 1/z \) and bilinear transformation.

COMPLEX INTEGRATION

Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula (excluding proofs) – Taylor’s and Laurent’s series expansions – Singularities – Cauchy’s residue theorem (excluding proof) – Application of residue theorem to evaluate real integrals - Unit circle and semi-circular contours (excluding poles on real axis).

LAPLACE TRANSFORM

Definition - Properties – Superposition - Shift in \( t \) - Shift in \( s \) - Time Derivatives - Time Integral – Initial and Final Value Theorems – Periodic functions: sine wave, saw-tooth, square and triangular waves

INVERSE LAPLACE TRANSFORM


Theory: 45   Tutorial: 15   Practical: 0   Project: 0   Total : 60 Hours

REFERENCES


E books and online learning materials

Course Outcomes
After successful completion of this course, the students should be able to
CO1: Recognize the core concepts of conducting materials.
CO2: Perceive the preambles, types of semiconductors and to conceive the Hall effect along with its applications
CO3: Categorize the magnetic materials based on their properties.
CO4: Elucidate the basics of superconductors and its applications
CO5: Understand the mechanism of dielectrics and its engineering applications.
CO6: Confer the properties, preparation and applications of new engineering materials and nano materials.

Pre-requisites :
NIL

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Course Assessment methods

Direct
1. Continuous Assessment Test I, II
2. Cooperative learning report, Assignment; Group Presentation, Project report, Poster preparation
3. End Semester Examination

Indirect
1. Course-end survey

CONDUCTING MATERIALS
Classical free electron theory of metals-electrical conductivity – thermal conductivity - expression – Wiedemann Franz law(derivation) – Lorentz number – drawbacks of classical
theory – Fermi distribution function – density of energy states – effect of temperature on Fermi energy.

**SEMICONDUCTING MATERIALS**

9 Hours

Origin of band gap in solids (qualitative treatment only) - carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – variation of Fermi level with temperature - electrical conductivity – band gap semiconductor – extrinsic semiconductor (Qualitative only) – variation of Fermi level with temperature and impurity concentration – Hall effect – determination of Hall coefficient – experimental set up – applications.

**MAGNETIC AND SUPERCONDUCTING MATERIALS**

9 Hours


Superconducting materials: Superconducting phenomena – properties of superconductors – Meissner effect, isotopic effect. Type I & Type II superconductors – high Tc superconductors- applications: cryotron, magnetic levitation and squids.

**DIELECTRIC MATERIALS**

9 Hours


**NEW ENGINEERING MATERIALS AND NANO TECHNOLOGY**

9 Hours

New engineering materials: metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics- properties of NiTi alloy applications, advantages and disadvantages of SMA.


| Theory: 45 | Tutorial: 0 | Practical: 0 | Project: 0 | Total: 45 Hours |

**REFERENCES**

Course Outcomes
After successful completion of this course, the students should be able to
CO1: Construct a phase diagram (K3)
CO2: Discuss the constitution of alloys and categorize the alloys (K2)
CO3: Discuss the applications of ferrous alloys based on their properties (K3)
CO4: Discuss the applications of Non-ferrous materials based on their properties (K3)
CO5: Outline about the non-metallic materials (K2)
CO6: Discuss the heat treatment techniques and apply in real life situation (K3)

Pre-requisites:
NIL

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Pre-requisites:
NIL

Course Assessment methods
Direct
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable)
3. End Semester Examination

Indirect
1. Course-end survey

CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 9 Hours
Constitution of alloys - Solid solutions, substitutional and interstitial - Phase rule - condensed phase rule - Construction of phase diagram (thermal analysis) - Applications of phase rule: Simple eutectic system (Ag - Pb, Fe - C system) - Isomorphism, eutectic, peritectic, eutektoid and peritectoid reactions.

