FACULTY OF ENGINEERING

Scheme of Instruction & Examination

(AICTE Model Curriculum for the Academic Years 2020-2024)

and

Syllabi

B.E. I and II Semester of

Four Year Degree Programme

in

Civil Engineering

(With effect from the academic year 2020– 2021)
(As approved in the faculty meeting held on 04.01.2021)

Issued by

Dean, Faculty of Engineering

Osmania University, Hyderabad – 500 007

30.01.2021

SEMESTER-WISE SYLLABI OF COURSES

SCHEME OF INSTRUCTION & EXAMINATION
B.E. (Civil Engineering) I- SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Scheme of Examination		Credits
			L	T	Pr/ Drg	CIE	SEE	
Theory Courses								
1	BS 201 MT	Mathematics -I	3	1	-	30	70	4
2	BS 214 CH	Chemistry	3	1	-	30	70	4
3	ES 302 CS	Programming and Problem Solving	3	-	-	30	70	3
4	MC802CE	Environmental Sciences	2	-	-	30	70	-
Practical/ Laboratory Courses								
5	BS253 CH	Chemistry Laboratory	-	-	3	25	50	1.5
6	ES351 CS	Programming and Problem Solving Laboratory	-	-	2	25	50	1
7	ES 352 ME	Workshop Practice	-	-	2 x 3hrs	50	50	3
			9	**1**	**12**			**16.5**

*Mandatory Requirement: Three weeks induction program to be conducted before commencement of the coursework of Semester-I as per the guidelines given by AICTE

MATHEMATICS-I

BS 201 MT

Instruction: 3+1 periods per week   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 4

Objectives:
  1. To introduce the concepts of sequences, series and their properties
  2. To introduce the concepts of functions of several variables and multiple integrals
  3. To study vector differential and integral calculus

Outcomes:
 The students will able to
 1. Find the nature of sequences and series
 2. Evaluate multiple integrals
 3. Apply this knowledge to solve the curriculum problems

UNIT – I
Sequences and Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence.

UNIT – II
Calculus of one Variable: Rolle's theorem, Lagrange's, Cauchy's mean value theorems, Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes.

UNIT – III
Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT – IV
Multivariable Calculus (Integration): Double integrals, Change of order of integration, Change of Variables from Cartesian to plane polar coordinates, Triple integrals.

UNIT – V
Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Suggested Reading:
   1. R.K. Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 2014.
   2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.
   3. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
   4. G.B. Thomas, Maurice Weir and Joel Hass, *Thomas' Calculus*, Peterson, 12th

Edition,2010.

5. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.

CHEMISTRY

BS 214 CH

Instruction: 3 periods per week+1period tutorial   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 4

Objectives:

1. Correlate the properties of materials with their internal structure and use the for Engineering applications
2. Apply the principals of electrochemistry in storage of electrical energy in batteries.
3. Gains knowledge in causes of corrosion and its prevention.
4. Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also learns the techniques of softening of hard water and treatment of water for drinking purpose.
5. Exposed to qualitative and quantitative parameters of chemical fuels.

Outcomes:

On successful completion of this course, students will be able to:

1. Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries.
2. Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods.
3. Estimate the physical & chemical parameters of quality of water and explain the process of water treatment.
4. Explain the influence of chemical structure on properties of materials and their choice in engineering applications
5. Classify chemical fuels and grade them through qualitative analysis.

UNIT – I:
Water and its treatment
Hardness of Water: Types of hardness-temporary and permanent, units and interrelation between them, Boiler troubles–Scale & sludge, Priming and foaming, Caustic embrittlement - Treatment of boiler feed water–Internal treatment (Colloidal and Calgon conditioning)– External treatment – Zeolite process, ion exchange process. Potable water - Steps involved in treatment of potable water–Disinfecting water by chlorination and ozonization – Reverse Osmosis &its significance.

UNIT – II
Corrosion and its control
Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT – III
Inorganic Engineering Materials
Refractories: Refractories, Properties of Refractories, Manufacture of Refractories, Common Refractory Bricks.

