

B. E. SYLLABUS

I & II SEMESTER

**With
Scheme of Teaching
& Examination**

**SCHEME AND COURSE CONTENT FOR I AND II SEMESTER
(COMMON TO ALL BRANCHES)
SCHEME OF TEACHING AND EXAMINATION**

I SEMESTER B.E.

PHYSICS GROUP

Sl. No.	Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E.	S.E.E.	Credits
1	17MA101	Engineering Mathematics –I	4+0+0+0	4	50	50	04
2	17PH102	Engineering Physics	4+0+0+0	4	50	50	04
3	17CV103	Elements of Civil Engineering & Engineering Mechanics	4+0+0+0	4	50	50	04
4	17ME104	Elements of Mechanical Engineering	4+0+0+0	4	50	50	04
5	17EE105	Basic Electrical Engineering	4+0+0+0	4	50	50	04
6	17ME106	Engineering Skill Development Lab	0+0+3+0	3	50	50	01
7	17HU107	Constitution of India & Professional Ethics	1+0+0+0	1	50	50	00
8	17HU108	Kannada	1+0+0+0	1	--	--	--
9	17PH109	Engineering Physics Lab	0+0+3+0	3	50	50	02
10	17BT120	Biology for Engineers	2+0+0+0	2	50	00	02
Total			30	30	450	400	25

I SEMESTER B.E.**CHEMISTRY GROUP**

Sl. No.	Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E.	S.E.E.	Credits
1	17MA101	Engineering Mathematics –I	4+0+0+0	4	50	50	04
2	17CY110	Engineering Chemistry	4+0+0+0	4	50	50	04
3	17CS111	Computer Concepts And C Programming	4+0+0+0	4	50	50	04
4	17EC112	Basic Electronics	4+0+0+0	4	50	50	04
5	17CV113	Environmental Studies	1+0+0+0	1	50	50	00
6	17HU114	English & Communication Skills	2+0+1+0	3	50	50	02
7	17ME115	Computer Aided Engineering Graphics	2+0+2+0	4	50	50	03
8	17CS116	Computer Concepts And C Programming Lab	0+0+3+0	3	50	50	02
9	17CY117	Engineering Chemistry Lab	0+0+3+0	3	50	50	02
Total			30	30	450	450	25

II SEMESTER B.E.**PHYSICS GROUP**

Sl. No.	Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E.	S.E.E.	Credits
1	17MA201	Engineering Mathematics –II	4+0+0+0	4	50	50	04
2	17PH102	Engineering Physics	4+0+0+0	4	50	50	04
3	17CV103	Elements of Civil Engineering & Engineering Mechanics	4+0+0+0	4	50	50	04
4	17ME104	Elements of Mechanical Engineering	4+0+0+0	4	50	50	04
5	17EE105	Basic Electrical Engineering	4+0+0+0	4	50	50	04
6	17ME106	Engineering Skill Development Lab	0+0+3+0	3	50	50	01
7	17HU107	Constitution of India & Professional Ethics	1+0+0+0	1	50	50	00
8	17HU108	Kannada	1+0+0+0	1	--	--	--
9	17PH109	Engineering Physics Lab	0+0+3+0	3	50	50	02
10	17BT120	Biology for Engineers	2+0+0+0	2	50	00	02
Total			30	30	450	400	25

II SEMESTER B.E.**CHEMISTRY GROUP**

Sl. No.	Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E.	S.E.E.	Credits
1	17MA201	Engineering Mathematics –II	4+0+0+0	4	50	50	04
2	17CY110	Engineering Chemistry	4+0+0+0	4	50	50	04
3	17CS111	Computer Concepts And C Programing	4+0+0+0	4	50	50	04
4	17EC112	Basic Electronics	4+0+0+0	4	50	50	04
5	17CV113	Environmental Studies	1+0+0+0	1	50	50	00
6	17HU114	English & Communication Skills	2+0+1+0	3	50	50	02
7	17ME115	Computer Aided Engineering Graphics	2+0+2+0	4	50	50	03
8	17CS116	Computer Concepts And C Programming Lab	0+0+3+0	3	50	50	02
9	17CY117	Engineering Chemistry Lab	0+0+3+0	3	50	50	02
Total			30	30	450	450	25

17MA101 - ENGINEERING MATHEMATICS – I**Sub Code: 17MA101****Credits : 04****Hrs/Week: 4+0+0+0****Total Hours : 52****This Course will enable students to**

1. Develop a thorough knowledge about the system of linear equations and obtaining their solutions
2. Be skilled in computations and applications of infinite series and sums and analyze the nature of a given infinite series, whether it converges or diverges.
3. Apply the concept of partial differentiation of a function of two or more independent variables to solve engineering problems.
4. Master the basic tools of calculus and become skilled in its use for solving problems in science and engineering
5. Be able to utilize methods of integration to compute the area, length of an arc, volume and surface area of curves

UNIT – I**Linear algebra:**

Vectors, linearly dependent and independent set of vectors, elementary row transformation of a matrix, rank of a matrix, Gauss elimination method, Gauss seidel method, Eigen values, Eigen vectors of square matrices, Rayleigh's power method to find the largest eigen value and the corresponding eigen vector. Linear transformation and diagonalization of a square matrix, quadratic forms, reduction to canonical form by orthogonal transformation. **10 Hours**

UNIT - II**Infinite Series:**

Convergence and divergence of infinite series, Comparison test, Ratio test, Cauchy's root test, Cauchy's integral test.

Determination of nth derivatives of some standard functions, Leibnitz's theorem (statement only), illustrative examples. Taylor's theorem for a function of single variable (Without proof), Expansion of functions into Taylor and Maclaurin's series. **10 Hours**

UNIT - III**Partial Differentiation:**

Euler's theorem. Total differentiation. Differentiation of composite and implicit functions, Jacobians, Errors and approximations. Taylor's theorem for a function of two variables, Maxima and Minima for a function of two variables- Lagrange's method of undetermined multipliers (with one subsidiary condition). **10 Hours**

UNIT – IV**Differential calculus:**

Polar curves, Angle between the radius vector and the tangent. Angle between two curves, pedal equation for polar curves. Derivatives of arcs and radius of curvature -Cartesian, parametric, polar forms. Rolle's Theorem (without proof) Lagrange's and Cauchy's Mean Value Theorems. **10 Hours**

UNIT – V**Integral Calculus:**

Reduction formulae for the integrals of functions $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$. Evaluation of these integrals with standard limits- problems. Tracing of standard curves in Cartesian form, parametric form and polar form. Applications to find area and length of given curves, volumes and surface areas of solids of revolution. **12 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. To solve systems of linear equations and learn the concept of linear transformations so that they can apply them in their field of study.
2. To determine the nature of a given infinite series, whether it converges or diverges.
3. To learn the concept of partial differentiation of a function of two or more independent variables and apply them to solve engineering problems.
4. To understand the concept of radius of curvature and mean value theorems
5. To understand and apply integral calculus techniques to find the area, length of an arc, volume and surface area of curves.

TEXT BOOKS:

1. Kreyszig: “Advanced Engineering Mathematics”, Vol- 1 & II, Wiley, 2013.
2. B.S.Grewal : “Higher Engineering Mathematics” – 42nd Edition, Khanna publishers., 2012

REFERENCE BOOKS:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw –Hill Ltd., 2006
2. N.Piskunov :Differential and Integral Calculus, Vol. 1, CBS Publishers, 2004.

E-BOOKS:

1. <http://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx>
2. http://www.ec.unipg.it/DEFS/uploads/linalg_evals_evects.pdf
3. <https://www.math.ku.edu/~lerner/LAnotes/LAnotes.pdf>
4. <https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/> (Gilbert Strang video lectures)
5. <http://nptel.ac.in/downloads/122101003/> (lecture notes)

MOOC/NPTEL:

1. <http://nptel.ac.in/>
2. <http://academicearth.org/>

17PH102 - ENGINEERING PHYSICS**I/II Semester B.E****Sub Code : 17PH102****Hrs/week : 4+0+0+0****Credits : 04****Total hours : 52****Course Learning Objectives:**

1. Limitations of the classical approach to describe various processes and introduce the concepts of wave mechanics.
2. To understand the behaviour of solids by studying various crystal structures.
3. To understand the properties of conductors & semiconductor.
4. To understand working of laser, types of lasers and optical fibers.
5. To highlight the importance of materials & their applications.