FERROUS AND NON-FERROUS MATERIALS AND ALLOYS 12 Hours
Composition, structure and properties of Carbon steels: low alloy steels - stainless steels - tool steels Cast irons: Grey iron, ductile iron, white iron and malleable iron

**NON-METALLIC MATERIALS**

9 Hours
Polymeric materials - Formation of polymer structure - Properties, processing and applications of engineering polymers: Advanced structure ceramics - WC-TiC- Al2O3 - SiC - Si3N4, CBN, Diamond and composites.

**ELECTRICAL & THERMAL PROPERTIES OF MATERIALS**

6 Hours

**HEAT TREATMENT**

9 Hours
Definition - Annealing, types - Normalizing, hardening and Tempering of steel - Isothermal transformation diagrams - Cooling curves superimposed on I.T. diagram CCR - Harden ability, Jominy end quench test - Austempering - Martempering - Case hardening - types.

| Theory: 45 | Tutorial: 0 | Practical: 0 | Project: 0 | Total: 45 Hours |

**REFERENCES**

Course Outcomes
After successful completion of this course, the students should be able to
CO1: Explain the concept of equilibrium of particles subjected to concurrent forces.
CO2: Determine the reactions in different types of support and loading conditions.
CO3: Estimate the moment of inertia for various shapes and sections.
CO4: Make use of various concepts of friction.
CO5: Solve problems using the concepts in kinematics
CO6: Solve problems in kinetics.

Pre-requisites:
Nil

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CO-PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Programme Outcomes(POS)

Course Assessment methods

Direct
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review,
   Group Presentation, Project report, Poster preparation, Prototype or Product
   Demonstration etc (as applicable)
3. End Semester Examination

Indirect
1. Course-end survey

BASICS & STATICS OF PARTICLES 12 Hours


EQUILIBRIUM OF RIGID BODIES 12 Hours

Moment of a force about point – Varignon’s theorem- Moment of a couple-Resolution of force in to force couple system-Resultant of coplanar non concurrent system - Types of supports and
their reactions- Requirements of stable equilibrium - Equilibrium of Rigid bodies in two dimensions.

**PROPERTIES OF SURFACES AND SOLIDS 12 Hours**

First moment of area and the Centroid of sections Rectangle, circle, triangle, T section, I section Angle section and Hollow section. Second and product moments of plane area Rectangle, triangle, circle. T Section, I section, Angle section and Hollow section, Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia.

**FRICTION 12 Hours**

Frictional force-Law of coulomb friction, simple contact friction, Rolling resistance and Belt friction, Ladder friction, Wedge friction.

**DYNAMICS OF PARTICLES 12 Hours**

**Kinematics:** Rectilinear & Curvilinear motion of particles, Displacements Velocity and acceleration.

**Kinetics:** Newton’s law, Work Energy method, Impulse and Momentum, Impact of elastic bodies.

| Theory: 45 | Tutorial: 15 | Practical: | Project: 0 | Total: 60 Hours |

**REFERENCES**

Course Outcomes
After successful completion of this course, the students should be able to:
CO1: Acquire the fundamental knowledge of Electric circuits and semiconductor devices
CO2: Select a suitable semiconductor device for specific application
CO3: Understand the functionality of Op-amps and gates
CO4: Understand the construction, working principle, characteristics and applications of motors
CO5: Apply the fundamental laws of magnetic circuits to electrical motors
CO6: Choose a suitable motor for desired application
Pre-requisites: Nil

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CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Course Assessment methods
Direct
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable)
3. End Semester Examination

Indirect
1. Course-end survey

ELECTRIC CIRCUITS FUNDAMENTALS 8 Hours
(Qualitative Treatment Only)
Ohm’s law, Kirchoff’s law, Passive elements.
Introduction to AC voltage: Alternating quantity, cycle, time period, frequency and average and RMS value, Relation between Voltage, Current, Resistance and Power in ac circuits. Energy stored in the passive elements.
Electromagnetism: Magnetic flux, Flux density, Permeability, Field intensity, –Faraday’s laws of Electromagnetic Induction – Self-inductance and Mutual inductance, Fleming’s rule