Polymers: Classification of polymers, Types of Polymerization–addition and condensation, differences between addition and condensation polymers, Mechanism of free radical addition polymerization.

Plastics: Thermoplastic &Thermosetting resins, differences between thermoplastic and thermosetting polymers. Preparation, properties and engineering applications of PVC, Teflon and Bakelite.

Glasses and Ceramics: Glasses, Manufacture of Glasses, Types of Glasses, Glass– Reinforced glass material, Advanced Ceramics.

UNIT – IV
Adhesives
Introduction- adhesive action, Development adhesive strength. Physical factors influencing adhesive action. Chemical factors influencing adhesive action. Bonding process by adhesive. Classification of adhesive.

UNIT – V
Explosives and Propellents
Explosives – Classifications of explosives – Primary explosives- Low explosives and high explosives.   Precautions during storage of explosives. Blasting fuses. Manufacture of important explosives. Classification of propellents- Rocket propellents.

Suggested Reading:

1. Engineering Chemistry by P C Jain and M Jain Dhanpat Rai & Sons (15th Edn), New Delhi.
2. Chemistry in Engineering and Technology by J C Kuriacose and J Rajaram, TMH, New Delhi
3. Engineering Chemistry by O G Palanna, TMH, and New Delhi.
4. Engineering Chemistry by S S Dara, S Chand & Sons, New Delhi.
5. Engineering Chemistry by Sashi Chawla. Dhanpat Rai & Sons, New Delhi.
6. Engineering Chemistry by Shikha Agrawal, Cambridge, New Delhi.
7. Engineering Chemistry by Prasanta Rath, Cengage Learning India Pvt. Ltd.

PROGRAMMING AND PROBLEM SOLVING

ES 302 CS

Instruction: 3 periods per week   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits: 3

Objectives:
1. To introduce the basic concepts of Computing environment, number systems and flowcharts
2. To familiarize the basic constructs of C language – data types, operators and expressions
3. To understand modular and structured programming constructs in C
4. To learn the usage of structured data types and memory management using pointers
5. To learn the concepts of data handling using pointers

Outcomes:
The students will able to
1. Formulate simple algorithms for arithmetic and logical problems.
2. Translate the algorithms to programs (in c language).
3. Test and execute the programs and correct syntax and logical errors.
4. Implement conditional branching, iteration and recursion.
5. Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. Use arrays, pointers and structures to formulate algorithms and programs.
7. Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. Apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

UNIT – I
Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.).
Idea of Algorithm: steps to solve logical and numerical problems.
Representation of Algorithm: Flowchart / Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT – II
Control Structures: Arithmetic expressions and precedence, Conditional Branching and Loops**,** Writing and evaluation of conditionals and consequent branching.
Arrays: Arrays (1-D, 2-D), Character arrays and Strings

UNIT – III
Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble and Selection), Finding roots of Equations. ***Functions:*** Functions (including using built in libraries), Parameter passing in functions, call by value. ***Passing arrays to functions***: idea of call by reference

UNIT – IV
Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series. ***Structure:*** Structures, Defining structures and Array of Structures

UNIT – V

Pointers - Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), **Introduction to File Handling.**

Suggested Reading:

1. Byron Gottfried, Schism's Outline of Programming with C, McGraw-Hill
2. A.K. Sharma, Computer Fundamentals and Programming in C, Universities Press, 2nd Edition, 2018.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India.

ENVIRONMENTAL SCIENCE

MC 802 CE

Instruction: 2 periods per week　　　　　　　　*Duration of SEE: 3 hours*
CIE: 30 marks　　　　　　　　　　　　　　　　*SEE: 70 marks*
Credits :Non-Credit

Course Objectives
1. To create awareness and impart basic knowledge about the environment and its allied problems.
2. To know the functions of ecosystems.
3. To understand importance of biological diversity.
4. To study different pollutions and their impact on environment.
5. To know social and environment related issues and their preventive measures.

Course Outcomes
After completing this course, the student will be able to:
1. Adopt environmental ethics to attain sustainable development.
2. Develop an attitude of concern for the environment.
3. Conservation of natural resources and biological diversity.
4. Creating awareness of Green technologies for nation's security.
5. Imparts awareness for environmental laws and regulations.

UNIT-I

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources –World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources –Use and over exploitation, deforestation & its effect on tribal people. Land Resources –Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification**.** Energy Resources –Growing energy needs, Renewable and Non-renewable energy resources.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

UNIT-III

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

UNIT-IV

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation.

UNIT-V
Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.
Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Suggested Readings:
1. A.K. De, *Environmental Chemistry,* Wiley Eastern Ltd.
2. E.P. Odum, *Fundamentals of Ecology,* W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta, *Waste Water Treatment,* Oxford and IBK Publications.
4. Benny Joseph, *Environmental Studies,* Tata McGraw Hill, 2005.
5. V.K. Sharma, *Disaster Management,* National Centre for Disaster Management, IIPE,1999.

CHEMISTRY LABORATORY

BS 253 CH

Instruction: 3 periods per week   *Duration of SEE: 3 hours*
CIE: 25marks   *SEE: 50 marks*
Credits : 1.5

Objectives:
1. Conduct experiments, take measurements and analyse the data though hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative Analysis while working in small group.
2. Interpret the electro analytical principles with experimental results graphically
3. Demonstrate writing skills through clear laboratory reports

Outcomes:
On successful completion of this course, students will be able to:
1. Apply the principles of Colourimetry and Electrochemistry in quantitative estimations.
2. Estimate the rate constants of reactions from concentration of reactants/ products as a function of time.
3. Synthesize small drug molecules.

List of Experiments:
1. Introduction to Chemical Analysis.
2. Techniques of Weighing.

Volumetric Analysis:
3. Preparation of Standard Mohr's salt solution, Standardization of $KMnO_4$ and estimation ferrous ion
4. Estimation Iron(II) by Dichromatometry

Water Analysis:
5. Preparation of Standard Magnesium sulphate solution, standardization of EDTA and Estimation of Total Hardness.
6. Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity.

Conductometry:
7. Estimation of HCl

8. Estimation of CH_3COOH and mixture of acids

Potentiometry
9. Estimation of HCl

10. Estimation of Iron

pH Metry:
11. Estimation of HCl

Colorimetry:

12. Verification of Beer-Lambert's law and estimation of Manganese.

Chemical Kinetics:

13. Determination of rate constant of acid catalysed hydrolysis of methyl acetate.

Drug Synthesis
14. Preparation of Aspirin

Note: Minimum ten experiments should be conducted in the semester

Suggested Reading:

1. Senior Practical Physical Chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co. Delhi)

2. An Introduction to Practical Chemistry, K. K. Sharma and D.S. Sharma (Vikas publishing N. Delhi)

PROGRAMMING AND PROBLEM SOLVING LABORATORY

ES 351 CS

Instruction: 2 periods per week   *Duration of SEE: 3 hours*
CIE: 25 marks   *SEE: 50 marks*
Credits : 1

Objectives:
1. Understand the fundamentals of programming in C Language.
2. Write, compile and debug programs in C.
3. Formulate solution to problems and implement in C.
4. Effectively choose programming components to solve computing problems.

Outcomes:
The students will able to
1. Choose appropriate data type for implementing programs in C language.
2. Design and implement modular programs involving input output operations, decision making and looping constructs.
3. Implement search and sort operations on arrays.
4. Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
5. Design and implement programs to store data in structures and files.

LIST OF EXPERIMENTS

1. Finding maximum and minimum of given set of numbers, finding roots of quadratic equation.
2. Sin x and Cos x values using series expansion.
3. Conversion of binary to decimal, octal, hexadecimal and vice versa.
4. Generating Pascal triangle, pyramid of numbers.
5. Recursion: factorial, Fibonacci, GCD.
6. Matrix addition and multiplication using arrays, linear search and binary search using recursive and non-recursive procedures.
7. Bubble sort and selection sort.
8. Programs on pointers: pointer to arrays, pointer to functions.
9. Functions for string manipulations.
10. Programs on structures and unions.
11. Finding the number of characters, words and lines of given text file.
12. File handling programs

Suggested Reading:
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. A.K. Sharma, Computer Fundamentals and Programming in C, Universities Press, 2018.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India.

WORKSHOP PRACTICE

ES 352 ME

Instruction: 6 periods per week *Duration of SEE: 3 hours*
CIE: 50 marks *SEE: 50 marks*
Credits : 3

Objectives:
1. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
2. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
3. To gain a good basic working knowledge required for the production of various engineering products.
4. To Study different hand operated power tools, uses and their demonstration.
5. Adopt safety practices while working with various tools

Outcomes:
1. Demonstrate an understanding of and comply with workshop safety regulations.
2. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiselling.
3. Study and practice on machine tools and their operations
4. Undertake jobs connected with Engineering Workshop trades including fitting, carpentry, sheet metal, house wiring, welding, smithy and foundry.
5. Apply basic electrical engineering knowledge for house wiring practice

LIST OF EXPERIMENTS:

A. TRADE FOR EXERCISES:
   1. Carpentry
   2. Fitting
   3. House wiring
   4. Sheet metal working
   5. Smithy
   6. Welding
   7. Plumbing

B. TRADES FOR DEMONSTRATION AND EXPOSURE:
   1. Machining (Lathe & Drilling)
   2. Injection moulding
   3. Mould making and casting
   4. Basic Electronics lab instruments

C. PRESENTATIONS AND VIDEO LECTURES
   1. Manufacturing Methods
   2. Rapid Prototyping
   3. Glass Cutting
   4. 3D printing
   5. CNC LATHE

D. IT WORKSHOP: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, operating system installation.

Note: At least two exercises from each trade.

Suggested Reading:

1. Venugopal, K, "Workshop manual", Anuradha Publications, Kumbakonam, TN, 2012
2. K.C. John, "Mechanical Workshop" 2nd Edn., PHI, 2010.
3. Hajra Choudary, "Elements of Workshop Technology" Vol. 1, Asian Publishers, Edn., 1993.
4. G.S. Sawhney, "Mechanical Experiments and Workshop Practice", I.K. International Publishing House, New Delhi, 2009.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. (Civil Engineering) II – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Scheme of Examination		Credits
			L	T	Pr/ Drg	CIE	SEE	
Theory Courses								
1	HS 101 EG	English	2	-	-	30	70	2
2	BS 203MT	Mathematics -II	3	1	-	30	70	4
3	BS 202 PH	Engineering Physics	3	1	-	30	70	4
4	ES 302 CE	Engineering Mechanics	3	1	-	30	70	4
Practical/ Laboratory Courses								
5	HS 151 EG	English Laboratory	-	-	2	25	50	1
6	BS 251 PH	Physics Laboratory	-	-	3	25	50	1.5
7	ES 353 CE	Engineering Graphics	-	-	2 x 3hrs	50	50	3
			11	**2**	**10**			**19.5**

* These courses, namely, Engineering Mechanics and Engineering Graphics and Design are also offered as service courses by the Department of Civil Engineering to the other departments.

ENGLISH

HS101 EG

Instruction: 3 periods per week   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 2

Objectives:
To enhance the English language abilities of Engineering students, especially in reading and writing, by
1. Using authentic material for language learning
2. Exposing them to a variety of content-rich texts
3. Strengthening their grammar and vocabulary
4. Improving their reading and comprehension skills
5. Honing their writing skills
6. Encouraging them to think creatively and critically

Outcomes:
On successful completion of the course, the student will be able to
1. Read, understand, and interpret a variety of written texts
2. Use appropriate vocabulary and correct grammar
3. Undertake guided and extended writing with confidence.

UNIT – I
    Reading   : RK Narayan, "A Horse and Two Goats"
    Vocabulary   : Word formation—Prefixes, Suffixes, Root Words
    Grammar   : Articles, Prepositions, Determiners
    Writing   : Guided Writing (Expanding the outline/Writing from verbal cues)

UNIT – II
    Reading   : Rudyard Kipling, "If"
    Vocabulary   : Word formation—Compounding and Blending, Contractions
    Grammar   : Transitions, Connectives
    Writing   : Paragraph Writing

UNIT – III
    Reading   : Martin Luther King Jr., "I Have a dream"
    Vocabulary   : Synonyms, Antonyms, One Word Substitutes
    Grammar   : Voice
    Writing   : Letter Writing

UNIT – IV
    Reading   : Robert Frost, "Road Not Taken"
    Vocabulary   : Homophones, Homonyms, Homographs
    Grammar   : Narration (Direct-Indirect Speech)
    Writing   : Report Writing

UNIT – V

Reading   : George Orwell, "The Sporting Spirit" (Excerpt)
Vocabulary   : Inclusive Language, Euphemisms
Grammar   : Tense
Writing   : SOP

Suggested Reading:

1. Board of Editors. Language and Life: A Skills Approach. Orient BlackSwan, 2018.
2. Sudharshana, NP and C Savitha. English for Engineers. Cambridge University Press, 2018.
3. Kumar, Sanjay and Pushp Lata. English Language and Communication Skills for Engineers. Oxford University Press, 2018.

MATHEMATICS-II

BS 203 MT

Instruction: 3+1 periods per week   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 4

Objectives:
1. To study matrix algebra and its use in solving system of linear equations and in solving eigen value problems
2. To provide an overview of ordinary differential equations
3. To study special functions like Legendre and Beta Gamma functions
4. To learn Laplace Transforms and its properties

Outcomes:
1. Solve system of linear equations and eigen value problems
2. Solve certain first order and higher order differential equations
3. Solve basic problems of Beta Gamma and Legender's Function.
4. Apply Laplace Transforms; solve ordinary Differential Equations by using it.

UNIT – I
Matrices: Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigenvectors, Properties of eigen values, Cayley - Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

UNIT – II
Differential Equations of First Order: Exact differential equations, Integrating factors, Linear differential equations, Bernoulli's, Riccati's and Clairaut's differential equations, Orthogonal trajectories of a given family of curves.

UNIT – III
Differential Equations of Higher Orders: Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients, Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation.

UNIT – IV
Special Function: Gamma Functions, Beta Functions, Relation Between Beta and Gamma Function, Error Functions. Power Series Method, Lengender's Differential Equations and Legender's Polynomial $P_n(x)$, Rodrigue's Formula (without proof).

UNIT – V
Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary Differential Equations using Laplace Transforms.

Suggested Reading:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition,2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.
3. Dr.B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition,2014.
4. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
5. N. Bali, M. Goyal, A text book of Engineering *Mathematics*, Laxmi publications,2010
6. H.K. Dass, Er. Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition.

ENGINEERING PHYSICS

BS 202 PH

Instruction: 3 periods per week+ 1period for tutorial   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 4

Objectives:
1. Aware of limits of classical free electron free theory and to apply band theory of solids
2. Acquire knowledge on various properties of semiconductors.
3. Grasp the intricacies in semiconductor-optical interaction

Outcomes:
1. Distinguish materials based on band theory of solids
2. Classify semiconductors on the basis doping and to estimate conductivity and learn transport phenomenon in semiconductors
3. Appreciate use of optical absorption by semiconductors.

UNIT – I
Crystallography: Introduction, Types of crystal systems, Bravais lattices, Lattiee planes and Miller Indices (Cubic system), Inter planar spacing (Cubic system), Bragg's law, Powder diffraction method.
Crystal Defects: Classification of point defects, Concentration of Schottky defects in metals and ionic crystals, Concentration of Frankel defects, Line defects, Screw and Edge dislocations, Burger's vector

UNIT – II
Band Theory of Solids & Semiconductors: Classical free electron theory (qualitative), Kronig Penney model (qualitative treatment), Energy band formation in solids, Intrinsic and Extrinsic semiconductors, Concept of a hole, Carrier concentration and conductivity in intrinsic semiconductors, Formation of P-N junction diode and its I – V characteristics, Thermistor and its characteristics, Hall effect and its applications.
Dielectric Materials: Dielectrics, Types of polarizations, Electronic, Ionic, Orientational and Space charge polarizations, Expression for Electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Determination of dielectric constant by capacitance Bridge method, Ferro electricity, Barium titanate, Applications of Ferroelectrics.

UNIT – III
Wave Mechanics: Matter waves –de-Broglie wavelength, properties of wave function, Physical significance, Schrodinger time dependent and time in-dependent wave equation. Particle in a 1-D box.
Electromagnetic theory: Basic laws of electricity and magnetism, Maxwell's equations in integral and differential forms, Conduction and displacement current, Relation between D, E and P – ***Electromagnetic waves:*** Equation of plane wave in free space, Poynting theorem.

UNIT – IV
Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials, Weiss molecular field theory of ferromagnetism, Magnetic domains, Hysteresis curve, soft and hard magnetic materials, Ferrites: Applications of ferrites.

Superconductivity: Introduction, General properties of super conductors, Meissner effect, Type I and Type II superconductors, BCS theory (qualitative), Introduction to High T_c superconductors, Applications of superconductors.

UNIT – V
Lasers: Characteristics of Lasers, spontaneous and stimulated emission of radiation, Einstein's Coefficients, population inversion, Ruby Laser, Helium Neon Laser, Semi-Conductor Laser and applications of lasers.
Fiber Optics: Introduction, Propagation of light through an optical fiber, Acceptance angle, Numerical aperture (NA), Types of Optical fibers and Refractive index profiles, Fiber drawing process (double Crucible Method), Losses in optical fibers, applications of optical fibers.

Suggested Reading:

1 B.K. Pandey and S. Chaturvedi Engineering Physics Cengage Learning 2012
2 A.K. Bhandhopadhya, Nano Materials, New Age International, 1st Edition, 2007
3 M.S. Avadhanulu and P.G. Kshirusagar, Engg. Physics, S. Chand & Co. 1st Edition, 1992.
4 C.M. Srivastava and C. Srinivasan – Science of Engg Materials, New Age International.
5 R.K Gaur and S.L Gupta- Engineering Physics, Dhanpathrai Publications, New edition.
6 Sanjay D Jain & Girish G Sahasrabudhe -Engineering Physics, University Press

ENGINEERING MECHANICS

ES 302 CE

Instruction: 3+1 periods per week   *Duration of SEE: 3 hours*
CIE: 30 marks   *SEE: 70 marks*
Credits : 4

Objectives:
The objectives of this course is to impart knowledge of
  1. Resultant and equilibrium of force system ,concept of friction,analyze the Perfectframes.
  2. Obtaining centroids and moments of inertia for various sections.
  3.Basic concepts of dynamics, Kinematics and Kinetics and their applications to problem
  solving

Outcomes:
After completing this course, the student will be able to:
1. Apply the fundamental concepts of forces, Resultant and Equilibrium conditions for static loads
2. Analyse forces in members of a Perfect frame using method of joints and method of sections, analyze friction for single and connected bodies
3. Determine the centroid and moment of inertia for various sections
4. Apply the basic concepts of dynamics for rectilinear and curvilinear motion and kinetics Using D' Alembert's Principle
5. Solve problems involving work energy principles and impulse momentum theory.

UNIT – I
*Introduction to Engineering Mechanics***:** Basic Concepts
*System of Forces***:** Coplanar Concurrent Forces, Components in Space – Resultant of coplanar and spatial systems, Moment of Force and Couple and its Application to coplanar system
*Equilibrium of Systems of Forces***:** Free Body Diagrams, Equations of Equilibrium and applications to Coplanar System.

UNIT – II
*Friction***:** Theory of friction, Laws of friction, Friction connected to single and connected bodies, Wedge friction.
*Analysis of Perfect Frames***:** Types of Frames, Assumptions for forces in members of perfect frame, Method of joints and Method of sections for Cantilever Trusses, Simply supported Trusses.

UNIT – III
*Centroid***:** Centroid of simple areas (from basic principles), Centroid of Composite areas.
Centre of Gravity: Centre of gravity of simple bodies (from basic principles).
Area Moment of Inertia: Definition, Moment of inertia of simple areas (from basic principles), Polar Moment of Inertia, Transfer formula, Moment of Inertia of Composite areas.
*Mass moment of Inertia***:** Mass moment of inertia of simple bodies (from basic principles).

UNIT – IV
*Kinematics***:** Introduction, Motion of particle, Rectilinear and Curvilinear motions, Velocity and Acceleration, Types of Rigid body, Angular motion, Fixed axis rotation.
*Kinetics:*Introduction, fundamental equation of kinetics for a particle, D' Alembert's principle

for particle motion, connected system and Fixed Axis Rotation

UNIT – V
*Work - Energy Method***:** Introduction, Equations for Translation, Work-Energy Applications to Particle Motion, Connected System and Fixed Axis Rotation.
*Impulse Momentum Method***:** Linear impulse momentum, law of conservation of momentum, coefficient of restitution, Elastic impact.

Suggested Reading:

1. Ferdinand L. Singer, *Engineering Mechanics Statics and Dynamics*, Harper Collins publishers inc, New York, 1994.
2. Ferdinand L. Singer, K. Vijaya Kumar Reddy, J. Suresh Kumar, *Singer's Engineering Mechanics*, BS Publications, Hyderabad, 2011.
3. S.S Bhavakatti, K. G. Rajashekarappa *Engineering Mechanics*, New age International publishers, Delhi,1994.
4. Rajeshakharan, S. and Sankara Subrahmanyam, G., *Engineering Mechanics Statics and Dynamics,* Vikas Publications, Delhi, 2005.
5. Junarkar, S.B. and H.J. Shah., *Applied Mechanics*, Charotar Publishing House Pvt. Ltd, Anand, 2015.

ENGLISH LABORATORY

HS 151 EG

Instruction: 2 periods per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits: 1

Objectives:
 1. Learn IPA
 2. Learn minimal pairs and types of syllables
 3. Overcome the difficulties with sounds of English
 4. Learn to participate well in gds, Debates and Presentations
 5. Communicate with appropriate body language and expressions

Outcomes:
 1. Learn IPA
 2. Learn minimal pairs and types of syllables
 3. Overcome the difficulties with sounds of English
 4. Learn to participate well in gds, Debates and Presentations
 5. Communicate with appropriate body language, expressions

*1. **Introduction to English Phonetics: Organs of Speech:*** respiratory, articulatory and phonatory systems; ***Sounds of English:*** Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.

*2. **Speaking Activities:*** Self Introduction, Picture perception, JAM.

3. Group discussion, Debate, Presentation skills

*4. **Listening Activities:*** Listening to different types of materials for effective comprehension

*5. **Role play:*** Use of dialogues in a variety of situations and settings

Suggested Reading:

 1 E. Suresh Kumar, a Handbook for English Language Laboratories (with CD).
 2 Revised edition, Cambridge University Press India Pvt. Ltd. 2014
 3 T. Balasubramanian. A Textbook of English Phonetics for Indian Students. Macmillan, 2008.
 4 J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
 5 Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata McGraw Hill, 2006.

PHYSICS LABORATORY

BS 251 PH

Instruction: 3 periods per week   *Duration of SEE: 3 hours*
CIE: 25 marks   *SEE: 50 marks*
Credits: 1.5

Objectives:
 1. Make precise measurements using basic physical principles and acquire skills to handle the instruments
 2. Relates the theoretical Knowledge to the behaviour of Practical Physical world.
 3. Analyse errors in the experimental data.
 4. Plot graphs between various physical parameters.

Outcomes:
 1. Conduct experiments, take measurements independently.
 2. Write appropriate laboratory reports.
 3. Compute and compare the experimental results and draw relevant conclusions.
 4. Use the graphical representation of data and estimate results from graphs

LIST OF EXPERIMENTS

 1. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).

 2. To draw the I - V Characteristics of P-N Junction diode and to evaluate the resistance.

 3. To find the values of Electrical conductivity and energy gap of Ge crystal.

 4. Determination of rigidity of modulus of Torsion pendulum.

 5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge crystal using Hall Effect Experiment.

 6. To determine the constants of A, B and α using Thermistor characteristics.

 7. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out

 i)Coercivity ii) Retentivity and iii) Hysteresis loss.

 8. To draw the I - V Characteristics of a solar cell and to calculate the

 i) Fill factor Efficiency and ii) Series resistance.

 9. To Determine the Numerical aperture (NA) of Optical fiber.

 10. To determine the wave length of the given Laser source

Note: Minimum eight experiments should be conducted in the semester

Suggested Reading:

1. N.K. De, "Basic Electrical Engineering", Universities Press, 2015.
2. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.
3. J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010

ENGINEERING GRAPHICS

ES 353 CE

Instruction: 2L +4D periods per week   *Duration of SEE: 3 hours*
CIE: 50 marks   *SEE: 50 marks*
Credits: 3

Objectives:
1. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. Communicate effectively using graphical methods
3. Understand the techniques, skills, and modern engineering tools necessary for engineering practice.

Outcomes:
1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards and solid modelling
4. Exposure to computer-aided geometric design
5. Exposure to creating working drawings

Sheet No	Description of the Topic	Contact Hours	
		Lecture	**Drawing**
1	Principles of Engineering Graphics and their significance, usage of drawing instruments.	1	
2	**Conic Sections – I** Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
3	**Conic Sections – II** Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola.		2
4	**Cycloids** (cycloid & epicycloids)	1	2
5	**Involutes** (involute of triangle, square & circle)		2
6	**Scales** (plain & diagonal scales)	1	4
7	**Introduction to AutoCAD** Basic commands and simple drawings.		4
8	**Orthographic Projection** Projections of points situated in different quadrants.	1	2
9	**Projections of straight lines – I** Line parallel to both the reference planes, line perpendicular or inclined to one reference plane.	1	2
10	**Projections of straight lines – II** Line inclined to both the reference planes.	1	2
11	**Projections of planes – I** Perpendicular planes	1	2
12	**Projections of planes – II** Oblique planes		2
13	**Projections of solids – I** Polyhedra and solids of revolution, Projections of solids in	1	2

	simple position.		
14	**Projection of solids – II** Projections of solids when the axes inclined to one or both the reference planes.	1	4
15	**Section of solids – I** When the sectional plane is parallel or perpendicular to one reference plane.	1	2
16	**Section of solids – II** When the sectional plane is inclined to one reference plane.		2
17	**Development of surfaces – I** Prisms and Cylinders	1	2
18	**Development of surfaces – II** Pyramids and Cones		2
19	**Intersection of surfaces – I** Intersection of cylinder and cylinder	1	2
20	**Intersection of surfaces – II** Intersection of cylinder and cone		2
21	**Isometric projection – I** Planes and simple solids	1	2
22	**Isometric projection – II** Combination of two or three solids		2
23	Conversion of Isometric Views to Orthographic Views	1	2

Note:

1. At least 20 sheets must be covered.
2. Sheet number 1 to 6 (Graph sheets / drawing sheets)
3. Sheet number 7 to 23 (AutoCAD drawings).

Suggested Readings

1   Bhatt N.D., Panchal V.M. & Ingle P.R., *Engineering Drawing*, Charotar Publishing House, 2014
2   Shah, M.B. & Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008
3   S.N Lal, Engineering Drawing with Introduction to Auto CAD, Cengage Learning India Pvt Lid, New Delhi, 2018
4   Agrawal B. & Agrawal C. M., Engineering Graphics, TMH Publication, 2012
5   Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008
6   Corresponding set of CAD Software Theory and User Manuals