UNIT - I**Wave Mechanics:**

Matter waves – de Broglie's relation, characteristics of matter waves, group velocity and phase velocity, Wave mechanics – wave function, properties and physical significance of a wave function, Probability density and Normalization of wave function. One dimensional, time independent Schrödinger wave equation, Eigen values and Eigen functions, Application of Schrödinger wave equation – Energy Eigen values for a free particle, Energy Eigen values of a particle in a potential well of infinite depth. **10 Hours**

UNIT – II**Crystallography & x-rays**

Space lattice, unit cell, primitive cell. Lattice parameters. Crystal systems and Bravais lattice Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Crystal structures of NaCl, CsCl, ZnS, diamond and Quartz (HCP). X rays – generation and properties, continuous and characteristic x-rays, Bragg's law and Bragg spectrometer, crystal structure determination. **10 Hours**

UNIT – III**Conductors and semiconductors**

Free-electron concept. Classical free-electron theory - Assumptions. Drift velocity. Mean collision time and mean free path. Relaxation time. Expression for electrical conductivity in metals. Effect of impurity and temperature on electrical resistivity of metals - Matthiessen's rule and Nordheim's rule. Failures of classical free-electron theory. Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics— Fermi energy and Fermi factor. Semiconductors - intrinsic and extrinsic semiconductors, Carrier generation in intrinsic and extrinsic semiconductors, Conductivity and effect of temperature on conductivity of intrinsic and extrinsic semiconductors, intrinsic effect, maximum device temperature. Hall effect – theory, derivation of expression for carrier concentration. **12 Hours**

UNIT – IV**Lasers & Optical Fibers**

Luminescence, absorption and emission of radiation. Einstein's theory and Einstein's coefficients. Condition for Laser action. Requisites of a Laser system – active medium, pumping mechanism and optical resonant cavity, three level and four level lasers. Principle, Construction and working of ruby laser, He-Ne and semiconductor Laser. Applications of lasers. Optical fibers - propagation mechanism in optical fibers, angle of acceptance, numerical aperture. Types of optical fibers and modes of propagation, distortion and attenuation, applications. **10 Hours**

UNIT – V**Special materials and applications**

Ferroelectric materials – characteristic properties, electro-strictive materials and piezo-electric materials, applications. Ferromagnetic materials – characteristic properties, classification and applications. Ultrasonic waves – methods of generation (Qualitative), properties and applications. Superconductors – characteristics, classification, applications. Nano materials – preparation (Milling and PVD), properties and applications. **10 Hours**

Course Outcomes:

1. Comprehend various properties of materials on the basis of quantum concepts.
2. Analyse the behaviour of solids through various crystal structures
3. Understand and explain the behaviour of materials like conductors & semiconductors
4. Provide the information about Laser & optical fiber.
5. Understand the importance of materials like ferroelectrics, ferromagnetic materials, superconductors and nanomaterials for various technological applications.

TEXT BOOK:

1. **G.K.Shivakumar:** *Engineering Physics, Prism Engineering Education Series, Prism books Pvt Ltd., Bangalore, 2010-11 edition (Reprint 2013-14).*

REFERENCE BOOKS:

1. **A.J.Dekker:** *Electrical Engineering Materials, Prentice Hall India Pub., New Delhi, Reprint 2011.*
2. **Kenneth Krane:** *Modern Physics, Wiley International, 3rd Edition, 2012.*
3. **S.O Pillai:** *Solid State Physics, New Age International, 7th Edition, 2015.*
4. **A.Ghatak:** *Optics, Tata McGraw Hill Pub., 5th edition, 2012*
5. **C.Kittel:** *Introduction to Solid State Physics, Wiley Eastern Ltd., 8th edition, 2005.*
6. **V. Rajendra:** *Engineering Physics, Tata McGraw Hill Pub., 1st edition, 2010.*

E Books /NPTEL

1. [http://web.pdx.edu/~pmoeck/lectures/Modern%20Physics%20for%20Science%20and%20Engineering%20\(eval\).pdf](http://web.pdx.edu/~pmoeck/lectures/Modern%20Physics%20for%20Science%20and%20Engineering%20(eval).pdf)
2. <http://nptel.ac.in/courses/122101002/23>
3. <http://nptel.ac.in/courses/113106039/1>
4. <http://nptel.ac.in/courses/115106061/>

**17CV103 - ELEMENTS OF CIVIL ENGINEERING &
ENGINEERING MECHANICS**

Sub Code	: 17CV103	Credits	: 04
Hrs/Week	: 4+0+0+0	Total Hours	: 52

Course Learning Objectives:**This Course will enable students to**

1. Understand the scope and importance of Civil Engineering and to improve analytical skill in calculating resultant of coplanar concurrent force system
2. Calculate the resultant of coplanar non-concurrent force systems.
3. Identify different types of beams, supports, loadings and to find the support reactions in determinate beams and also to solve friction forces.
4. Compute the centroid and moment of inertia of typical sections.
5. Understand the different types of approach to solve dynamic problems

UNIT – I

Scope and importance of different fields of Civil Engineering.

Introduction to Engineering Mechanics: Basic idealizations - Definition of force, Characteristics of a force, Force systems and classification; Axioms of Mechanics. Concept of free body diagram. Resolution of forces, Composition of forces - Definition of Resultant; Resultant of coplanar concurrent force system. **9 Hours**

UNIT - II

Moment of a force, couple, characteristics of couple, Equivalent force - couple system; Varignon's theorem, Resultant of coplanar - non-concurrent force system. Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems. Equilibrium of coplanar concurrent force system. **11 Hours**

UNIT - III

Equilibrium of coplanar non concurrent force systems: Simple, Hinged and fixed supports, Point, udl and uvl loads, support reactions for statically determinate beams.

Friction – Theory of friction, Types of friction, Coulomb’s Laws of dry friction, Limiting friction, Angle of friction, angle of repose, Ladder friction.

10 Hours

UNIT - IV

Centroid of plane figures; Locating the centroid of rectangular, triangular, semicircular, quarter of a circular area and sector of a circular areas using method of integration, Centroid of simple built up sections (consisting of three components).

Moment of inertia of an area, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, triangular, semicircular, quarter of a circular area and sector of a circular areas from the method of integration; Moment of inertia of composite areas (consisting of three components).

10 Hours

UNIT – V

Kinetics of rigid bodies, Dynamic equilibrium, D’Alembert’s principle, work-energy and impulse momentum principle, impact of elastic bodies (direct central impact).

12 Hours

TEXT BOOKS:

1. Ferdinand L. Singer “*Engineering Mechanics*”, Harper and Row Publishers, New York, 3rd edition, 2014
2. Bhavikatti,S.S, “*Engineering Mechanics*”, New Age International Publishers, New Delhi. 3rd edition, 2008.

REFERENCE BOOKS:

1. Timoshenko,Young,J.V Rao and S.Patil inS.I Units “*Engineering Mechanics*” ,,McGraw-Hill Book Company, New Delhi.5th edition,2013
2. Merium J.L, Kraige L.G, “*Engineering Mechanics*”, Statics and Dynamics, Wiley Publishers. 7th Revised Edition, 2013.
3. McLEAN and Nelson, “*Engineering Mechanics*”, (Schaum’s outline Series), McGraw-Hill Book Company, New Delhi, 1997.
4. Ferdinand P. Beer and E. Russel Johnson, “*Mechanics for Engineers: Statics and dynamics*”, McGraw-Hill Book Company, New York.4th edition, 1987.

E Books / MOOC / NPTEL

1. <http://nptel.ac.in/courses/112103108/>
2. <http://nptel.ac.in/courses/122104015/>
3. <http://nptel.ac.in/courses/112103109/>
4. <http://nptel.ac.in/courses/122104014/>
5. <https://elearningatria.wordpress.com/notes/1st-year/elements-of-civil-engineering-engineering-mechanics/>

Course Outcomes:

1. Determine the resultant of coplanar concurrent force system
2. Calculate the resultant of coplanar non concurrent force system and solve the problem on equilibrium
3. Analyze the determinate beams and to solve problems on frictions
4. Locate the position of centroid and to find the moment of inertia of typical section
5. Analyse problems in dynamics using Alembert's Principle, work-energy principle and impulse-momentum principle.

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	M											L		
CO2	M	M											L		
CO3	M	M											L		
CO4	M	M											L		
CO5	M	M											L		

Note : L : Low M: Medium H : High

17ME104 - ELEMENTS OF MECHANICAL ENGINEERING

Sub Code : 17ME104

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 52

Course Learning Objectives:

Students belonging to all branches of Engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical systems, equipment and process. This Course will enable students to

1. Understand the formation of steam and working principles of steam turbine.
2. Know the basic things about prime movers and I.C. Engine.
3. Understand the basic calculations of speed ratios in power transmission and also to know about joining process.

4. Assimilate about pumps, compressor, refrigeration and air conditioning.
5. Understand the working of machine tools and its operations.

UNIT - I

Properties of Steam: Steam formation, Types of Steam, Steam properties, States of steam (Simple numerical problems). **4 Hours**

Steam boilers: Definition and function of boilers, Classification of boilers, Details of Cochran boiler, Babcock & Wilcox boiler. Functions of all boiler mountings & accessories. **3 Hours**

Working of a Thermal Power Plant using block diagram. Steam turbines - Classification, Principle of operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. (No compounding of turbines). **3 Hours**

UNIT – II

Gas turbines: Classification, working principles and Operations of Open cycle and closed cycle gas turbines. **2 Hours**

Working of a Hydro Electric Power Plant using block diagram.
Water turbines- Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine. **3 Hours**

Internal Combustion Engines - Two stroke and four stroke Diesel engine, Four stroke Petrol engine, Simple problems to determine indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency. Introduction to electric vehicles, Introduction to Bharath stage emission norms. **5 Hours**

UNIT – III

Pumps and compressors: Classification of pumps and compressors, working principle of centrifugal liquid pump and reciprocating air compressors. **3 Hours**

Refrigerants: properties of refrigerants, list of commonly used refrigerants. Refrigeration – Definitions – Refrigerating effect, Ton of Refrigeration, COP, Principle and working of vapor compression refrigeration and vapor absorption refrigeration, working Principles of air conditioners. **7 Hours**

UNIT – IV

Power Transmission: Belt drives - Applications, open and cross belt drives. Gear drives - Introduction of spur, helical, rack and pinion, bevel and worm gears. Simple and compound spur gear trains. Simple Numerical problems on belt and gear drives. **5 Hours**

Bearing and Lubrication- Function and Classification, Ball and Roller Bearing Function of a lubricant, Types of lubricants, Properties of a good lubricant. **3 Hours**

Soldering, Brazing and Welding: Definitions, classification and method of soldering, Brazing and welding. Differences between soldering, Brazing and Welding. **3 Hours**

UNIT – V

Machining Operations: Introduction to machine tools

Lathe Operations-Turning, facing, Boring, Taper Turning and thread cutting

Drilling operations- drilling, Counter Sinking, Counter Boring,

Milling operations- Plane milling, End milling, Slot milling.