LOW POWER SEMICONDUCTOR DEVICES 7 Hours
(Qualitative Treatment Only)
Symbol, operation and V-I Characteristic and types of Semiconductor diode - Zener diode- photo diode - light emitting diode, Bipolar Junction transistors, JFET, MOSFET
HIGH POWER SEMICONDUCTOR DEVICES:  7 Hours
(Qualitative Treatment Only)
Symbol, operation and V-I Characteristic of Power diodes, Power Bipolar Junction
transistors –Power MOSFET, IGBT, SCR. Comparison of power semiconductor devices.

INTEGRATED CIRCUITS (Qualitative Treatment Only)  8 Hours
Analog Electronics: Operational amplifiers, Ideal op-amp, adder, subtractor, amplifiers –
inverting, non-inverting and differential amplifiers, Integrator, Differentiator.
Binary logic gates: – AND, OR, NOT, Universal gates, Introduction to Boolean algebra,
Multiplexers, De-multiplexers, Encoders, Decoders.

ELECTRICAL MOTORS (Qualitative Treatment Only)  8 Hours
DC motor: Types of motors, Principle of operation – Back-emf and voltage equation –
Torque and speed Characteristics of Series, Shunt and compound motors
Transformer: Ideal Transformer, transformation ratio, Emf equation, Applications
Ac motors: Single phase induction motor, Three phase induction motor – Cage rotor and
Wound rotor – Principle of operation – Torque Slip characteristics

SPECIAL MACHINES: (Qualitative Treatment Only)  7 Hours
Introduction, Stepper motor, Types of stepper motor, Permanent Magnet DC motor, to
Brushless DC motor, Switched Reluctance Motor, Servo motor, Selection of motor for
automotive applications

Theory: 45  Tutorial: 0  Practical: 0  Project: 0  Total: 45 Hours

REFERENCES
2. Thyagarajan T., Sendur Chelvi K.P. and Rangaswamy T.R., Engineering
   Basics: Electrical, Electronics and Computer Engineering, Revised II edition, New
   Age International Pvt. Ltd., 2007
   International, 2003
5. Theraja B.L., Fundamentals of Electrical Engineering and Electronics, S. Chand
   Global Education, 2013
Course Outcomes
After successful completion of this course, the students should be able to

CO1: Prepare standard solutions (S1)
CO2: Analyse the properties of water by applying the chemical concepts (S2)
CO3: Analyse the solutions by electrochemical techniques and apply it in real life situations like corrosion, soil, water testing etc (S2)
CO4: Analyse the solutions by spectroscopic techniques and apply it in real life situations like corrosion, soil, water testing etc (S2)

Pre-requisites:
NIL

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Course Assessment methods

- Direct
  1. Post-experiment Test/Viva; Experimental Report for each experiment; Model Examination
  2. End Semester Examination

- Indirect
  1. Course-end survey

List of Experiments

1. Preparation of normal solutions of the following substances - Sodium carbonate, Hydrochloric acid and Buffer solution

WATER TESTING

2. Determination of total, temporary and permanent hardness by EDTA method.
3. Estimation of DO by Winkler’s method
4. Estimation of alkalinity by Indicator method.
5. Estimation of chloride by Argentometric method.

ELECTRO CHEMICAL ANALYSIS

7. Conductometric estimation of mixture of acids and strong base
8. Estimation of corrosion of Iron by Potentiometry

PHOTOMETRY

10. Estimation of sodium and potassium in water by Flame photometry.
DEMONSTRATION
11. Determination of Fire point and Flash point
12. Determination of Cloud and Pour point
14. Determination of Molecular weight by Viscometer

Theory: 0   Tutorial: 0   Practical: 30   Project: 0   Total: 30 Hours

REFERENCES
Course Outcomes
After successful completion of this course, the students should be able to
CO1: Understand the performance characteristics of DC Motors
CO2: Understand the performance characteristics of AC Motors
CO3: Understand the characteristics of semiconductor devices.
CO4: Understand the VI characteristics of BJT.
CO5: Understand Ohms and Kirchhoff’s Law.

Pre-requisites:
NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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Course Assessment methods
Direct
1. Pre-or Post-experiment Test/Viva; Experimental Report for each experiment; Comprehensive report / Model Examination
2. End Semester Examination

Indirect
1. Course-end survey

List of Experiments 30 Hours
ELECTRONICS:
1. Verification of Ohms and Kirchhoff’s Law
2. Power Measurement in Simple RLC Circuits
3. V/I Characteristic of PN Junction Diode
4. V/I Characteristic of Zener Diode
5. V/I Characteristic of BJT

ELECTRICAL:
1. Torque - speed characteristics of dc shunt motor
2. Torque - speed characteristics of dc Compound motor
3. Torque - slip characteristics of single phase Induction Motor
4. Torque - slip characteristics of three phase Induction Motor
5. Open circuit test on transformer for finding the transformation ratio

Theory: 0  Tutorial: 0  Practical: 30  Project: 0  Total: 30 Hours
REFERENCES
Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop a healthy relationship & harmony with others
CO 2: Practice respecting every human being
CO 3: Practice to eradicate negative temperaments
CO 4: Acquire Respect, Honesty, Empathy, Forgiveness and Equality
CO 5: Practice Exercises and Meditation to lead a healthy life
CO 6: Manage the cognitive abilities of an Individual

Pre-requisites:
1. U17VEP1501 / PERSONAL VALUES

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Course Assessment methods

Direct
1. Group Activity / Individual performance and assignment
2. Assessment on Value work sheet / Test

Indirect
1. Mini project on values / Goodwill Recognition

Values through Practical activities: 30 hours

1. Introduction: Introduction to interpersonal values – Developing harmony with others – Healthy relationship – Need & importance of interpersonal values for dealing with others and team - Effective communication with others.

2. Maneuvering the temperaments: From Greed To Contentment - Anger To Tolerance - Miserliness To Charity – Ego To Equality - Vengeance To Forgiveness.


4. Pathway to Blissful life:

| Theory: 0 | Tutorial: 0 | Practical: 30 | Project: 0 | Total: 30 hours |

REFERENCES
1. INTERPERSONAL SKILLS Tutorial (PDF Version) - TutorialsPoint
   www.tutorialspoint.com/interpersonal_skills/interpersonal_skillsTutorial.pdf
2. INTERPERSONAL RELATIONSHIPS AT WORK - KI Open Archive - Karolinska
   www.publications.ki.se/xmlui/bitstream/handle/10616/39545/thesis.pdf?sequence=1
3. VALUES EDUCATION FOR PEACE, HUMAN RIGHTS, DEMOCRACY – UNESCO
4. MANEUVERING OF SIX TEMPERAMENTS - Vethathiri Maharishi
   www.ijhssi.org/papers/v5(5)/F0505034036.pdf
5. THE BLISS OF INNER FIRE: HEART PRACTICE OF THE SIX ... - Wisdom Publications
   www.wisdompubs.org/sites/default/files/Bliss%20of%20Inner%20Fire%20Book%20Preview.pdf...
COURSE OUTCOMES
After successful completion of this course, the students should be able to:

CO1: Achieve the desirable awareness regarding significant social problems and identify the needs to provide a possible and innovative solution.

CO2: Acquire and demonstrate effective professional and technical skills to deal with social issues through innovative leadership and sustainable services / approaches.

CO3: Provide students with a rich practical and socially oriented team work approach.

CO4: Explain how to make leadership decisions concerning organizational structure and the role of project resources on a project’s team.

CO5: Enhance technical knowledge in addressing the needs of a community problem.