Grinding operations- Surface grinding, Cylindrical grinding (external and internal), centerless grinding.

(No sketches of Machine tools, sketches to be used only for explaining operations. Demonstration of machining operations) **6 Hours**

Automation: Definition, types –Fixed, Programmable & Flexible automation, CNC machines: Basic elements with simple block diagrams, applications. **2 Hours**

Robotics: Introduction, classification based on robot configuration and joints: Cartesian, polar, articulated; Application. **3 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. Know the formation of steam and working principles of steam turbine.
2. Know the working principle of prime movers and I.C. Engines.
3. Appreciate the importance of power transmission and the concept of joining processes.
4. Acquire the fundamental knowledge about refrigeration, air conditioning, lubrication and bearings.
5. Acquire knowledge about the working of machine tools and its operations.

Program Articulation Matrix

Course	PO1	PO2	PO 3	PO 4	PO 5	PO6	PO7	PO 8	PO9	PO 10	PO1 1	PO 12	PSO1	PSO 2
C-17ME104	M	M	M	H	L	L	L	L	H	H	H	M	M	M

Course Articulation Matrix

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
17ME104.1	M		L				H						L	M
17ME104.2	L	L					H			M			L	M
17ME104.3		L					H	L				H	M	L
17ME104.4		M		M			H					H	L	M
17ME104.5	H	M	M										M	M

L: Low M: Medium H: High

TEXT BOOKS:

1. K.R.Gopalkrishna, “**A text Book of Elements of Mechanical Engineering**” Subhash Publishers, Bangalore. 2010
2. Mikell P. Groover, “**Automation, Production Systems & CIM**”, 3rd Edition, PHI, 2012
3. V.K. Manglik, “**Elements of Mechanical Engineering**”, PHI Publications, 2013.

REFERENCE BOOKS

1. S. Trymbaka Murthy, “**A Text Book of Elements of Mechanical Engineering**”, 4th Edition 2006, Universities Press (India) Pvt. Ltd, Hyderabad.
2. K.P. Roy, S.K. Hajra Choudhury, Nirjhar Roy, “**Elements of Mechanical Engineering**”, Media Promoters & Publishers Pvt Ltd, Mumbai, 7th Edition, 2012.
3. Pravin Kumar, “**Basic Mechanical Engineering**”, 2013 Edition, Pearson.

Webliography:

1. Construction and Working principle of Lancashire boiler (video)
<https://www.youtube.com/watch?v=EJmrMO72tak>
2. Construction and working of Babcock and Wilcox boiler (video)
https://www.youtube.com/watch?v=ae_QmSRhD5w
3. Pelton turbine
<https://www.youtube.com/watch?v=rf9meqw2SQA>
4. Francis turbine
<https://www.youtube.com/watch?v=3BCiFeykRzo>
5. Kaplan Turbine
<https://www.youtube.com/watch?v=0p03UTgpnDU>
6. Introduction to Robotics.
<http://nptel.ac.in/courses/112101099/>
7. Introduction to Robotics
<http://nptel.ac.in/syllabus/syllabus.php?subjectId=108105062>.

Scheme of Examination

1. Question paper consists of 5 units with two questions in each unit.
2. Students are expected to answer FIVE full questions choosing ONE question from each unit.
3. Each question carries 20 marks.

17EE105 - BASIC ELECTRICAL ENGINEERING**Sub Code :17EE105****Credits : 04****Hrs/Week: 4+0+0+0****Total Hours: 52****Course Learning Objectives:**

1. To familiarize the student with the basic concepts in Electrical Engineering.
2. To solve DC circuits, single phase AC series, parallel circuits.
3. To illustrate the working principle of Transformers DC machine, Induction motors and Synchronous machines.
4. To introduce electrical measurements and various instruments.
5. To introduce the concept of wiring, appliances and electrical earthing

UNIT – I**DC Circuits:**

Review: Basic circuit elements and variables, Ohm's law, reduction of series, parallel dc circuits. voltage and current division rule, Network reduction by Star-delta transformation, Mesh and node analysis. **6 Hours**

Electromagnetism:

Basic magnetic elements and variables, Faraday's and Lenz's law, Concept of self and mutual inductance, energy stored in magnetic field, lifting power of magnet. **4 Hours**

UNIT – II**Single-phase AC Circuits**

Representation of alternating quantities, concept of average and RMS values, form factor, peak factor for sinusoidal signal, phasor algebra. relationship of voltage, current, power, power factor and energy in pure R,L, and C circuits. Analysis of parallel and series – parallel circuits using phasor algebra. **10 Hours**

UNIT - III**Three-phase AC Circuits**

Necessity and advantages of three-phase systems, star, delta connections, relationship between line and phase voltages, expression for three-phase power, measurement of three-phase power using two wattmeter method (balanced- lagging load). **4 Hours**

Transformers:

Construction and Principle of operation of single phase transformer, EMF equation, power losses, definition of efficiency, condition for maximum efficiency, voltage regulation. **3 Hours**

Measuring Instruments

Introduction to measuring instruments, construction and working principle of moving iron, moving coil and induction type instruments. **3 Hours**

UNIT – IV**DC Machines**

Construction and Working principle of DC machines: generator and motor, EMF equation of generator, back EMF and torque equations of DC motors, types of DC motors, characteristics of series and shunt motor, applications, working principle of three point starter.

7 Hours**Synchronous Generators**

Construction and Principle of operation of an alternator, relationship between synchronous speed and frequency, EMF Equation (derivation of pitch and distribution factors excluded), voltage regulation.

3 Hours**UNIT – V****Induction motors**

Concept of rotating magnetic field, Construction and Principle of operation of 3-phase induction motor, Slip and frequency of rotor currents, application of induction motors, principle of DOL starter and star-delta starter. Principle of Operation of single-phase induction motor with permanent capacitor.

6 Hours**Domestic Appliances**

Construction and working principle of fluorescent lamp and Sodium vapor lamp, CFL. Two-way control of lamps, necessity and types of earthing, role of fuse and MCB with respect to concept of overloading and protection of appliances.

4 Hours**Course Outcomes :**

At the end of the course student will be able to

1. Analyze and solve problems pertaining to DC circuits and electromagnetism, imply star/ delta reduction technique
2. Deduce the parameters of single phase A.C circuits such as impedance, current, power factor for RLC series and parallel configuration.
3. Expound the fundamentals and operation of three phase circuits, measuring instruments, single phase Transformer, compute transformer efficiency at different loads and power factor
4. Explicate the construction, operation of DC machines, synchronous generator and analyze the given data to compute EMF, torque.
5. Comprehend the basic fundamentals, classifications of Induction motors, concept of slip, compute synchronous speed, safety measures, types of fuse and switch

Mapping of POs & COs:

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes												
CO1	H	M										
CO2	M	M										
CO3	H	H										
CO4	M	H										
CO5	H	H					H		M			

TEXT BOOKS:

1. Hughes, Edward: Electrical and Electronics Technology, Pearson Education Publications, 10th Edition, 2010.
2. V. K. Mehta, Principles of Electrical Engineering and Electronics, Revised Edition, S Chand, 2010

REFERENCE BOOKS:

1. Rajendra Prasad, “Fundamentals of Electrical Engineering” Third edition PHI, 2014
2. Dr. Debashisha Jena, “Basic Electrical Engineering”, Wiley India Private Limited, 2012.
3. K.A. Krishnamoorthy and M. R. Raghuvver: Electrical, Electronics and Computer Engineering for Scientists and Engineers, New Age Publishers, 2011
4. H. Cotton, Advanced Electrical Technology, Reem Publications Pvt. Ltd. 2011
5. D. C. Kulshreshtha , Basic Electrical Engineering TMH, Revised First Edition, 2011

E Books / MOOC / NPTEL:

1. <http://nptel.ac.in/downloads/108105053/>
2. <http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc-ema-em-1.pdf>
3. Basic Electrical Technology Lectures by Dr.L Umanand Department of Power Electronics Group, CEDT IISC Bangalore available at <http://www.nptelvideos.in/2012/11/basic-electrical-technology.html>

17ME106 - ENGINEERING SKILL DEVELOPMENT LAB

Sub code : 17ME106

Credits : 01

Hrs/Week : 0+0+3+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Develop simple mechanical models by fitting, carpentry and sheet metal work
2. Identify and explain the use of different types of wiring tools, switches, fuse, sockets and plugs etc and to prepare simple wiring circuit.
3. Understand the use and function of various automobile parts.
4. Understand the operation of Lathe, milling, grinding and CNC machine.

PART- A

1. Fitting Shop:

Study and use of engineering steel rule, height gauge, caliper, micrometer, files, chisels, hacksaw, hammers, drill bit, taps etc.

Models: Preparation of fitting models by making use of filing, sawing, chipping, drilling and tapping.

2. Sheet metal and soldering:

Study the use of sheet metal work and soldering tools. Study the development of surfaces of simple solids like prism, cylinder and cone.

Models: Preparation of sheet metal model of prism (square and rectangle), cylinder and frustum of cone.

PART- B

1. Carpentry Shop:

Study and use of wood working tools, joints etc.

Models: Preparation of any one carpentry joints like mortise or tenon joint.

Demonstration of hand operated power tools.

2. Automobile Shop:

Study the use and function of various automobile parts.

3. Machine Shop:

Study the operation of Lathe, milling, grinding and CNC machine.

Demonstration of Robot.

4. Electrical wiring lab:

Identification and study the use of different types of wiring tools, switches, fuse, sockets and plugs etc.

Demonstration of simple electrical device like fan, washing machine, pump starter etc.

Experiments: Preparation of simple wiring circuit.

REFERENCES:

1. Hajra Choudhury S.K. and Bose S.K., "Elements of Workshop Technology", Vol.I, Media Promoters & Publishing Pvt. Ltd., Mumbai,2012.
2. Bhattacharya S.K. and Rastogi K.M., "Experiments in Basic Electrical Engineering", New Age International, Delhi, 2003.
3. K.R.gopalkrishna, "Engineering Drawing", Subhas Publications, Bangalore.
4. S.Srinivasan, "Automotive Mechanics", Tata McGraw Hill, 2003.

Scheme of examination for Workshop Practice.

- | | | |
|----------------------|----------------|-----------------|
| | PART- A | |
| 1. Fitting model | | 30 Marks |
| 2. Sheet metal model | | 10 Marks |
| | PART- B | |
| 3. Viva-voce | | 10 Marks |

Course Outcomes**At the end of the course the student should be able to**

1. Develop simple workpiece models using fitting, carpentry and sheet metal work.
2. Identify and know the use of different types of wiring tools, switches, fuse, sockets and plugs etc and to prepare simple wiring circuits.
3. Appreciate the use and function of various automobile parts.
4. Demonstrate the operation of Lathe, milling, grinding and CNC machine.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C-15ME511.1	L	H	H		L	H	H	H	H	H	L	H	M	H
C-15ME511.2	H	H	M	M	L		M	L		H	L	M	M	M
C-15ME511.3	H	H	H	H	M	H	H			H	L	L	M	L
C-15ME511.4	M	H			M	H	M	M		H	L	H	L	L

L: Low M: Medium H: High

17HU107 - CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS**Sub Code : 17HU107****Non-credit compulsory course****Hrs/Week : 1+0+0+0****Total Hours : 12****Course Learning Objectives:****This Course will enable students to**

1. Develop in themselves a Social, Political, Economic, Cultural Awareness.
2. Understand their Obligations, Responsibilities, Privileges and Rights, Duties and the Role that they have to play in deciding the Administrative Machinery of the country.
3. Consider inculcating the National and Patriotic Spirit among themselves as responsible citizens of the country.
4. Imbibe Ethical values of business and realize the responsibility and obligations of Professionals to the Society and Nation.

5. Interpret the Scope and Aims of Engineering Ethics, their responsibilities, virtues and traits of right behaviour such as Honesty, Integrity and Reliability, the Risk and Liability in the Engineering profession.

UNIT – I

Introduction, Historical Background (Evolution – in brief), Preamble to the Constitution of India: Importance and Parts of the preamble - Citizenship – A brief account on Constitutional Provisions and procedures of Citizenship. **4 Hours**

UNIT - II

Importance, Scope and Extent of – Limitations (Restrictions) of different kinds of Fundamental Rights in brief as given under Part III **3 Hours**

UNIT - III

Relevance of Directive Principles of State Policy (DPSP) under Part – IV: Nature of DPSP, different kinds and their significance.

Significance of Fundamental Duties under Part IVA; Article 51A. **2 Hours**

UNIT - IV

Emergency: Grounds for proclaiming Emergency, kinds & effects of Emergency

Executive – President and Governors; Legislature and Council of Ministers - Central and States; Indian Judicial System (Self Study Component) **2 Hours**

UNIT – V

Scope and Aims of Engineering Ethics: Responsibility of Engineers – Impediments to Responsibilities; Honesty, Integrity and Reliability; Risk, Safety and Liability in Engineering **1 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. Analyse the legalities and related issues of drafting, adoption and enforcement of the Indian Constitution as a fundamental law of the nation and the provisions and privileges of Indian Citizenship
2. To understand and judiciously use the fundamental rights and privileges envisaged in the constitution propagating social harmony and equality and respecting the rights and liberties of other people.

3. To contribute in protecting and preserving the sovereignty and integrity of India and have a compassion to all living creatures, uphold sense of brotherhoodness among all citizens of the nation and promote peace and harmony
4. To respect the Constitutional Institutions like Judiciary, Executive, Legislature and also to respect the national flag, national anthem and all those noble ideals cherished by the those great leaders and our ancestors during Indian struggle for freedom
5. To become ethically and socially upright and also to positively contribute to social development and nation building.

TEXT BOOKS:

1. Introduction to the Constitution of India; Dr. Durga Das Basu; Twentieth Edition, Reprint 2011; LexisNexis Butterworths Wadhwa , Nagpur, Haryana, India.
2. Engineering Ethics- Concepts and Cases; Charles E. Harris, Michael S. Pritchard and Michael J. Robins; Second Edition 2005, Thomson Wardsworth; Eastern (Press) Bangalore Pvt. Ltd, Bangalore.
3. Ethics in Engineering; Mike W. Martin and Ronald Schinzinger; Fourth Edition, 2005; Tata McGraw Hill Publishing Company Ltd., New Delhi.

REFERENCE BOOKS

1. Introduction to Constitution of India; M.V. Pylee; Fourth Revised Edition, 2005; Vikas Publishing House Pvt. Ltd., New Delhi.
2. Introduction to Constitution of India; Brij Kishore Sharma; Second Edition, 2004; Prentice Hall of India Pvt. Ltd., New Delhi.
3. An Introduction to Constitution of India and Professional Ethics; Prof. B R Venkatesh and Merunandan K B; Merugu Publications, Bangalore; Second Edition, 2007.

E-Resources:

1. <http://nptel.ac.in/courses/109104032/>
2. <https://pothi.com/pothi/book/ebook-ministry-law-and-justice-constitution-india-iasplanner.blogspot.com/2010/11/free-ebook-download-constitution-of.html>
3. www.iasabhiyan.com
4. www.civilserviceindia.com › Subject › General Studies › NCERT Books

17PH109 - ENGINEERING PHYSICS LAB

I/II Semester B.E

Sub Code : 17PH109

Hrs/week : 0+0+3+0

Credits : 02

Total Hours : 33

Course Learning Objectives:

1. To provide hands-on laboratory experience and training to plan and perform experiments.
2. To relate theory and experimental results through analysis.
3. Making them familiar with various measuring instruments and measurement techniques.
4. Acquaint the students with possible errors in measurements and methods of correction.

List of experiments:

1. Planck's constant determination using photoelectric effect.
2. I-V characteristics of LED.
3. I-V characteristics of zener diode.
4. Series and parallel resonance in an LCR circuit.
5. Ultrasonic Interferometer.
6. Hall effect.
7. Energy gap of a semiconductor using diode.
8. Numerical aperture / Power loss in an optical fibre.
9. I-V characteristics of solar cell.
10. Charging and discharging of a capacitor.
11. Transistor characteristics.

Course Outcomes:

1. To Plan and perform experiments to obtain reasonably correct data.
2. Able to understand theoretical concepts.
3. Familiar with proper handling and use of measuring instruments.
4. Identifying the errors and inaccuracies built into the experimental set up and the procedure and hence to refine the data

REFERENCE BOOKS:

1. **H.Sathyaseelan:** Laboratory Manual in Applied Physics, New Age International, 3rd Edition, 2009.
2. **B. Basavaraju and P.Sadashiva:** A Laboratory Manual in Engineering Physics, Omkar Publications.

Justification:

Most of the experiments included in the syllabus are having theoretical back up in Engg. Physics.

Scheme: All the ten experiments are to be performed. Candidate has to perform two experiments in S E examination.

17CY110 - ENGINEERING CHEMISTRY

Sub Code : 17CY110

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 52

Course Learning Objectives:

The course will enable the students to:

1. Get acquainted with the different types of industrially important polymers along with their characteristic properties.
2. Know the basics of electrochemistry and its usage in the working of fuel cells and modern day batteries.
3. Gain knowledge on the harmful effects of corrosion on metal and techniques used in preventing it, including metal finishing.
4. a) Know the requirements of boiler feed water.
b) Understand the different routes of nano material synthesis
5. a) Get the knowledge on the different chemical fuels and related parameters.
b) Know the basics of liquid crystals.

UNIT – I

POLYMERS

Definition, Classification. Polymerization – definition, types of polymerization. Addition and Condensation with examples. Free radical mechanism of polymerization with examples. Methods of polymerization-bulk, solution, suspension and emulsion polymerization. Glass transition temperature, Structure and property relationship.

Synthesis, properties and applications of polyurethane, PMMA, Polycarbonate and Phenol-formaldehyde resin.

Elastomers - Deficiencies of natural rubber, Vulcanization of rubber, Advantages of synthetic rubber. Synthesis and application of Buna-S, Butyl rubber and Silicone rubbers.

Adhesives- Manufacture and applications of Epoxy resins. Polymer Composites: Introduction, synthesis, properties and applications of kevlar and carbon fiber. Conducting polymers - definition, Mechanism of conduction in polyacetylene and its applications.

10 Hours

UNIT – II

ELECTROCHEMICAL CELLS

Introduction, Electrodes, single electrode potential - origin, sign conventions. Derivation of Nernst equation. Numerical problems. Standard electrode potential. Electrochemical series. Construction, working and applications of calomel electrode, Measurement of single electrode potential. Ag /AgCl electrode, Glass electrode (Derivation of expression for electrode potential). Determination of pH using glass electrode. Concentration cells. Numerical problems. **5 Hours**

BATTERY TECHNOLOGY

Introduction, battery characteristics. Classification of batteries – primary, secondary and reserve batteries. Construction working and applications of Zn-MnO₂, Pb-acid, Nickel-Metal hydride, Lithium ion batteries.

FUEL CELLS

Introduction, types of fuel cells- Construction, working and uses of H₂-O₂ and Methanol-Oxygen fuel cells. **5 Hours**

UNIT – III

CORROSION SCIENCE

Corrosion - definition, Chemical corrosion and Electro-chemical theory of corrosion, Factors affecting the rate of corrosion. Types of corrosion, Differential metal corrosion-galvanic series, Differential aeration corrosion - Water line and pitting corrosion. Stress corrosion-caustic embrittlement in boilers. Corrosion Control: Protective coatings; Inorganic coating - Anodizing and Phosphating. Metal coating - Galvanization and Tinning. Organic coatings, Corrosion inhibitors, Cathodic protection. **5 Hours**

METAL FINISHING

Technological importance of metal finishing. Electroplating– Process, Polarization, decomposition potential and over-voltage. Effect of plating variables on the nature of electrodeposit. Electroplating of Cr. Electroless plating – principles, similarities and difference between electroless plating and electroplating. Electroless plating of copper in PCB. **5 Hours**

UNIT – IV

WATER CHEMISTRY

Impurities in water, Water analysis - Determination of Hardness. Boiler feed water and boiler problems – scales and sludges, boiler corrosion. External treatment of boiler feed water- Hot lime soda process, Ion-exchange method. Internal treatment of water-phosphate conditioning, colloidal conditioning, calgon conditioning. Desalination of water - Electrodialysis and Reverse Osmosis.

Sewage and its treatment- Dissolved Oxygen in water, Biological Oxygen Demand and Chemical Oxygen Demand. Numerical problems on BOD and COD. Primary, secondary and tertiary sewage treatment. **8 Hours**

NANOCHEMISTRY

Introduction, Nanoparticles, Classification (Zero dimensional, one dimensional, two dimensional and three dimensional). Synthesis of nano materials by: microwave, combustion,

chemical vapour deposition and Sol- gel methods. Preparation of ZnO nanoparticles by microwave method. **4 Hours**

UNIT – V

CHEMICAL FUELS

Introduction to energy; Chemical fuels-definition, classification, Calorific value-definition, Gross and Net calorific values. Determination of calorific value of a solid / liquid fuel using Bomb calorimeter. Numerical problems. Petroleum cracking-fluidized catalytic cracking. Reformation of petrol. Knocking – petrol and diesel knock and harmful effects. octane number, cetane number. Prevention of knocking, anti-knocking agents, unleaded petrol; Power alcohol and biodiesel. **6 Hours**

LIQUID CRYSTALS

Introduction, classification-Thermotropic and Lyotropic with examples. Types of mesophases - nematic, chiral nematic smectic and columnar. Chemical constitution of liquid crystals. Electro-optic effect of liquid crystals. Applications of liquid crystals in display systems. **4 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. Analyse the different types of polymers, their synthetic routes and applications.
2. Understand the basic components of electrochemical cells and thereby relate its principles on modern batteries and fuel cells.
3. Identify the different types of corrosion, techniques generally used for its prevention and understand the metal surface modification techniques like electroplating and electroless plating.
4. Understand the prime problems faced in boiler feed water and subsequent remedial measures undertaken, analyse the quality of water and identify the synthetic approaches undertaken for designing nanomaterials.
5. Identify the methodologies used to analyse as well as improvise on chemical fuels and understand the applications of liquid crystals in display systems.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain & Monica Jain., Dhanpat Rai Publications, New Delhi, 2015.
2. Engineering chemistry by R V Gadag & A Nityananda Shetty., IK International Publishing House Private Ltd. New Delhi, 2016.

REFERENCE BOOKS:

1. Chemistry for Engineering Students by B.S. Jai Prakash, R.Venugopal, Sivakumaraiah & Pushpa Iyengar., Subhash Publications, Bangalore,2016.
2. Principles of Physical Chemistry by B.R.Puri, L.R.Sharma & M.S. Pathania., S.Chand & Co. Pvt. Ltd. New Delhi,1998.
3. Liquid crystals and plastic crystals, Vol-I, edited by G.W.Gray and P.A.Winsor, Ellis Horwood series in Physical Chemistry, New York. (p.No. 106-142),2010.
4. Corrosion Engineering by M.G.Fontana, Mc Graw Hill Publications,2006.
5. Polymer Science by F. W. Billmeyer., John Wiley & Sons, 2016.

6. Engineering Chemistry by O. G. Palanna; Tata McGraw hill Education Private Limited, New Dehli, 2016.
7. G.A.Ozin & A.C. Arsenault, "Nanochemistry A Chemical Approach to Nanomaterials", RSC publishing, 2009.

NPTEL/MOOC/E-Books

Engineering Chemistry

1. Composite Materials: Engineering and Science: F.L. Mathews and R.D. Rawlings, CRC press, 084930251X.
2. Handbook of Composites: S.T. Peters, ISBN 978-1-4615-6389-1.
3. Essentials of Nanotechnology by Jeremy Ramsden, 2009, 126 pages, 4.6MB,
4. <https://drive.google.com/file/d/0Bz82vSA0C1xIWC11WkpsTmlwQVv/view>
5. <http://nptel.ac.in/courses/104104011>

17CS111 - COMPUTER CONCEPTS AND C PROGRAMMING

Sub Code : 17CS111

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 50

Course Learning Objectives:

This course will enable students to

1. Make students learn basic principles of Problem solving, implementing through C programming language and to design & develop programming skills.
2. Analyze problem domain and design the solution for a given problem and represent the solution in the form of flowchart/algorithm and C program.
3. To gain knowledge of basic data structures and their applications.
4. Write their own C programs for various scientific, engineering and business domains.

UNIT – I

Introduction to Problem Solving and Programming Languages

Introduction to Computer System and Problem Solving, Problem Solving Aspect, Program Development steps, Introduction to Programming Languages, Types and Categories of Programming Languages, Program Development Environments.

Processing Data

Transforming Data into Information: How computers represent data, how computers process data. Microcomputer processors, Operating system basics, The purpose of Operating system, Types of Operating system, Examples.

10 Hours

UNIT – II

Introduction to C Programming Language

Evolution & Characteristics of C Language, Structure of a C Program, C Compilation Model. Characters set, C tokens, Keywords and identifiers, Constants, Variables, Data Types, and Declaration of Variables.

Operators and Expressions

Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and Decrement operators, conditional operator, Bitwise operators, Special Operators, Arithmetic expressions, Evaluation of expressions, Precedence of Arithmetic operators, Type conversions in expressions, Operator precedence and associativity.

10 Hours

UNIT – III

Programming styles: Commenting, naming conventions and indentation.

Managing Input and Output Operations

Reading a character, Writing a Character, Formatted Input, and Formatted Output.

Decision marking and Branching

Decision making with if statement, Simple *if* Statement, the *if...else* statement, *Nesting of if...else* statements, The *else...if* ladder, The *switch* statement, The ternary operator, The *goto* statement, break and continue statements.

Decision making and Looping

The *while* statement, the *do...while* statement, the *for* statement, Jumps in Loops.

10 Hours

UNIT – IV

Arrays

One-dimensional Arrays, Declaration of one-dimensional Arrays, Initialization of one-dimensional Arrays, Two-dimensional Arrays, Initialization of two-dimensional Arrays, Passing arrays as parameters to functions, Strings: Declaring Initializing, Printing and reading strings, string manipulation functions, String input and output functions, array of strings-examples for one dimensional and two dimensional

User-defined Functions

Need for the User Functions, A multi-function program, Element of User-defined Functions, Definition of Functions, Argument Passing – call by value, call by reference. Return Values and their Types, Function Calls, Function Declaration, Category of Functions.

10 Hours

UNIT – V

Structures

Defining a Structure, Declaration and Accessing the Structured Variable. Copying and Comparing structured Variable, Arrays of Structures and Simple Programs on Structures.

Pointers & File handling

Introduction, Understanding Pointers, Accessing the address of Variables, Declaration pointer variable, difference between pointers and arrays, pointers and structures. Simple programs using Pointers, Opening/Closing of files, Reading/Writing from/to Sequential files.

10 Hours

Course Outcomes:

After Studying this course, students will be able to

1. Outline and explain the concepts of problem solving and process data in the computer system.

2. To obtain the knowledge about the structure of C, Keywords , basic data types, using operators and writing expressions in C
3. To learn about the programming style and basic elements like input/output and control statements,
4. Apply the concepts of code reusability, parameter passing and returning with the help of user defined functions and use the basic elements like arrays and strings in simple programs.
5. Demonstrate the use of Structures , Pointers and file handling mechanism that are essential for understanding the concepts in database management systems

Graduate Attributes (as per NBA)

1. Problem Analysis
2. Design/Development of Solutions
3. Individual and team work
4. Ethics

TEXT BOOKS:

1. The C Programming (ANSI C) - Kernighan & Ritchie, PHI, 1998.
2. C Programming with Problem Solving – Jacqueline A. Jones & Keith Harrow. Dreamtech Press, 2009.

REFERENCE BOOKS:

1. Programming in ANSI C,E Balaguruswamy, Tata McGraw Hill-III Edition.
2. Yashwant Kanetkar, “Let Us C”, 5th Edition, BPB Publications, New Delhi, 2004.

E-Books / Online Resources:

1. <http://www.lysator.liu.se/c/bwk-tutor.html#introduction>
2. http://www.acm.uiuc.edu/webmonkeys/book/c_guide/
3. C programming Tutorial by Mark Burgers <http://markburgess.org/CTutorial/C-Tut-4.02.pdf>

MOOCs:

1. <http://nptel.ac.in/courses/106105085/4>
2. <https://www.lynda.com/C-training-tutorials/1249-0.html>

17EC112 - BASIC ELECTRONICS

Sub Code : 17EC112
Hrs/Week: 4+0+0+0

Credits : 04
Total Hours : 52

Course Learning Objectives:

This course will enable the students to:

1. Understand the working of Semiconductor Diodes, Zener Diodes and its applications.
2. Understand the working of Transistors and SCR
3. Understand the working of Amplifiers and Oscillators
4. Understand the working of OPAMPs and basics of modulation techniques
5. Understand basics of number systems and Digital logic

UNIT – I

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Shunt capacitor - Approximate analysis of capacitor filters, Zener diodes, Zener diode voltage regulators, Numerical examples as applicable. **10 Hours**

UNIT – II

TRANSISTORS: Bipolar Junction transistor, parameters, Transistor Voltages and currents, amplification, Common Base, Common Emitter Characteristics, DC Load line and Bias Point, Base Bias, Numerical examples as applicable.

OTHER DEVICES: Silicon Controlled Rectifier (S.C.R), gate triggering circuits for half wave SCR controlled rectifiers (pulse / 90° and 180° phase control), Automatic Heater control using S.C.R. **10 Hours**

UNIT - III

AMPLIFIERS & OSCILLATORS: -Decibels and Half power points, Single Stage CE Amplifier, Series voltage negative feedback, Additional effects of Negative feedback (Qualitative discussions only), Positive feedback in Oscillators, The Barkhausen Criteria for sustained oscillations, BJT RC phase shift oscillator, Hartley and Colpitt's oscillator (Qualitative discussions only), Numerical examples as applicable. **10 Hours**

UNIT - IV

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP and properties, Saturable property of an OP AMP, OPAMP applications (comparator / inverting and non-inverting amplifiers / voltage follower / inverting adder/ integrator and differentiator), Cathode Ray Oscilloscope (CRO), Applications of CRO, Numerical examples as applicable

COMMUNICATION SYSTEMS: Block diagram, Advantages of Modulation, Amplitude and Frequency Modulation (qualitative discussions only). **10 Hours**

UNIT - V

NUMBER SYSTEMS: Introduction, Decimal , Binary, Octal and Hexadecimal number systems, conversion from one system to other , Addition and subtraction, fractional numbers , subtraction of Binary using 2's complement method , Binary Coded Decimal numbers.

DIGITAL LOGIC: Logic gates, Half-adder, Full-adder, Parallel Binary adder. **12 Hours**

Course Outcomes:

After completing this course, students should be able to:

1. Understand the characteristics and working of Semiconductor Diode and analyze its use in rectification and regulation.
2. Understand the construction, characteristics and different modes of operation of a Bipolar Junction Transistor and other semiconductor devices.
3. Understand the operation and gain-frequency characteristics of RC coupled Amplifier and appreciate its use in various circuits(amplifiers and oscillators).
4. Analyze and design op-amp circuits for basic mathematical operations, understand the working of an oscilloscope for observing signals, appreciate the concept of modulation.
5. Identify different number systems, convert from one base to another base, understand the working of different logic gates and design logic circuits using them.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
CO1	H		L									
CO2	H	M	L									
CO3	M	M	M									
CO4	H	L	L									
CO5	M	M	M									

L: Low

M: Medium

H: High

TEXT BOOKS:

1. David A. Bell, Electronic Devices and Circuits, 5th edition, PHI , 2014.
2. Krishnamurthy K.A. and Raghuvver M.R., Electrical, Electronics & Computer Engineering for Scientist and Engineers, New Age International Publishers, 3rd Edition, Reprint 2012.

REFERENCE BOOKS:

1. Jacob Millman and Christos C Halkias, Electronic Devices and Circuits, TMH, 2015.
2. Bernard Davis, George Kennedy and S. R. M. Prasanna, "Electronic Communication Systems", TMH ,5th Edition, 2012.
3. Morris Mano, "Digital Logic and Computer Design", PHI,2008.

MOOCS Link: <https://www.coursera.org/learn/electronics#syllabus>

17CV113 - ENVIRONMENTAL STUDIES

Sub Code : 17CV113
Hrs/Week: 1+0+0+0

Credits : 00
Total Hours : 13

Course Outcomes:

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

1. Identify the significance of environmental practice in their daily life and in the engineering practices
2. Create awareness about environmental conditions
3. Follow environmentally appropriate behavior
4. Understand the importance of their surroundings
5. Understand Current environmental issues of importance

UNIT – I

Environment: Definition, Significance of environmental studies- current scenario, local, regional, national and global problems. Components of environment: atmosphere, hydrosphere, lithosphere and biosphere. Layers of atmosphere and its role. Parts of Earth-lithosphere and its role, hydrological cycle.

Eco system- Definition, Ecology and environment, Ecological balance. Elements of Ecosystem: biotic, abiotic, producers, consumers, decomposers, habitat, range of life and biome. Balanced eco- system: food chain, food web and ecological pyramids.

Human activities: The Anthro System- activities like growing food, building shelter and some other for economy and social security. Soil erosion, water logging-definition. Organic farming- definition. **3 Hours**

UNIT – II

Natural resources: water, minerals, fossil fuels and energy. Water resources- Global water resources, distribution, Uses of water for irrigation, domestic and industrial purposes in India. Quality aspects-Water Quality Parameters, Drinking water standards for turbidity, pH value, total hardness, iron, fluoride, lead, arsenic, nitrate. Mineral resources-Metallic minerals, Non-metallic minerals. Fossil fuels-Coal and petroleum. Forest Wealth-Components of the forest, Key benefits of forests. Deforestation-Environmental effects of deforestation and remedies. Sustainable Development- Definition, objectives. Material cycles - Carbon, Nitrogen and Sulphur cycles. **3 Hours**

UNIT – III

Environmental pollution: Definition, Harmful effects related to public health. Water pollution: Definition, types and sources-Agriculture-(pesticides and fertilizers), Industry, domestic, mining and its harmful effects. Water borne and Water induced diseases- definition, common diseases and their causatives. Fluoride problem in drinking water. Land pollution: Definition, sources- Agriculture, Housing, Industry, mining, transportation. Types of municipal Solid waste Disposal -Sanitary landfills, Composting, incineration in brief and

effects. Air Pollution: Definition, Types and sources- Industry, mining, agriculture, transportation and its effects. Noise pollution: Definition, sources, mining, industries, Rail-Roads, aviation, its effects and control measures. **3 Hours**

UNIT – IV

Energy: Different types of energy- Non Renewable energy, Fossil fuels- Coal, Oil and Natural Gas- Brief description only. Nuclear energy- Nuclear power plants. Renewable Energy: Solar energy- Photovoltaic systems for street and domestic lighting, Solar water

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M						M							
CO2				L						L					
CO3	L				L										
CO4	L			L											
CO5			H								H				

heating-Brief description only. Wind energy- definition, merits and demerits. Hydro Power- definition, merits and demerits. Biomass Energy- Definition, Sources of Bioenergy, Biogas, Biofuels, India's position in renewable energy. Hydrogen as an alternative future source of energy- brief scope, fuel cells. **2 Hours**

UNIT – V

Current environmental issues of importance:

Population growth-Definition, growth rate, effects, remedies. Urbanization- Definition, environmental impacts and remedies. Global warming and climate change -Concept of green house effect, sources of greenhouse gases, effects and remedial measures of greenhouse gases. Acid rain: Definition, Causes and Effects, Control measures. Ozone Depletion: Definition, Causes, Effects and Control measures. Environmental Impact Assessment (EIA)- definition, objectives and benefits of EIA **2 Hours**

Mapping of POs & COs :

TEXT BOOKS:

1. Erach Bharucha (2010 reprinted) Text book of Environmental Studies for undergraduate courses, Universities Press, Hyderabad
2. Benny Joseph (2005), "Environmental Studies", Tata McGraw Hill Publ. Co., New Delhi.
3. Rajagopalan, R. (2005), "Environmental Studies: From Crisis to Cure", Oxford University Press, London.

REFERENCE BOOKS:

1. Balasubramanya, N and Chatwal, Gurdeep R. (2007), "Environmental Studies", Himalaya Publishing House, Mumbai.
2. Barucha, E. (2004), "Environmental Studies", University Grants Commission, New Delhi.

E Books / MOOC / NPTEL:

1. <http://nptel.ac.in/courses/120108004/>
2. <http://nptel.ac.in/courses/122102006/>

17HU114 - ENGLISH & COMMUNICATION SKILLS

Sub Code : 17HU114	Credits : 02
Hrs/Week : 2+0+1+0	Total Hours : 39

Course Learning Objectives:-

This Course will enable students to

1. Understand how to pronounce words, rules of word stress, intonation in speech.
2. Understand the process of communication, its types and the barriers.
3. Interpret literary pieces and enhance social values and language skills.
4. Effectively apply the etiquettes of telephone communication.
5. To draft technical communication writings like resume, reports, business letters and know the nuances of personality and leadership

UNIT – I

Introduction to Phonetics: Introduction, Consonant and Vowel Sounds, Syllable structure, Transcription, Word Stress & Rhythm, Weak & Strong Forms, Intonation, Awareness of Different Accents, Dealing with problem sounds. **8 Hours**

UNIT - II

Communication: What is Communication, Process of Communication, Types of Communication (Verbal & Non Verbal, Intrapersonal, Interpersonal – Formal/Informal Mass and Organizational Communication), Listening to announcements. **5 Hours**

UNIT - III

Language Skills: Prose-02 lessons & Poetry -02 poems; Comprehension , Reading & Writing Skills, Vocabulary, Parts of Speech (Articles, Prepositions, Conjunctions), Subject

Verb Agreement, Question Tag, Synonyms, Antonyms, Prefixes & Suffixes, One-word substitutes.

10 Hours

UNIT - IV

Telephone Skills/ Digital communication: Introduction, Types of calls, Handling Calls, Leaving message, Making requests, Making & Handling complaints, Telephone Etiquette.

5 Hours

UNIT – V

Correspondence skills/Professional Skills: Resume, Types of letter formats, Cover-letters, Meeting, Short Formal Speech

Personality: Term, Types, Significance, Body language

Leadership: Qualities of a successful leader, difference between leader & manager.

11 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Comprehend and use the proper usage and pronunciation of English Language
2. Deliver proper communication skills and etiquettes.
3. Appreciate literary pieces for its language and social interpretations.
4. Effectively execute telephone skills and etiquettes.
5. Enhance personality, leadership, and managerial skills.

TEXT BOOK:

3. Subhashini, English & Communication Skills, Revised Edition 2017; Innovate Publishers, Bangalore.

REFERENCE BOOKS:

1. *Cambridge International Dictionary of English*, New Delhi: Thomson Press, 2014.
2. Covey, Stephen R. *The 7 Habits of Highly Effective People*. Great Britan: Simon & Schuster, 1994.
3. Jones, Daniel. *Cambridge English Pronouncing Dictionary*. n.d.
4. Murphy, Raymond. *Murphy's English Grammar*, Cambridge: Cambridge University Press, 2004.
5. Rizvi, M Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005.

E-Resources:

1. <http://nptel.ac.in/courses/109103020/>
2. <http://nptel.ac.in/courses/109106067/>
3. <http://nptel.ac.in/courses/109105117/>
4. <http://nptel.ac.in/courses/109106116/>
5. <http://nptel.ac.in/courses/109106094/>
6. <http://nptel.ac.in/courses/109106066/>

17ME115 - COMPUTER AIDED ENGINEERING GRAPHICS

Sub code : 17ME115
Hrs/Week : 2+0+2+0

Credits : 03
Total Hours : 52

Course Learning Objectives:

This course will enable students:

1. To impart and inculcate understanding of the theory of projection and concepts like dimensioning, conventions and projection of points and lines in different quadrants of projection system.
2. To know and understand the projection of different plane surfaces.
3. To impart the knowledge on understanding and drawing of different solid objects in different positions.
4. To develop the lateral surfaces of solid objects and its use in sheet metal development
5. To sketching an isometric view of solid objects and an assembly of the objects.
6. To improve the visualization skills and use of drafting software.

UNIT - I**Orthographic Projection**

Orthographic Projection: Planes of Projection, First angle projection, reference line. Conventions employed for drawing, Projection of points located in first, second, third and fourth quadrants, Projection of Lines (**First angle projection only**), True and apparent lengths, true and apparent inclinations. **10 Hours**

UNIT - II**Projection of Plane surfaces**

Projection of plane surface: Triangle, Square, Rectangle, Pentagon and Hexagon in different positions. **10 Hours**

UNIT - III**Projection of Solids**

Projection of right regular solids: Prisms, Pyramids, Cones and Cylinders in different positions. **14 Hours**

UNIT - IV**Development of Lateral surfaces of solids**

Development of lateral surfaces of: Right regular Prisms, Pyramids, Cylinders and cones and their frustums. **8 Hours**

Isometric projection and Isometric view

Isometric scale, Difference between Isometric projection and isometric view: To draw

Isometric views of simple solids and machine components using their orthographic projections. **10 Hours**

Course Outcomes:

At the end of the course the student should be able to

1. Explain the basics of orthographic projection and fundamental concepts of four quadrants of projection system.
2. Know the projection of different plane surfaces in different positions.
3. Illustrate the projection of different solid objects in different positions.
4. Draw the development of lateral surfaces of solid objects and its use in sheet metal development.
5. Draw the isometric projection of solid objects and differentiating it from orthographic projection.
6. Use drafting software for executing the above drafting exercises.

Program Articulation Matrix

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C-17ME115	H	H	L	M	H	M	L	L	H	H	-	M	H	M

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-17ME115.1	H	H	L	M	H	M	L	L	H	H	-	M	H	H
C-17ME115.2	H	H	L	M	H	M	L	L	H	H	-	M	H	M
C-17ME115.3	H	H	L	M	H	M	L	L	H	H	-	M	H	M
C-17ME115.4	H	H	L	M	H	M	L	L	H	H	-	M	H	M
C-17ME115.5	H	H	L	M	H	M	L	L	H	H	-	H	H	M
C-17ME115.6	H	H	M	M	H	M	L	L	H	H	-	H	H	H

L: Low M: Medium H: High

17CS116 - COMPUTER CONCEPTS AND C PROGRAMMING LAB

Sub Code : 17CS116

Hrs/Week : 0+0+3+0

Credits : 02

Total Hours : 32

Course Learning Objectives:

This Course will enable students to

1. **Get** the idea of **how** to debug and execute C programs
2. **Make use of** flowcharts and algorithms to **analyze** and **demonstrate** various C programming concepts.
3. **Experiment** with different types of low complexity and high complexity programs using C language

PART A

1. Write a C program to find the roots of a quadratic equation $ax^2+bx+c=0$
2. Write a C program to find the sum of all the digits and occurrence of a digit in the number.
3. Write a C program to find the GCD and LCM of given two numbers using Euclid's method.
4. Write a C program to print the prime numbers in a given range.
5. Write a C program to find if a given string is a palindrome or not.
6. Write a C program to input N real numbers in 1-D array. Compute mean, variance and Standard Deviation. Mean= sum/N, Variance = $\Sigma (Xi-mean)^2 /N$, STD Deviation= $\sqrt{\text{variance}}$.
7. Write a C program to read N integers into an array A and find the sum of elements using pointers
8. Write a C program to copy contents of one file to another file.

PART B

1. Write a C program to perform a binary search for a given key integer in a single dimensional array of numbers in ascending order and report success or failure in the form of a suitable message
2. Write a C program to input N integer numbers into a single dimension array, sort them in to ascending order using selection sort technique, and then to print both the given array and the sorted array with suitable headings.
3. Write a C program to transpose a matrix of order M x N and find the trace of the resultant matrix.
4. Write a C program using functions to read two matrices A (M x N) and B (P x Q) and to compute the product of A and B if the matrices are compatible for multiplication.
5. Write a C program using functions readmat (), rowsum (), colsum (), totsum () and printmat () to read the values into a two dimensional array A, find the sum of all the elements of a row, sum of all the elements of a column, find the total sum of all the elements of the two dimensional array A and print the results.

Average	Grade
80 -100	Distinction
60-79	First Class
40 -59	Second Class
<40	Fail

6. Write a C program to perform a linear search for a given key integer in a single dimensional array of numbers and report success or failure in the form of a suitable message using functions.

- Write a C program to enter the information like name, register number, marks in 6 subjects of N students into an array of structures, find the average & display grade based on average for each student.
- Write in C language, a bubble sort programme using function to sort given N integers in ascending/ descending order as per user's preference

Course Outcomes:

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

- Develop** programs using concept of decision making statements and arrays.
- Reduce the complexity of the programs **by making use of** functions.
- Develop** and **experiment** with programs using concepts like pointers, files, structures.

Mapping of POs & COs:

P Os COs	a	b	c	d	e	f	g	h	i	j	k	l
1		H			M							H
2		H			H							H
3		H			M							M

H : High M: Medium L : Low

17CY117 - ENGINEERING CHEMISTRY LABORATORY

Sub Code : 17CY117
Hrs/Week : 0+0+3+0

Credits : 02
Total Hours : 39

Course Learning Objectives:

- To provide students with practical knowledge of quantitative analysis of materials by classical methods.
- Familiarize with the practical knowledge of chemistry enabling their skill development by instrumental methods of analysis.

PART – A
VOLUMETRIC ANALYSIS

1. Determination of Total Hardness of a sample of water using disodium salt of EDTA.
2. Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
3. Determination of Iron in the given sample of Haematite ore solution using potassium dichromate crystals.
4. Determination of manganese dioxide in pyrolusite using standard potassium permanganate solution.
5. Determination of Chemical Oxygen Demand (COD) of the given industrial waste Water sample.
6. Determination of nitrogen ammonia in a given sample of fertilizer using standard hydrochloric acid solution.

PART – B
INSTRUMENTAL ANALYSIS

1. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
2. Colorimetric determination of iron.
3. Conductometric estimation of an Acid mixture using standard NaOH solution.
4. Determination of pKa of a weak acid using pH meter.
5. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
6. Flame photometric estimation of sodium in the given sample of water.

Course Outcomes :

At the end of the course the student will be able to

1. Understand the different types of volumetric titrations for estimation of materials for accurate results.
2. Analyze the materials using different types of instruments for quick and accurate results.

REFERENCE BOOKS :

1. Vogel's text book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.
2. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company, New Delhi.

Scheme of Examination :

1. One experiment from Part-A and another from Part-B shall be set.
2. In given batch a common experiment shall be set under Part-A and different experiments under Part-B.

17MA201 - ENGINEERING MATHEMATICS - II

Sub Code : 17MA201
Hrs/Week : 4+0+0+0

Credits : 04
Total Hours : 52

Course Learning Objectives:**This Course will enable students to**

1. Build a strong foundation in the mathematical tools of calculus which are useful in various engineering fields.
2. Form differential equations as mathematical models suitable for physical problems.
3. Solve differential equations by using different analytical methods.
4. Be familiar with the concept of Laplace Transformation and to use this technique to obtain the solutions of initial value problems.
5. Use the concept of definite integrals and multiple integrals to evaluate the mathematical problems related to their fields of interest.

UNIT - I

Differential Equations: Introduction to first order and first degree differential equations. Exact, reducible to exact and Bernoulli's differential equations. Orthogonal trajectories of cartesian and polar curves. Applications to engineering- Newton's law of cooling, flow of electricity, laws of decay and growth etc. Nonlinear first order differential equations- equations solvable for p , y and x . General and singular solutions. Clairaut's equations and equations reducible to Clairaut's form.

10 Hours**UNIT – II**

Linear Differential equations: Second and higher order linear differential equations with constant coefficients- solution by inverse differential operator method, method of undetermined coefficients. method of variation of parameters. Linear differential equations with variable coefficients- solution of Cauchy's and Legendre's linear differential equations. Solution of Cauchy's homogeneous linear equations. Applications to engineering problems.

10 Hours**UNIT – III**

Integral Calculus: Differentiation under integral sign (Integrals with constant and variable limits). Multiple Integral:- Evaluation by change of order of integration – change of variables and applications to area and volume. Beta and Gamma functions.

11Hours**UNIT – IV**

Laplace Transforms: Definitions, Transforms of elementary functions- Transforms of derivatives and integrals- properties. Periodic functions, Unit Step functions and Unit Impulse functions.

Inverse Transforms- Properties Convolution Theorem. Initial & Final value theorems. Solutions of linear differential equations. Applications to Engineering problems.

12 Hours

UNIT – V

Partial differential equations: Formation of partial differential equations by elimination of arbitrary constants/ arbitrary functions. Derivation of one dimensional heat and wave equations, Solution of PDEs by direct integration, by the method of separation of variables, by Lagrange's method. **9 Hours**

Course Outcomes:

At the end of the course the student will be able to

1. Form differential equations as mathematical models suitable for physical problems.
2. Solve ordinary differential equations by using different analytical methods.
3. Apply the concept of definite integrals and multiple integrals to solve the relevant problems in their field of study.
4. Apply Laplace Transformation technique to solve a system of differential equations
5. To solve partial differential equations by grid analysis.

TEXT BOOKS:

1. Kreyszig: “Advanced Engineering Mathematics”, Vol- 1 & II, Wiley, 2013.
2. B.S.Grewal : “Higher Engineering Mathematics” – 42nd Edition, Khanna publishers;2012

REFERENCE BOOKS:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw –Hill Ltd., 2006
2. N.Piskunov :Differential and Integral Calculus , Vol. 1, CBS Publishers, 2004.

E-BOOKS:

1. <http://tutorial.math.lamar.edu/Classes/DE/DE.aspx>
2. <http://nptel.ac.in/downloads/122101003/>

MOOC/NPTEL:

1. [http://nptel.ac.in/\(I&II\)](http://nptel.ac.in/(I&II))
2. <http://academicearth.org/>

17BT120 - BIOLOGY FOR ENGINEERS**Sub Code : 17BT120****Credits : 02****Hrs/Week : 2+0+0+0****Total Hours : 26****Course Learning Objectives:**

1. To understand and integrate unique biological principles in engineering to improve present technologies. Apply biologically-inspired principles and designs to develop solutions for engineering problems.

UNIT – I**MEMBRANE BIOLOGY AND ENGINEERING PRINCIPLES**

Architecture of cell membrane, passage of water through membrane, maintenance of osmotic balance, bulk passage across the membrane, Selective transport or aided transport across the membrane, active transport across the membrane. Diffusion of ions through channels, facilitated diffusion, Kidney filtration. Application of membrane property to engineering principles: Principle of dialysis, electro dialysis, reverse osmosis, desalination process, membrane filtration technology. Membrane potential, Membrane depolarization during muscle contraction and nerve impulse conduction, generation of action potential and propagation of action potential (electrical impulse). Mechanism of generation of electrical voltage by electric eel or electric ray.

10 Hours**UNIT – II****BIOLOGICAL THERMODYNAMICS**

What is energy? Kinetic and Potential energy, the oxidation reduction, the flow of energy in living systems, The laws of thermodynamics and thermodynamics of living system. Activation energy, enzymes as catalyst to decrease activation energy. Systems and surroundings. Enthalpy of biological system, Second law of thermodynamics and entropy of biological system, Gibbs Free energy, protein and DNA structure as an examples for thermodynamic principles. Equilibrium phenomena, dialysis, protein and DNA denaturation, membrane transport, non-equilibrium thermodynamics and life.

8 Hours**UNIT – III****ADOPTION OF ANATOMICAL PRINCIPLES FOR ENGINEERING DESIGN**

Sliding filament theory of muscle contraction is analogous to sliding plates in machinery. Information theory and biology. Analogy between birds flight and airplane design. Analogy between dragon fly flight and helicopter design. Analogy between whale body contour and submarine body design. Generation of electrical impulse for heart muscle contraction by natural pace maker in the heart, artificial pace maker. Mechanism of hearing and cochlear implant for hearing impaired, echolocator (sonar) in bat and aquatic mammals and its application in submarine. Analogy between heat sensors of snake and heat sensors of missiles. Mechanism of vision (Photoreception) and Bionic eye. Analogy between Mars rover/spirit and crab locomotion. Counter current heat exchanger in large fish and aquatic mammals. Brain cooling system in hoofed mammals.

8 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Draw inspirations from biological principles to solve engineering problems.
2. Understand concept of energy and energy conservation through biological system.
3. Apply biomechanics in biological designs to develop engineering technologies.

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	H	L				M	L		L			
CO2	H	L					L		L			
CO3	H	M				L			L			

REFERENCE BOOKS:

1. Taylor, D. J., Green, N. P. O., Stout, G. W and Soper, R. Biological Science, 3rd Ed. Cambridge University Press, 2012.
2. Haynie, D. T., Biological Thermodynamics, Cambridge University Press, 2013.
3. Raven, P. H. and Johnson, G. B. Biology. 4th Ed. WCB publishers, 2010.
4. Ethier, R. S. and Simmons, C. A. Introductory biomechanics- From cells to organisms. Cambridge University Press, 2012.
5. Johnson A.T., Biology for Engineers, CRC Press, 2010.

ಪ್ರಾಚಾರ್ಯ ಅಧ್ಯಯನ

(FOR KARNATAKA STUDENTS)

Course Code: 17HU108

Credits: Non-credit

Teaching Hours: 01+0+0

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(ಪ್ರಾಚಾರ್ಯ/ಪ್ರಾಚಾರ್ಯ)

- | | |
|---------------------------------|------------------------------|
| 3. ಉತ್ತಮ ಉದಾಹರಣೆಗಳನ್ನು ಕೊಡುವುದು | - ವ್ಯವಸ್ಥಿತವಾಗಿ |
| 4. ಉದಾಹರಣೆ | - ಉದಾಹರಣೆಗಳನ್ನು ಗುರುತಿಸುವುದು |
| 5. ಉದಾಹರಣೆ | - ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು |
| 6. ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು | - ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು |
| 7. ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು | - ಸಮೀಪದ ನಾಗಭೂತಗಳನ್ನು |
| 8. ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು | - ಉದಾಹರಣೆಗಳನ್ನು ವಿವರಿಸುವುದು |

nouns.

Lesson-4: Enquiring about a room for rent, Qualitative and Quantitative adjectives.

Lesson-5: Enquiring about the college, Predicative forms, locative case.

Lesson-6: In hotel-dative case defective verbs.

Lesson-7: Vegetable market, Numeral, Plurals.

UNIT - II

Lesson-8 : Planning for a picnic, Imperative, Permissive, hortative.

Lesson-9 : Conversation between doctor and patient. Verb-iru, negation-illa, non-past tense.

Lesson-10 : Doctor's advice to patient, potential forms, no-past continuous.

Lesson-11 : Discussing about a film, past tense, negation.

Lesson-12 : About Brindavan Garden, Past tense, negation.

Lesson-13 : About routine activities of a student, verbal principle, reflexive form, negation.

Lesson-14 : Telephone conversation, past and present perfect, past continuous and their negation.

Lesson-15: About Halebid, Belur, relative, principle, Negation.

Lesson-16: Discussing about examination and future plan, simple conditional and negative.

UNIT - III

Lesson-17: Karnataka (Lesson for reading)

Lesson-18: Kannada Bhaashe (Lesson for reading)

Lesson-19: ManataruvaSangati (Lesson for reading)

Lesson-20: BekuBedagalu (Lesson for reading)

REFERENCE BOOKS:

1. Kannada Kali – Dr. Lingadevaru Halemane
2. Kannada Paatagalu – Editor:Dr. Chandrashekara Kambara.