CO6: Identify tools and techniques for planning and working on a project.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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Course Assessment methods

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Version 1 (17.8.17)
SOCIAL BONDING AND ENGINEERING

Society and its impact on the individual – Responsibility of individuals towards community building – Essential requirement of the society – Role of an engineering graduate in approaching the requirements - Developing social consciousness.

ENGINEERING PREREQUISITE FOR ENHANCED SOCIAL LIVING

Theoretical reading (Based on the project / general – Books to be identified by the team) - Inculcating Social immersion and Leadership- Study on the society and identifying problems - Social immersion and Engineering implementation - Analysis of problems on issue based - Identification of causes and effects of the social issue identified.

ESSENTIAL ENGINEERING INNOVATION

Essential Engineering Concepts - Multiple approaches towards the problem &Selection for addressing- Addressing a theoretical social problem -Providing multiple solutions for the problem

PROJECT PLANNING AND APPROACHES

Knowledge on budgeting and fund raising - Approaching agencies related to problems. Partnering with agencies- Presentation Skills - Report preparation

**BROAD AREA OF PROJECTS**

*(Students can also identify their own social issue)*

Water / Sanitation and Hygiene - Waste Management -Women Empowerment- Community health - Child health/ Poverty/Education/others - Energy management -Environment Management - Adult Education - -Youth Empowerment - Green Industry - Given above are the broad areas of projects recommended. Projects may vary to individuals/ groups/ class/ branch.

**TOTAL : 60 Hours**

**References:**


ENGLISH ELECTIVES
U17ENE2501 – ACADEMIC ENGLISH

(Common to all branches of Engineering and Technology)

COURSE OUTCOMES

After the course the Student will be able to:

CO1: Maintain the standards of communal communication and acquire excellent listening skills with good Received Pronunciation.
CO2: Accommodate with speaking skills, with fluency in communication obtaining levels of competency.
CO3: Project desirable research oriented skills to interface the corporate and meet out the challenges of the modern trends.
CO4: Familiarising with learner-centred strategies and improve writing activities through proper analysis.
CO5: Develop the ability in procuring information and effectiveness in communication based on situations.
CO6: Ability to present the individuals opinions, persuasion skills and academic curricular along with career profiles.

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Course Assessment methods

Direct

6. Continuous Assessment
7. Cooperative learning
8. Assignment
9. Presentation
10. End Semester Examination

Indirect

1. Course-end survey
AUDITORY PERCEPTION

Listening for understanding & information - short announcements, short conversations, telephonic conversation; Listening to British, American, Australian and Neutral Accent of Indian English; Listening and synthesizing information; Listening to TED/INK Talks (General); Critical review of short films, documentaries.

ORAL FLUENCY


FOUNDATIONS OF ACADEMIC WRITING

Plan and write a library-based coursework assignment on an Engineering topic. Read academic textbooks and journal articles. Research and analyse scientific data and express understanding. Procuring information - Identifying research papers in a specific discipline, reading abstracts of research papers, reading the abstract of projects, reading articles from journals and publications and documenting/ archiving information.

TRAITS OF RESEARCH WRITING

Reading research articles and summarizing. Review of Secondary sources - Writing an abstract - Writing an introduction to a paper in academic writing - Avoiding plagiarism – Bibliography – International Academic Styles of writing a research paper - Peer Evaluation.

PROCESS OF PREPARING A RESEARCH ARTICLE

Research Projects – Converging areas of interest into field of research - Identifying the problem of research – Formulating hypothesis – Research Objectives – Literature Review – Identifying the research gap - Research methodology – Requirements – Plan of work – Result and Discussion – Conclusion – References – Appendices.

L: 0 P: 60 Total: 60 Hours

Reference Books:


U17ENE2502 – PROFESSIONAL ENGLISH

(Common to all branches of Engineering and Technology)

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**COURSE OUTCOMES**

After the course the Student will be able to:

CO1: Formulate an understanding for effective use of short telephonic and oral conversations.

CO2: Analyse and identify necessary interpersonal and persuasive skills for effective oral presentation.

CO3: Employ appropriate strategies to articulate random thoughts and ideas in brainstorming sessions.

CO4: Analyse and review technical and non-technical contents.

CO5: Compose and compile effective written documents needed in a professional scenario.

CO6: Recognize and establish dynamic corporate communication and relationship.

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**CO/PO Mapping**

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

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**Course Assessment methods**

**Direct**

1. Continuous Assessment
2. Review
3. Assignment
4. Report
5. End Semester Examination

**Indirect**

1. Course-end survey
AUDITORY PERCEPTION 12

Listening for understanding & information - short announcements, short conversations, telephonic conversation; Listening to British, American, Australian and Neutral Accent of Indian English; Listening and synthesizing information; Listening to TED/INK Talks (General); Critical review of short films, documentaries

ORAL FLUENCY 12

Informal introduction of self and others, conversation starters, articulating simple thoughts and ideas with clarity, Seeking Permission, Talking about People and Places, Describe an object or event. Retelling an incident, voicing opinions, persuasion skills, speaking from a single perspective (debate) - preparing and delivering an informal talk, Introduction to Presentation Skills – Formal tone – Impersonal style - Structuring and Presenting information. Transcode graphics orally

FOUNDATIONS OF PROFESSIONAL COMMUNICATION 12

Focused listening, Listening to lectures and talks on science and technology, Listening in international seminars, Video Documentary review, Receiving compliments and sharing information in a corporate scenario, Speaking in Formal Context. Business Vocabulary. Speaking practice in a variety of registers, Giving and Getting Product and Service Information. Product Review. Recording equipment and safety checklist. Business Itinerary, Presenting a Company Profile, Encoding and decoding advertisements

CORPORATE DYNAMICS 12

Corporate Social Responsibility, Crisis Management - handling issues and situations, Creating a powerful first impression, Goal Setting - Immediate goals, short term goals, long term goals, smart goals, strategies to achieve goals, Time Management - Types of time, Identifying time wasters, time management skills, Stress Management - Reasons, Strategies to cope up with stress, Stress-busters, Emotional Intelligence – Mental health, Job performance, Managing emotions

PROFESSIONAL WRITING 12

Writing Agenda and minutes of the meetings, Writing daily/periodic reports, Writing business / professional letters, Business E-mail - Writing an Email Announcing a Meeting - Writing an Email Announcing the modifications in a Meeting - Writing an Email Announcing the cancellation/postponement of Meeting

L: 0   P: 60    Total: 60 Hours

Reference Books:

COURSE OUTCOMES

After the course the Student will be able to:

CO1: Recognize the inventory of listening strategies by various proposed listening activities.

CO2: Construct learning situations and increase speaking skills based on strong educational and communication theories.

CO3: Invent and practice effective reading strategy to enhance competent communication

CO4: Honing the strengths of writing skills and set objectives for future development

CO5: Showcase industry-ready attitude along with corporate communication=

CO6: Develop imaginative and critical thinking abilities, and improve the problem solving aptitude.

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AUDITORY PERCEPTION 12

Listening for understanding & information - short announcements, short conversations, telephonic conversation; Listening to British, American, Australian and Neutral Accent of Indian English; Listening and synthesizing information; Listening to TED/INK Talks (General); Critical review of short films, documentaries.

ORAL FLUENCY 12


FOUNDATIONS OF ETS 12

Analogy, Synonyms and antonyms, Morphemes – Derivational and Inflectional, Affixes – Prefix and Suffix, strategies to improve high frequency vocabulary

VERBAL BASED COMPETENCY 12


SKILL BASED COMPETENCY 12

Analytical writing – Argumentative writing, a 30-minute Analyse an argument, a 30-minute Analyse an issue, Listening and Speaking Tasks in ETS, Reading Comprehension – GRE, GMAT, TOEFL, IELTS, GATE

L: 0  P: 60  Total: 60 Hours

Reference Books:

