

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

<b>Course Code</b>	<b>HSIC11</b>
<b>Course Title</b>	<b>Communication Skills in English</b>
<b>Number of Credits</b>	<b>3 (2L+2P)</b>
<b>Prerequisites (Course code)</b>	<b>----</b>
<b>Course Category</b>	<b>Institute Core (IC)</b>

**Semester: Odd/Even**

**Time: 3hrs**

**Internal: 50 Marks**

**Theory: 50 Marks**

**Total: 100 Marks**

### **Course objectives**

- To develop communication skills among engineering students.
- To build confidence in speaking English with correct pronunciation.
- To develop basic writing skills and vocabulary.
- To develop the ability to comprehend text in various contexts.

### **Part- I Theory Teaching**

#### **Unit I: Introduction to Communication Skills**

Introduction to Communication Skills: meaning and definition of communication, forms of communication, barriers to effective communication, ways to overcome barriers in communication; Communication Skills: Listening Skills, Speaking Skills, Reading Skills, Writing Skills; Technical Communication; Digital Communication.

#### **Unit II: Soft Skills for Professional Excellence**

Introduction to soft skills: meaning, nature, scope and importance of soft skills in the present organizational set up; managing interpersonal relationships: leadership skills, team work, attitude, creativity, resilience etc.; nonverbal communication: body language and gestures, significance and role of body language in effective communication across cultures.

#### **Unit III: Written Communication**

Formal letters, curriculum vitae and resume writing, writing e-mails, technical reports with an emphasis on different styles and structures/formats.

#### **Unit IV: Grammar and Punctuation**

Parts of speech, tenses, subject verb, active passive, interjections, capitalization etc. Use of comma, period, exclamation marks, ellipsis, question mark, colon, semi-colon, quotation marks, apostrophe etc. Common errors and acceptable forms of English language.

### **Part- II Language Laboratory**

#### **Unit I: Listening Skills**

Listening Process and practice- introduction to recorded lectures, poems, interviews and speeches, listening tests, problems in comprehension and retention, importance of listening in organizational set up.

## **Unit II: Reading and Pronunciation Skills**

Phonetics and Phonology: Introduction to sounds, vowel and consonant sounds, diphthongs etc. IPA transcription of words, word stress, weak forms, voice, intonation, tone etc.

## **Unit III: Soft Skills**

Proper use of Body Language: facial expressions, eye contact, gestures, postures and dressing; emotions displayed by body language; different types of handshakes; desirable and undesirable body language under different professional situations.

## **Unit IV: Speaking Skills**

Standard and formal speech: Activities like Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.

## **Reference Books**

1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.  
James Hartman & et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University Press, 2006.
2. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.  
Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
3. Margaret M. Maisson. Examine your English. Orient Longman: New Delhi, 1964.
4. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
5. William Sanborn and T.V.S Padmaja. Technical Communication: A Practical Approach. 6th ed. Delhi: Pearson, 2007.

## **Course Outcome**

At the end of this course the students will be able to communicate effectively with an increase in their confidence to read, write and speak English fluently. They will also demonstrate a significant increase in word power. The variety of exercises and activities that will be conducted in the Language Lab will develop the skills needed to participate in a conversation like listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly and overall students will be able to prepare, organize, and deliver an engaging oral presentation.

## **Note**

It is further proposed to do away with the attendance component of the awards in the internal assessment. A note may be appended with each course on the following instructions:

- (i) The faculty member is expected to explore and be acquainted with the existing Indian Knowledge in the domain of the course and share with the students.
- (ii) The students are expected to do the necessary study of the existing Indian Knowledge in the domain of the course, prepare the report, and submit the same to the concerned faculty member at the end of the semester.
- (iii) The faculty member will evaluate the reports and award marks to the students with maximum cap being the equivalent of attendance component marks.

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

<b>Course Code</b>	<b>HSIC12</b>
<b>Course Title</b>	<b>Economics for Engineers</b>
<b>Number of Credits</b>	<b>3 (2L + 1T)</b>
<b>Prerequisites (Course Code)</b>	----
<b>Course Category</b>	<b>Institute Core (IC)</b>

**Semester: Odd/Even**

**Time: 3hrs**

**Internal: 50 Marks**

**Theory: 50 Marks**

**Total: 100 Marks**

### Course Objectives

- To enable students to understand the economics principles applicable to engineering.
- To help students in learning the techniques of economic decision making.
- To familiarize the students with basic fundamentals of Indian financial economy.

### Unit I: Introduction and Demand Analysis

Principles of economics, how markets work: market forces of supply and demand, Elasticity and its application, Consumer equilibrium.

### Unit II: Theory of Cost, Production and Markets

Firms' production, cost and revenue behavior; resources optimization; Firms' behavior under competitive markets, monopoly and monopolistic competition.

### Unit III: Financial and Engineering Economy

Financial system: financial institutions, markets and instruments. Engineering Economy: Time value of money, Alternatives' comparing techniques: Present worth analysis, annual worth analysis, rate of return analysis.

### Unit IV: Indian Economy, Foreign Trade & Investment

Indian Economy: monetary, fiscal policies and their implications. Trade and investment factors, trade protectionism; balance of payment, devaluation and exchange rate determination.

### Reference Books

- N. Gregory Mankiw. Principles of Microeconomics, 8th Ed., Cengage Learning India Pvt, 2022.
- Krugman, Paul, and Robin Wells. Microeconomics. 6th Ed. Worth Publishers, 2020.
- Anindya Sen, Microeconomics, 2nd Ed., OUP India, 2006.
- Leland T. Blank & Anthony J. Tarquin, Engineering Economy, McGraw-Hill, 2007.
- Hal R. Varian Intermediate Microeconomics, W. W. Norton and Company, 2019.
- Ruder Dutt and Sundaram, Indian Economy, 65th Ed., S. Chand, 2018.
- D. Salvatore, International Economics, 11th Ed., John Wiley & Sons, 2013.

### Course Outcomes

After this course, the students will be able to understand the concepts of economics and will learn that how to use the principles of economics in the engineering discipline. The course would develop the insight of students in understanding the consumer and production behavior and functioning of market economy. Students would also learn the implications of monetary and fiscal policies in Indian economy. The course will help the students in learning the techniques of comparing the alternative on monetary terms.

**Note**

It is further proposed to do away with the attendance component of the awards in the internal assessment. A note may be appended with each course on the following instructions:

- (i) The faculty member is expected to explore and be acquainted with the existing Indian Knowledge in the domain of the course and share with the students.
- (ii) The students are expected to do the necessary study of the existing Indian Knowledge in the domain of the course, prepare the report, and submit the same to the concerned faculty member at the end of the semester.
- (iii) The faculty member will evaluate the reports and award marks to the students with maximum cap being the equivalent of attendance component marks.

Course Code: MAIC 11

Course Title: Differential Calculus and Differential Equations

Number of Credits: 4

Pre-requisites: The basic knowledge of matrix theory, Limit, Continuity, Differentiability for functions of one variable, Basic knowledge of ordinary differential equations of first order and first degree.

Course Type: IC

Course Objectives:

- To understand matrix algebra and its applicability in different engineering fields.
- To incorporate the knowledge of calculus and its subsequent engineering applications.
- To be able to form and solve the ordinary differential equation with engineering applications.
- To have the idea of Laplace transforms with engineering applications.

**Unit 1: Matrix Theory**

9L hours

Matrices, Related matrices, Rank of a matrix, Linear dependence and independence of vectors, Consistency of linear systems of equations, Solution of linear system of equations, Eigen value problem, Eigen values and Eigen vectors with their properties, Cayley-Hamilton theorem and its applications, Similarity of matrices, Diagonalization of a real symmetric matrix, Quadratic form and their reduction to canonical form.

**Unit 2: Multivariable Calculus**

9L hours

Limits, continuity and differentiability of multivariable functions, Partial differentiation and its geometrical interpretation, Total differential, Composite function, Taylor's and Maclaurin's expansion for the functions of two variables, Maxima and minima, Lagrange's method of undetermined multipliers, Jacobian, Difference between total derivative and Jacobian.

**Unit 3: Ordinary Differential Equations**

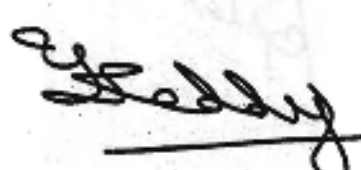
9L hours

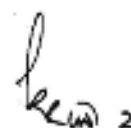
Linear higher order ordinary differential equations with constant coefficients, Solutions of homogenous and non-homogenous equations, Method of variation of parameters, Method of undetermined coefficients, Equations reducible to linear equations with constant coefficients (Euler-Cauchy and Legendre's linear differential equations).

**Unit 4: Applications of Differential Equations**

9L hours

First order differential equations: Newton's law of cooling, Radioactive decay, L-R and C-R circuits. Second order differential equations: Mechanical Vibrations- Free undamped and damped vibrations, Forced Oscillations, Resonance phenomenon. Electrical Vibrations- Series LCR circuit, Analogy with mass spring system, LCR circuit with voltage source, Complex impedance and Resonance phenomena.

  
External Member: Prof. Y. N. Reddy  
BOS NIT Warangal

  
27/10/22  
Chairman (BOS)  
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(गणित विभाग)



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### Unit 5: Laplace Transforms

9L hours

Laplace transforms- Definition, Laplace transforms of standard functions and their properties, Inverse Laplace transforms and its properties, Convolution theorem, Initial and final values theorems, Laplace transforms of periodic functions, Heaviside unit step function, Dirac-delta function, Solution of ordinary differential equations.

#### Text Books

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9<sup>th</sup> Edition, Wiley India Pvt. Ltd., (2011).
2. Paras Ram, *Engineering Mathematics through Applications*, 2<sup>nd</sup> Edition, CBS Publishers, (2015).

#### Reference Books

1. G. B. Thomas and R.L. Finney, *Calculus and analytical geometry*, 9<sup>th</sup> Edition, Pearson Education, 5th Indian Reprint, (2002).
2. Peter V. O'Neil, *Advanced Engineering Mathematics*, 5th Edition, Thomson, Book/Cole, (2003).
3. A. K. Nandakumaran, P. S. Datti, and Raju K. George, *Ordinary Differential Equations: Principles and Applications* Cambridge University Press, (2017).

#### Course Outcomes

By the end of the course the students will be able to

CO1: Understand and analyze the theoretical and practical aspects of matrix applications.

CO2: Identify extreme values of functions and interpret the engineering problems.

CO3: Model simple physical problems as differential equations, analyze and interpret the solutions.

CO4: Use Laplace transforms to solve ordinary differential equations.

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विभागाध्यक्ष,  
(गणित विभाग),  
राष्ट्रीय प्रौद्योगिकी संस्थान  
पुणे-411 004

Course Code	:	PHIC11
Course Title	:	Physics -I
Credits	:	4 (2L + 1T + 2P)
Prerequisites	:	-
Course Type	:	IC

#### Course Objectives:

- To develop the understanding of Physics fundamentals essential for various engineering disciplines.
- To familiarize students about relevance of Quantum mechanics and Electromagnetic principles and their applicability in tackling real life engineering challenges.
- To develop key ideas of Crystal Physics, Theory of Relativity and Nuclear technology applicable in state of the art technological applications.
- To familiarize the working principles of Optical instruments, LASERs, and Optical Fibers along with their real life applications.

#### Course Content

##### UNIT-I [6 L]

**QUANTUM MECHANICS:** Basics of quantum mechanics, De-Broglie's hypothesis, Uncertainty principle, Probability and Wave function, Postulates of quantum mechanics, Time-dependent and Time-independent Schrodinger wave equation, Particle in a box.

**ELECTROMAGNETIC THEORY:** Maxwell's equations in vacuum and medium, Electromagnetic Waves, Propagation Energy and Poynting Vector.

##### UNIT-II [6 L]

**SOLID STATE PHYSICS:** Space Lattice, unit cell and translation vectors; Miller indices, Simple and Close-packed crystal structures with examples, Origin of energy bands, Kronig Penney Model (qualitative), E-K diagram, Brillouin Zones, Concept of effective mass and holes, Classification into metals, Semiconductors and insulators, Hall effect.

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### UNIT-III [6 L]

**SPECIAL THEORY OF RELATIVITY:** The Michelson-Morley experiment, Relativistic transformations, Length contraction, Time dilation, Variation of mass with velocity, Mass-energy equivalence.

**NUCLEAR TECHNOLOGY:** Interaction of radiation with matter, Nuclear reactors, Moderators, Reactor criticality & Neutron cross-section

### UNIT-IV [6 L]

**ENGINEERING OPTICS:** Fundamentals of Interference, Diffraction and Polarization, Lasers and characteristics, Einstein's coefficients, He-Ne laser, Semiconductor lasers, Applications of Lasers.

**OPTICAL FIBRES:** Acceptance angle, Numerical aperture, Classification of optical fibres, Fibre losses, Fibre manufacturing, Applications of optical fibre in industry and communication.

#### Reference Books

1. D.J. Griffiths, Introduction to Electrodynamics, PHI Learning Publishers, New Delhi, 2012.
2. M. A. Wahab, Solid State Physics, Narosa, 2022.
3. S.O.Pillai, Solid state Physics, New age International publishers, 2012.
4. A. Beiser, Concepts of Modern Physics, McGraw-Hill, 2008.
5. John Lilley, Nuclear Physics, Principles and applications, Wiley, 2016.

#### Course Outcomes:

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

- develop the skills to apply various Physics concepts in tackling real life engineering problems.
- understand and apply the ideas of Quantum Mechanics and Electromagnetic Theory for designing and development of various technological equipments.
- understand various technological domains of applicability of Crystal Physics, Theory of Relativity, and Nuclear technology.
- initiate the design and develop relevant applications based on fundamentals of Optics, LASERS, and Optical Fibers.

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## B. TECH. 1<sup>ST</sup> SEMESTER PHYSICS PRACTICALS

### LIST OF EXPERIMENTS

1. To find the wavelength of Sodium light by using diffraction grating.
2. To find the wavelength of different colours of white light by using diffraction grating.
3. To study Polarization of light and verification of Malus's law.
4. To find the wavelength of light by using Newton's rings.
5. To find the specific rotation of a solution by using a polarimeter.
6. To find the temperature coefficient of resistance of platinum by using platinum resistance thermometer.
7. To study the variation of magnetic field along the axis of a circular coil carrying current and to estimate the radius of the coil.
8. To find the frequency of AC mains using sonometer.
9. To plot a graph between the difference of temperature of two junctions and thermo e.m.f. for a thermocouple using a potentiometer.
10. To study I-V characteristics and rectification properties of a semiconductor diode.
11. To find high resistance by leakage method.
12. To find a) the wavelength of sodium light b) the thickness of a thin transparent sheet by Michelson's interferometer.
13. Wavelength, angle of divergence and Particle size determination using Diode Laser.
14. To determine the acceptance angle and numerical aperture of an optical fibre.
15. To study the characteristics of a GM Tube and determination of its operating voltage and Plateau length.

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Course Code	Course Category	Course Title	Teaching Schedule			Credits
			L	T	P/D	
CEIC11	IC	Engineering Graphics	1	0	3	2

**Pre-requisites:** Nil

**Course Objectives:**

1. To present fundamentals of graphics and drafting appropriate for developing functional skill in computer aided drafting.
2. To provide students with adequate knowledge and experience in preparing engineering drawings using AutoCAD and CATIA
3. To teach students to read, construct and understand basic engineering drawings.
4. To help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned Engineering drawings.

**Course Content:**

#### 1. Orthographic Projections

Basics of lettering, dimensioning, types of scales and their uses, types of projections, reference planes and quadrants, projection of points keeping it in different quadrants, auxiliary planes. Theory of orthographic projections, planes of projection, four quadrants, first angle projection, third angle projection, BIS Code of practice, view analysis, orientation of the object, laying out three view drawings, hidden lines and curves surfaces, conventional lines, conversion of pictorial view into orthographic views, development of missing views.

#### 2. Projections of Straight Lines and Planes

Planes in different quadrants, projections of lines parallel to one or both the planes, contained by one or both the planes, perpendicular to plane, inclined to one plane and parallel to other, inclined to both the planes, contained by a plane perpendicular to both the planes, true length of a line and its inclinations with the reference plane, traces of line. Types of planes, perpendicular planes, oblique planes, traces of planes, projections of planes parallel to one plane, perpendicular to both the planes, perpendicular to one plane and inclined to another plane.

#### 3. Projections of Solids

Types of solid-polyhedral, solids of revolution, projections of solids, axis perpendicular to one plane, axis parallel to both the planes, axis parallel to one plane and perpendicular to other plane, axis inclined to both the planes.

Section planes, sections, true shape of sections, sections of prisms, pyramids, cylinders, cone placed in simple position.

#### 4. Generating Drawings in AutoCAD

Drawing of projection of lines, planes and solids using AutoCAD, Drawing of building and its components - front view, top view and sectional views of a typical residential building through AutoCAD. Perspective view of a building.

**Reference Books**

1. Engineering Drawing by P. S. Gill (S. K. Kataria & Sons)
2. Elementary Engineering Drawing by N. D. Bhatt (Charotar Publishing House)
3. Engineering Drawing & Graphics using AutoCAD by T. Jeyapovan, Vikas Publishing House Pvt. Ltd.

**Course Outcome:**

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

1. PRODUCE geometric construction, multi-view, dimensioning and detail drawings of typical 3-D engineering objects.
2. APPLY the skill for preparing detail drawing of engineering objects.
3. UNDERSTAND and visualize the 3-D view of engineering objects.
4. UNDERSTAND and apply computer software to prepare engineering drawing.

**B. TECH. (1st SEMESTER) MECHANICAL ENGG.**

<b>Course Code</b>	<b>MEIR-11</b>
<b>Course Title</b>	<b>Engineering Practice</b>
<b>Number of credits</b>	<b>2.0</b>
<b>Prerequisites (Course code )</b>	<b>NIL</b>
<b>Course Type</b>	<b>IC</b>

**Course Learning Objectives**

1. To make students aware of the basic concepts, terminology of the thermodynamics.
2. To make the students understand the various laws of thermodynamics and their application.
3. To make students know about the feasibility of various thermodynamic processes.
4. To make students understand the various general thermodynamic relations.

**COURSE CONTENT:**

**UNIT- I**

**Introduction**

Introduction to engineering practices, objective of industrial safety, cause & Effects of Industrial accidents, Safety measures

**Fitting shop**

Introduction, fitting tools: clamping tools, measuring and marking tools, cutting tools:, striking tools: hammers, taps, files and its classification, hacksaw, chisels. **(4hrs)**

**UNIT- II**

**Carpentry shop**

Introduction of carpentry, Wood Structure, types of woods, seasoning of wood, carpentry tools: measuring tools, marking tools, cutting tools', planning tools, striking tools, drilling tools, wood working joints

**Foundry Shop**

Introduction, foundry hand tools, moulding boxes, ladle, Classification of moulding sand **(6hrs)**

**UNIT- III**

**Machining Shop**

Lathe, description of lathe: headstock, tailstock, gearbox, carriage, apron, cutting speed, feed & depth of cut, cutting tools, Lathe operations, Chucks: 3 jaw, 4 jaw. **(2 hrs)**

**UNIT IV**

**Welding Shop**

Introduction, classification of welding processes, advantages, disadvantage and applications of welding, Shielded metal arc welding, Gas welding equipment's, types of flame, types of welding joints, soldering & brazing **(2hrs)**

**Reference Books:**

1. S K Hajra Choudhury, Nirjhar Roy, A K Hajra Choudhury, Elements of workshop Technology (vol. 1&2 ), media promoters.
2. B S Raghuwanshi, A Course in Workshop Technology (manufacturing Process vol1) Dhanpat Rai & CO.
3. W A J Chapman, Workshop technology in SI unit (part – 1 &2), Mc Graw Hill Education.
4. MP GROOVER, Principles of Modern Manufacturing, Wiley.
5. Kalpakjian, Manufacturing Process for Engineering Materials, Pearson Education India.
6. W/S Technology- Baker

**Course Outcomes:**

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

1. Understand the fundamental concept of various basic engineering practices namely fitting, carpentry, foundry, machining welding, etc.
2. Decide and recommended appropriate tools and equipment for different manufacturing techniques.
3. Develop their communication skills in oral, written and developed modes.
4. Function effectively in teams and within a diverse environment.
5. Understanding professionalism, ethics and the associated responsibilities.

Course Code	:	CSIC-11
Course Title	:	Problems Solving and Programming Skills (for CO & IT)
Number of Credits	:	3.5
Prerequisites	:	
Course Type	:	IC

#### Course Learning Objectives:

The objective of this course is to provide fundamentals of problem solving using C language programming.

#### Course Outcomes:

1. Understand the use of software and programming for problem solving.
2. Learn programming using simple concepts of input, output and control statements.
3. Use arrays, functions, strings, structures and pointers for problem solving.

#### Course Content:

##### 1. Programming Fundamentals & Control Statements:

Block Diagram of Computer, Hardware vs software, concept of operating system and compiler, Introduction to C programming, basic programming using input and output operators and expressions, programming using if and if-else, Programming using looping-for, while, do-while; use of switch and break.

##### 2. Arrays based Programming:

Defining and processing 1-D and 2-D Arrays for Problem Solving and Strings.

##### 3. Modular programming using Functions:

Structured Programming, Defining and calling a function, modular programming using functions, passing arguments and arrays to functions, functions of void and returning values.

##### 4. Programming using pointers, structures and unions:

Pointers in C: Pointer declaration, Passing Pointer to functions, pointers vs arrays, dynamic memory allocation. Structures and Unions, Programming Using Array of Structures and Unions, Memory Requirements for Unions.

#### Reference Books:

1. Byron S. Gottfried, Programming with C Language, Schaum Series, Tata McGraw Hill, 2015.
2. E Balaguruswamy, Programming with C, Tata McGraw Hill, 2015.
3. Kernighan & Richie, C Programming, Prentice Hall of India, 2002.

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Course Code	:	CSIC-13
Course Title	:	Problems Solving and Programming Skills (for ECE, EE, ME, PIE and CE)
Number of Credits	:	3.5
Prerequisites	:	
Course Type	:	IC

#### Course Learning Objectives:

The objective of this course is to provide fundamentals of problem solving using C language programming.

#### Course Outcomes:

1. Understand the use of software and programming for problem solving.
2. Learn programming using simple concepts of input, output and control statements.
3. Use arrays, functions and strings for problem solving.
4. Use of File Handling and Structures for Standard Problems.

#### Course Content:

##### 1. Programming Fundamentals & Control Statements:

Block Diagram of Computer, Hardware vs Software, Concept of Operating System and Compiler, Software Development Life Cycle. Introduction to C Programming, Basic Programming using Input And Output Operators And Expressions, Programming using if and if-else, Programming using looping- for, while, do-while; use of switch and break.

##### 2. Arrays based Programming:

Defining and Processing 1-D and 2-D Arrays for Problem Solving.

##### 3. Programming using Functions:

Defining and calling a function, Programming using Functions, Passing Arguments and Arrays to Functions, Functions of Void and Returning Values.

##### 4. Programming using Strings, Structures and File Handling:

String as Array of character, Use of Null Char, Defining and Processing Structures, Passing Strings and Structures to Functions, Files Opening and Closing, Reading and Writing into Files Using Commands like fprintf, fscanf, fclose, fread, fwrite etc. Handling of formatted and unformatted Files.

#### Reference Books:

1. Byron S. Gottfried, Programming with C Language, Schaum Series, Tata McGraw Hill, 2015.
2. E Balaguruswamy, Programming with C, Tata McGraw Hill, 2015.
3. Kernighan & Richie, C Programming, Prentice Hall of India, 2002.

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**B. Tech. 1<sup>st</sup> Semester****(2022-23 onwards)**

<b>Course Code</b>	<b>:</b>	<b>CHIC11 (Common for all branches)</b>			
<b>Course Title</b>	<b>:</b>	<b>Energy and Environmental Science</b>			
<b>Number of credits</b>	<b>:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
		<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>
<b>Prerequisites (Course code)</b>	<b>:</b>	<b>Nil</b>			
<b>Course Type</b>	<b>:</b>	<b>IC</b>			

**Course Learning Objectives:**

- To discuss the complexity of issues and challenges relating to energy and environmental science
- To explore the environmental impact of various energy sources and also the effects of different types of pollutants.
- To introduce the principal renewable energy systems.
- To discuss the human impact on the environment and human exposure to environmental contaminants.

**Course Content:**

<b>Unit</b>	<b>Course Description</b>	<b>L (Hrs.)</b>
<b>Unit 1</b>	<b>Environment, Ecosystems and Biodiversity</b> <b>Environment:</b> Multidisciplinary nature, scope and importance, Need for public awareness. <b>Ecosystems:</b> Concept, types, structure and functions, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids, Energy flow in an ecosystem. <b>Biodiversity:</b> Values of biodiversity, hot spots and threats to biodiversity, conservation.	<b>6</b>
<b>Unit 2</b>	<b>Natural Resources</b> <b>Renewable and non-renewable resources:</b> Natural resources and associated problems.	<b>8</b>

	<p><b>Forest resources:</b> Use and over-exploitation, deforestation, case studies, Timber extraction, Mining, Dams and their effects on forest and tribal people.</p> <p><b>Water resources:</b> Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water, Dams – benefits and problems.</p> <p><b>Mineral resources:</b> Use and exploitation, Environmental effects of extracting and using mineral resources, case studies.</p> <p><b>Food resources:</b> World food problems, Changes caused by agriculture and overgrazing, Effects of modern agriculture, Fertilizer-pesticide problems, Water logging, Salinity, case studies.</p> <p><b>Energy resources:</b> Present energy resources in India and its sustainability, Energy demand scenario in India, Growing energy needs, Renewable and non-renewable energy sources, Use of alternate energy sources.</p> <p><b>Solar energy:</b> Basics of solar energy, solar thermal energy, photovoltaic (PV) solar cells, advantages and disadvantages, environmental impacts and safety.</p> <p><b>Wind energy:</b> Energy from wind turbines, India's wind energy potential, off shore wind energy, environmental benefits and impacts.</p>	
Unit 3	<p><b>Environmental Pollution</b></p> <p><b>Air pollution:</b> Sources and effects of pollutants, primary and secondary pollutants, control measures. <i>Acid rain:</i> Impacts on human communities and agriculture. <i>Green-house effect:</i> Definition, causes and consequences. Depletion of ozone layer, destruction of ozone layer by CFC, consequences, effect of ozone modification, Photochemical smog, Bhopal gas tragedy.</p> <p><b>Water pollution:</b> Water characteristics, water quality (WHO standard), natural water pollutants their origin and effects: oxygen demanding wastes, pathogens, nutrients, salts, heavy metals, pesticides, volatile organic compounds. River/ lake/ ground water pollution: DO, BOD, COD, pH and eutrophication.</p> <p><b>Thermal pollution:</b> Causes, effects and control measures.</p> <p><b>Solid waste management:</b> Causes, effects and control measures of urban and industrial wastes.</p> <p><b>Nuclear hazards:</b> Causes, effects and control measures.</p>	8
Unit 4	<p><b>Social Issues and the Environment</b></p> <p><b>From unsustainable to sustainable development:</b> Urban problems related to energy, Water conservation, Rain water harvesting, Watershed management.</p>	6



	<b>Environmental ethics:</b> Issues and possible solutions, consumerism and waste products, <i>Acts:</i> Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Public awareness, Population explosion, Environment and human health, Role of Information Technology in environment and human health.	
	<b>Total</b>	<b>28</b>

### Reference Books:

1. A. Basak, *Environmental Studies*: Pearson Education; 1<sup>st</sup> Edition, 2009.
2. E. Bharucha, *Environmental Studies for Undergraduate Courses of all Branches of Higher Education* for University Grants Commission, 2013.
3. D. Dave and S.S. Katewa, *Text Book of Environmental Studies*: Cenage Learning India Private Limited, 2<sup>nd</sup> Edition, 2012.
4. S. Somvanshi and R. Dhupper, *Fundamentals of Environmental Studies*: S. K. Kataria and Sons, Reprint 2019.
5. A. K. De, *Environmental Chemistry*: New Age International (P) Limited, 8<sup>th</sup> Edition, 2017.
6. R. J. Daniels and J. Krishnaswamy, *Environmental Studies*: Wiley India Private Limited, Reprint, 2013.
7. B. Joseph, *Environmental Studies*: McGraw-Hill Education (India) Private Limited, 3<sup>rd</sup> Edition, 2017.
8. A. Kaushik and C.P. Kaushik, *Perspectives in Environmental Studies*: New Age International (P) Limited, 7<sup>th</sup> Edition, 2021.

### Course Outcomes:

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

- Know the environmental pollutants and their health effects and environmental remediation and management.
- Understand the principles of renewable energy systems and explore the environmental impact of various energy sources.
- Understand interrelationships among science, technology, and environment
- Appreciate the Importance of saving energy and environment.

## Energy and Environment Science Lab

### Course Learning Objectives:

- To learn about laboratory skills.
- To get a knowledge about some important laboratory techniques used in assessing the amount of different pollutants in water and air.

### Laboratory Experiments

1. Determination of alkalinity in the water sample
2. Determination of dissolved oxygen (DO) in the water sample.
3. Determination of chemical oxygen demand (COD) in the water sample.
4. Determination of residual chlorine in the water sample.
5. Determination of total dissolved solids in water/effluent sample.
6. Determination of total  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  hardness in water.
7. Determination of strength of nitrite ions in water samples.
8. Analysis of BTX through Gas-Chromatography in air samples.
9. Analysis of heavy metal ions in industrial effluent by Atomic Absorption Spectroscopy (AAS).
10. Determination of moisture and pH of soil sample.

### Reference Books

1. O. P. Virmani and A. K. Narula, *Applied Chemistry-Theory and Practice*: New Age India Publishers, New Delhi, 2<sup>nd</sup> Edition, 2017.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*: Dhanpat Rai Publishing company Ltd., New Delhi, 2006.

**Course Code: MAIC 12**

**Course Title: Integral Calculus and Difference Equations**

**Number of Credits: 4**

**Pre-requisites:** The basic knowledge of differentiation, Integration, Summation, Scalars, Vectors and trigonometrical functions.

**Course Type: IC**

**Course Objectives**

- To provide the students with sufficient knowledge of Integral Calculus and its applications.
- To have the knowledge of vector calculus and its physical interpretation with applications.
- To have the knowledge of fundamental concept of Fourier series and its applications.
- To have the idea of difference equation and Z-transforms with engineering applications.

**Unit 1: Power Series Solutions and Special Functions**

**9L hours**

The Sturm-Liouville Problem, Orthogonality of eigen functions, Ordinary and singular points of an equation, Series solution about an ordinary point using Power series solutions, Series solution about a regular singular point using Frobenius method, Solution of Legendre's and Bessel's differential equations, Legendre's and Bessel's functions.

**Unit 2: Multiple Integrals**

**9L hours**

Evaluation of double integrals (Cartesian and polar coordinates), Change of order of integration, Change of variables between cartesian and polar coordinates, Applications of Double Integrals, Triple integrals, Change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Applications of triple integrals, Beta and Gamma functions, Dirichlet integrals.

**Unit 3: Vector Calculus**

**9L hours**

Scalar and vector valued functions, Gradient of a scalar point function and its geometrical interpretation, Directional derivative, Divergence and curl of a vector point function and their physical interpretations, Statement of vector identities, Scalar and velocity potentials, Line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using these theorems.

**Unit 4: Difference Equations and Z-transforms**

**9L hours**

Difference Equation-Definition of Difference equation, First and second order difference equations with constant coefficients, Fibonacci sequence, Solution of difference equations (complementary functions and particular integrals).

Z-transform- Definition of Z-transform, Relation between Z-transform and Laplace transforms, Z-transforms of standard functions, Inverse Z-transforms, Inverse Z-transforms by partial fraction method, Inverse Z-transforms by convolution method, Solution of simple difference equations using Z-transforms.

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### Unit 5: Fourier Series

9L hours

Fourier series, Euler's formula, Dirichlet's conditions, Fourier series expansion of functions having point of discontinuity, Change of interval, Expansion of even and odd functions, Half range series, Typical wave-forms, Parseval's formula, Practical Harmonic Analysis.

#### Text Books

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 8th Edition, John Wiley & Sons, Wiley student Edition, (2011).
2. Paras Ram, *Engineering Mathematics through Applications*, 2nd Edition, CBS Publishers, (2015).

#### Reference Books

1. Michale D. Greenberg, *Advanced Engineering Mathematics*, 2nd Edition, Pearson Education, First Indian reprint (2002).
2. Peter V. O' Neil, *Advanced Engineering Mathematics*, 5th Edition, Thomson, Book/Cole (2003).

#### Course Outcomes

At the end of this course, the students will be able to

CO1: Understand and analyze the practical aspects of series solution and special functions.

CO2: Interpret the line, surface and volume integrals.

CO3: Use Z-transforms to solve difference equations analytically.

CO4: Apply the analytical technique to express periodic functions as a Fourier series.

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External Member: Prof. Y.N. Reddy  
(BOS) NIT Warangal

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<b>Course Code</b>	<b>:</b>	<b>PHIC12</b>
<b>Course Title</b>	<b>:</b>	<b>B. Tech. Physics-II (CE, ME &amp; PI)</b>
<b>Credits</b>	<b>:</b>	<b>4 (2L +1T + 2P)</b>
<b>Prerequisites</b>	<b>:</b>	<b>-</b>
<b>Course Type</b>	<b>:</b>	<b>IC</b>

### Course Objectives

- To develop the understanding of Physics fundamentals essential for Electrical, and Electronics engineering.
- To gain key concepts related to practical applications of the electronic, dielectric and magnetic properties of materials.
- To understand relevant theories and engineering principles for electrical and electronic device design and development.
- To develop initial skills for tackling the involved challenges in electrical and electronic device operations at industry levels.

### Course Content

#### UNIT-I [6 L]

**MECHANICAL PROPERTIES OF MATERIALS:** Phase diagram, Gibbs phase rule, Binary phase diagram its types, Solid solution: Hume Rothery Rules, Concepts of stress and strain, Stress-Strain diagrams; Tensile test; Elastic deformation, Plastic deformation. Impact Testing & toughness behavior. Hardness of materials, Imperfections and dislocations.

#### UNIT-II [6 L]

**THERMAL PHYSICS:** Seebeck effect, Peltier effect, Thomson effect, Kelvin relationships, Wiedemann-Franz law, Thermal equilibrium, Entropy, The laws of thermodynamics, Thermal conductivity of bulk materials, Phonons: Lattice vibration heat transfer, Specific heat of solids, classical, Einstein and Debye Model, Ideal quantum gases: Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics.

#### UNIT-III [6 L]

**MAGNETIC MATERIALS AND SUPERCONDUCTORS:** Orbital diamagnetism, Magnetic moments, Classical theory of Paramagnetism, Ferromagnetism, Molecular field theory and domains, Applications of magnetic materials, Type I and II Superconductors, London equation, Applications of superconductivity.

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## UNIT-IV [6 L]

**NANOTECHNOLOGY:** Classifications of nanomaterials (3D, 2D, 1D and 0D) and their density of states, Nanocomposites, Carbon nanotubes (CNTs), Graphene, Nanoclusters, Structural, thermal and mechanical properties of nanomaterials, Bottom-up and Top-down synthesis processes, Basic characterization techniques for nanomaterials (XRD, SPM and TEM), Applications of nanotechnology.

### Reference Books

1. Schroeder, V. Daniel, An introduction to thermal physics, 1999
2. Bansal Garg, Thermal physics, Tata McGraw-Hill Education, 2013
3. Wole Soboyejo, Mechanical Properties of Engineered Materials, Marcel Dekker, 2003
4. D. K. Bhattacharya, Engineering Physics, Oxford University Press, 2015
5. Charles P. Poole, Jr and Frank J. Owens, Introduction to Nanotechnology, John Wiley & Sons, 2006.

### Course Outcomes:

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

- develop the skills to apply various Physics concepts in tackling real life electrical, and electronics engineering problems.
- understand and apply the fundamentals of electronic, semiconducting and dielectric properties of materials in various technological domains.
- understand various technological applicability of Magnetic Materials, Superconductors, and Nanotechnology.
- realize the operation mechanisms of various electrical and electronic devices at industry levels.

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Course Code	:	PHIC13
Course Title	:	PHYSICS – II (EE & ECE)
Credits	:	4 (2L+1T + 2P)
Prerequisites	:	-
Course Type	:	IC

### Course Objectives

- To develop the understanding of Physics essential for electrical, and electronics engineering.
- To gain knowledge of the electronic, dielectric and magnetic properties of materials.
- To understand theories relevant to the engineering principles of materials and devices.
- To solve problems related to electrical and electronics device operations in industry.

### Course Content

#### UNIT-I [6 L]

**ELECTRONIC PROPERTIES OF MATERIALS:** Drude and Sommerfeld's Free Electron theory of Metals, Concept of Fermi level and Fermi surface, Fermi-Dirac distribution function, Charge carrier densities.

**NANOTECHNOLOGY:** Classifications of nanomaterials (3D, 2D, 1D and 0D) and their density of states, Quantum confinement, Manifestation of quantum confinement on optical, electrical and mechanical properties, Basic characterization techniques for nanomaterials (XRD, SPM, Electron Microscope), Applications of nanotechnology.

#### UNIT-II [6 L]

**DIELECTRIC PROPERTIES OF MATERIALS:** Polarization, Bound Charges, Electric displacement, susceptibility, dielectric coefficient, permittivity & various relations between these, Dielectrics in ac fields, Dielectric loss factor, Effect of temperature and frequency on dielectric constant and dielectrics loss factor (qualitative description), Applications of dielectrics.

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### UNIT-III [6 L]

**SEMICONDUCTING PROPERTIES OF MATERIALS:** Direct and indirect Band gap semiconductors, Elemental and compound semiconductors, Equilibrium and extrinsic carrier concentration, carrier transport, Drift and Diffusion current, mobility, Excess carrier generation and recombination,

**Devices:** PN diode, tunnel diode, NPN and PNP transistors, Solar cell, LEDs

### UNIT-IV [6 L]

**MAGNETIC MATERIALS AND SUPERCONDUCTORS:** Orbital diamagnetism, Atomic magnetic moments, Classical theory of Paramagnetism, Ferromagnetism, Molecular field theory and domains, Concept of ferro-electricity and ferri-electricity, Applications of magnetic materials, Superconductors (Type I and II), London equation, Applications of Superconductivity.

#### Reference Books

1. Arthur Beiser, Tata McGraw Hill, Concept of Modern Physics, publication, 2003.
2. Charles Kittel, John Wiley, Introduction to Solid State Physics, publication, 2013.
3. Ben G. Streetman, Prentice-Hall of India, Solid State Electronic Devices, 2012.
4. Jaspreet Singh, John Wiley, Semiconductor Devices-Basic Principles, publication 2008.
5. D. K. Bhattacharya, Oxford University Press, Engineering Physics, 2015.

#### Course Outcomes:

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

- apply various physics concepts for electrical, and electronics engineering problems.
- understand fundamentals of electronic, dielectric and nanomaterials properties of materials for technological applications.
- to apply the concepts of Magnetic Materials, Superconductors, and Nanotechnology.
- realize the operation mechanism of various electrical and electronic devices.

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**B. TECH. 2<sup>nd</sup> SEMESTER PHYSICS PRACTICALS**  
**(PHIC-12, 13 and 14)**

**LIST OF EXPERIMENTS**

1. To find the value of Planck's constant by photo electric cell.
2. To calibrate an electromagnet using Guoy's balance.
3. To measure Hall's co-efficient of Germanium and calculation of charge carrier concentration.
4. To measure the velocity of ultrasonic waves in organic liquids.
5. To study the decay of charge on a capacitor and to find its capacitance.
6. To determine the resistivity of a semiconductor by four probe method.
7. To determine the band gap of germanium from the variation of its resistivity with temperature.
8. To study the intensity response of a cadmium sulphide cell.
9. To calibrate a voltmeter by using potentiometer.
10. To study the shunting effect of a voltmeter on voltage measurement
11. To measure i) Saturation magnetization ii) coercivity and iii) retentivity in a given ferromagnetic material.
12. To study the dielectric properties of a dielectric at different frequencies by resonance method.
13. To draw the I-V characteristics of a solar cell under constant illumination.
14. To verify Stefan's radiation law by using incandescent filament.
15. To verify the inverse square law of gamma ray using GM counter

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### Branch Course-I

Course Code	:	CSEC-12
Course Title	:	Digital System Design
Number of Credits	:	3.5
Prerequisites	:	
Course Type	:	IC

#### Course Learning Objectives:

1. Awareness of intricate design details of components in any digital system.
2. Knowledge of number system and conceptual understanding of different codes.
3. Design fundamentals of computing machinery.
4. Introduction of computational automation process.

#### Course Outcomes:

1. Clarity of application of different number system and coding schemes.
2. Proficiency in design and analysis of combinational and sequential circuits.
3. Circuit level understanding of computer addressing and memory layouts.
4. Application of digital circuits for design of finite automaton.

#### Course Content:

##### 1. Number Systems and Coding Schemes:

Number Systems and Codes Introduction to the positional number system, signed magnitude numbers, floating point numbers, binary arithmetic: addition, subtraction, multiplication and division, Base conversion, conversion formulas with examples, one's and two's complement arithmetic, Computer codes – BCD codes, gray codes, excess-3 codes, parity checks, Hamming and alphanumeric codes.

##### 2. Combinational Logic:

Design Introduction, standard representations for logical functions, Karnaugh map representation, simplification of logical functions using K-map, minimization of logical functions specified in minterms/maxterms or Truth Table, minimization of logical functions not specified in minterms/maxterms, Don't care conditions, design examples, Ex-or and Ex-nor simplification of Kmaps, five and six-variable K-maps, QM method, MEV method, Introduction of multiplexers and their use in combinational logic design, demultiplexers/decoders and their use in combinational logic design, adders and their use as subtractors, digital comparators, parity generators/checkers, code converters, priority encoders.

##### 3. Synchronous Sequential Circuits:

Introduction, FSM model, memory elements and their excitation functions. Synthesis of synchronous sequential circuits, capabilities and limitation of FSM, state equivalence and minimization, simplification of incompletely specified machines, registers and counters, RAM design, ROM design and programmable logic array.

##### 4. Asynchronous Sequential Circuits:

Fundamental mode and Pulse mode Circuits Analysis and Design.

#### Books:

1. M. Morris Mano and Michael D. Ciletti: Digital Logic Design, Sixth Edition, Pearson Education.
2. R.P. Jain: Modern Digital Electronics, Fifth Edition, TMH.
3. Z. Kohavi and Niraj. K. Jha: Switching And Finite Automata Theory, Third Edition, Cambridge University Press.
4. Kumar A. Anand: Fundamentals of Digital Circuits, Fourth Edition, PHI.
5. James Bignell and Robert Donovan: Digital Electronics, Fifth Edition, Cengage Learning.

Course Code	:	CSIC-14
Course Title	:	Engineering Graphics (Web Design)
Number of Credits	:	2.5
Prerequisites	:	
Course Type	:	IC

#### Course Learning Objectives:

1. Introduction and brief history of World Wide Web (WWW).
2. Web essentials: HTML, XHTML, CSS.
3. Addressing web standards, client requirements and principles of web page design.
4. Introduction of Web architecture.

#### Course outcomes

1. Knowledge of basic principles of web site design.
2. Design proficiency of websites adhering to current web standards (HTML, XML, CSS).
3. Knowledge of various scripting languages.

#### Course Content:

1. **Introduction:** Introduction to world wide web, Web Browsers, Web Servers, Hypertext Transfer Protocol, URLs, Domain Names, Internet Service Provider, Basic steps for Developing Website, Choosing the Contents, Planning and Designing Web Site, Creating a Website, Web Publishing, Hosting Site, Types of hosting packages, Five Golden rules of web designing.
2. **Web essentials and standards:** Clients, servers, introduction to Markup languages, scripting languages, Introduction to elements of HTML, XHTML and CSS, Introduction to Document object model (DOM), working with text, list, tables, frames, hyperlinks, Images, forms and controls. CSS properties, Id and Class, Box Model.
3. **Javascript:** Javascript as programming language, Data types, Values, Variables, Expressions and Operators. JavaScript Statements, loops, arrays, strings, methods, Defining and Invoking functions and their closure, random functions and maths library, representing dates, Pattern Matching and Regular Expressions, difference between server side and client side javascript, embedding javascript in HTML, hiding HTML elements, showing hidden HTML elements. DOM and event handling, error handling, mouse, text, and keyboard events and cookies.
4. **XML:** XML: Introduction – benefits of XML, well formed XML documents, XML syntax, XML declaration, XML schema, XML with CSS, Document Type Definition (DTD), creating DTD – Types(internal DTD, external DTD),XSL.

#### Reference Books:

1. Thomas A Powell, HTML: The Complete Reference, Tata McGraw Hill Publications.
2. Scott Guelich, Shishir Gundavaram, Gunther Birzniek; CGI Programming with Perl 2/e, O'Reilly
3. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with SOAP, O'Reilly
4. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
5. Yong, XML Step by Step, PHI.
6. Chris Bales, "Web programming- Building Internet Application".
7. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
8. Marty Hall and Larry Brown, "Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
9. Bayross Ivan, "Web Enabled Commercial Applications Development using HTML, Javascript, DHTML & PHP", BPB Publication, 2005.

**B. Tech. 1<sup>st</sup> Semester****(2022-23 onwards)**

<b>Course Code</b>	<b>:</b>	<b>CHIC12</b>			
<b>Course Title</b>	<b>:</b>	<b>Chemistry (For CE, ME and PIE)</b>			
<b>Number of credits</b>	<b>:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
		<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>
<b>Prerequisites (Course code)</b>	<b>:</b>	<b>Nil</b>			
<b>Course Type</b>	<b>:</b>	<b>IC</b>			

**Course Learning Objectives:**

- To enable the students to acquire knowledge of the principles of chemistry involving hardness of water and softening of water.
- To introduce the concept of phase rule and its application in making alloys, freezing mixture, etc.
- To educate the students about different mechanisms of corrosion of metals and their controlling processes.
- To introduce the concepts and applications involving advanced engineering materials such as polymers, cement and high energy materials.
- To provide knowledge to the students about conventional fuels as well as sustainable fuels and to educate the students about the concepts involving lubricants.

**Course Content:**

<b>Unit</b>	<b>Course Description</b>	<b>L (Hrs.)</b>
<b>Unit 1</b>	<b>Softening of Water and Phase Rule</b> <b>Softening of Water:</b> Boiler problems, Remedial Measures, Demineralization, Desalination, Advanced reverse osmosis (RO), Electro dialysis, Zeolite process, Ion-exchange process, MBD, Polished water. <b>Phase Rule:</b> Description of various terms (phase, component and degrees of freedom), One component system (water), Two component system (Pb-Ag, KI-H <sub>2</sub> O), Technical applications: freezing mixtures, solders, safety plugs and freeze drying.	<b>8</b>

<b>Unit 2</b>	<b>Corrosion</b> Introduction, Corrosion mechanisms: dry corrosion and wet corrosion, Types of corrosion: concentration corrosion, water-line corrosion, stress corrosion (caustic embrittlement in boilers and seasonal cracking), pitting corrosion, Factors affecting the rate of corrosion, Remedial measures against corrosion: design, cathodic protection, modification of environment, Protective coatings (galvanizing and tinning by hot dipping, metal cladding).	<b>5</b>
<b>Unit 3</b>	<b>Advanced Engineering Materials</b> <b>Polymers:</b> Introduction and Classification, Preparation, properties and Technical applications of: Thermosetting polymers (Phenol-formaldehyde resins and Epoxy resins), Thermoplastic polymers (HDPE and LDPE), Elastomers (Natural rubbers and Synthetic rubbers i.e. Buna-S and Buna-N), Inorganic polymers (Silicones), Advantages of Inorganic polymers over Organic polymers. <b>Conducting Polymers:</b> Intrinsic and extrinsic polymers, Properties and applications of: Conducting polymers (Polythiophene and Polyaniline), Biodegradable polymers (Cellulose acetate and Polyhydroxy-Urethanes). <b>Construction Material:</b> Composition, setting and hardening of Portland cement. <b>High Energy Materials (HEM):</b> Introduction, Classification and Requirements of HEM, Some important explosives: RDX, DDNP, TNT, PETN (Structure and properties) and plastic explosives.	<b>10</b>
<b>Unit 4</b>	<b>Fuels and Lubricants</b> <b>Fuels:</b> Introduction, Calorific value (HCV and LCV), Determination of HCV by Bomb's calorimeter, Proximate and ultimate analysis of coal, Coal liquefaction (Fischer-Tropsch method), Coal gasification (water gas), Sustainable fuels: Bio-diesel, Green-diesel, Power-alcohol and Hydrogen economy. <b>Lubricants:</b> Introduction, Classification, Significant properties and their determination (viscosity and viscosity index, cloud and pour point, flash and fire point, aniline point, acid value, saponification value, iodine value), Semi-solid lubricants (Greases), Solid lubricants (Graphite and MoS <sub>2</sub> ).	<b>7</b>
	<b>Total</b>	<b>30</b>

## Reference Books:

1. P.C. Jain and M. Jain, *Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 16<sup>th</sup> Edition, 2015.
2. G. Odian, *Principles of Polymerization*: Wiley, 4<sup>th</sup> Edition, 2004.
3. S. Chawla, *A Text Book of Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 3<sup>rd</sup> Edition, 2017.
4. S. S. Dara and S. S. Umare, *A Text Book of Engineering Chemistry*: S. Chand Publishing Company, New Delhi, 12<sup>th</sup> Edition, 2018.
5. R. Sivakumar and N. Sivakumar, *Engineering Chemistry*: Tata McGraw-Hill Publishing Company Limited, New Delhi, 1<sup>st</sup> Edition, 2008.
6. O. G. Palanna, *A Text Book of Engineering Chemistry*: McGraw Hill, New Delhi, 4<sup>th</sup> Reprint, 2012.
7. Puri, Sharma and Pathania, *Principles of Physical chemistry*: W. H. Freeman and Company, 48<sup>th</sup> Edition, 2021.
8. V. R. Gowariker, N V Viswanathan, Jayadev Sreedhar, *Polymer Science*: New Age International Publishers, 4<sup>th</sup> Edition, 2021.

## Course Outcomes:

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

- Gain the basic knowledge about hardness of water, its disadvantages and the methods available to soften the water.
- Understand the concepts of phase rule and its application in making the alloys, freeze drying, freezing mixture, etc.
- Understand the mechanism of corrosion and ways to control the corrosion.
- Appreciate the concepts and applications involving advanced engineering materials such as polymers, cement and high energy materials.
- Understand the concepts of non-sustainable and sustainable fuels and gain the knowledge about the lubricants.



## **Chemistry Lab (For CE, ME and PIE)**

### **Course Learning Objectives:**

- To learn about laboratory skills.
- To get a knowledge about some important laboratory techniques used in quantitative assessment of lubricant properties.
- To learn about working of instruments in characterization of advanced materials.

### **Laboratory Experiments**

- 1) Preparation of Phenol-formaldehyde resin.
- 2) To prepare Urea formaldehyde (U-F) resin.
- 3) Determination of the strength of strong acid and strong base/weak acid and strong base using conductometric titration method.
- 4) Determination of viscosity of lubricants by Redwood viscometer.
- 5) Determination of acid value of lubricant oil.
- 6) Determination of saponification value of lubricant oil.
- 7) Determination of flash and fire point of lubricant.
- 8) Determination of calcium as calcium oxide volumetrically in cement extract solution.
- 9) Preparation of different freezing mixtures and determination of their eutectic temperatures.
- 10) Investigatory project based on syllabus.

### **Reference Books**

1. O. P. Virmani and A. K. Narula, *Applied Chemistry-Theory and Practice*: New Age India Publishers, New Delhi, 2<sup>nd</sup> Edition, 2017.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*: Dhanpat Rai Publishing Company Ltd., New Delhi, 2006.
3. S. S. Dara, *A Text Book on Experiments and Calculations in Engineering Chemistry*: S. Chand and Company Ltd., New Delhi, 9<sup>th</sup> Edition, 2015.

**B. Tech. 2<sup>nd</sup> Semester**  
**(2022-23 onwards)**

<b>Course Code</b>	<b>:</b>	<b>CHIC13</b>			
<b>Course Title</b>	<b>:</b>	<b>Chemistry (For ECE and EE)</b>			
<b>Number of credits</b>	<b>:</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
		<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>
<b>Prerequisites (Course code)</b>	<b>:</b>	<b>Nil</b>			
<b>Course Type</b>	<b>:</b>	<b>IC</b>			

**Course Learning Objectives:**

- To introduce about advanced polymers and their applications in modern science.
- To introduce the students about basic principles of batteries, fuel cell construction and their applications.
- To make the students learn about importance of renewable energy sources.

**Course Content:**

<b>Unit</b>	<b>Course Description</b>	<b>L (Hrs.)</b>
<b>Unit 1</b>	<b>Polymers</b> Introduction to industrially important polymers: Liquid Crystal Polymers (LCP), Conducting polymers (CP), Interpenetrating Polymer Network (IPN), Smart Polymers or Stimuli-responsive Polymers, Polymer Blends and Polymer Composites, Detailed study on Conducting Polymers: Methods of synthesis, properties and applications of Polyaniline (PANi), Polypyrrol (PPy) and Polythiophene (PTh) in advanced technologies. Biodegradable polymers.	<b>8</b>
<b>Unit 2</b>	<b>Batteries</b> Introduction to primary, secondary and flow batteries, Construction, working principle, operation and applications of Zn-AgO, Nickel-metal hydride, Metal-acid and Lithium ion batteries, Fuel cells: Methanol-Oxygen <b>fuel cell</b> , <b>solid oxide fuel cell (SOFC)</b> and <b>polymer electrolyte fuel cell (PEFC)</b> .	<b>7</b>



<b>Unit 3</b>	<b>Fuels and Lubricants</b> <b>Fuels:</b> Introduction and classification of fuels, Calorific value, Determination of CV using Bomb calorimeter and Boy's calorimeter, Theoretical calculation of CV, Coal and its analysis - Ultimate and Proximate analysis, Liquid fuels, Fluidized bed catalytic cracking, Synthetic petrol by Fischer-Tropsch process, Power alcohol, Biodiesel, Hydrogen as a source of energy. <b>Lubricants:</b> Definition, Theories of action, Properties of lubricants (Viscosity, Viscosity Index, Oiliness, Pour point and Cloud point, Flash point and Fire point), Additives to lubricants, Solid lubricants.	<b>7</b>
<b>Unit 4</b>	<b>Renewable Energy Sources</b> Introduction and Classification of Energy Resources (Conventional and Non-conventional), Energy and its environmental impacts. <b>Solar energy:</b> Photo voltaic (PV) technology: Present status, solar cells, cell technologies, characteristics of PV and Integrated PV systems. <b>Wind energy:</b> Wind speed and power relation, power extraction from wind, wind distribution and wind speed predictions. <b>Wind power systems:</b> Wind Power system components, Types, rating and working of Turbine, electrical load matching. <b>Hydro systems:</b> Definition, layout and working principle of hydro power plant.	<b>8</b>
	<b>Total</b>	<b>30</b>

### Reference Books:

1. W. D. Callister, D. G. Rethwisch, *Materials Science and Engineering: An introduction*: Wiley India Pvt. Ltd., New Delhi, 10<sup>th</sup> Edition, 2018.
2. P.C. Jain and M. Jain, *Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 16<sup>th</sup> Edition, 2015.
3. S. Chawla, *A Text Book of Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 3<sup>rd</sup> Edition, 2017
4. S. S. Dara and S. S. Umare, *A Text Book of Engineering Chemistry*: S. Chand Publishing Company, New Delhi, 12<sup>th</sup> Edition, 2018.
5. D. Hull and T. W. Clyne, *An Introduction to Composite Materials*: Cambridge University Press, 2<sup>nd</sup> Edition, 1996, Online Edition 2012.

6. O. G. Palanna, *A Text Book of Engineering Chemistry*: McGraw Hill, New Delhi, 4<sup>th</sup> Reprint, 2012.
7. Puri, Sharma and Pathania, *Principles of Physical chemistry*: W. H. Freeman and Company, 48<sup>th</sup> Edition, 2021.

**Course Outcomes:**

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

- Learn the significance and applications of industrially important advanced polymers.
- Understand the basics of some important types of batteries and their working principles.
- Learn about various types of renewable energy sources and their utilities.

## Chemistry Lab (For ECE and EE)

### Course Learning Objectives:

- To learn about laboratory skills.
- To get a knowledge about some important laboratory techniques used in quantitative assessment of lubricant properties.
- To learn about working of instruments in characterization of advanced materials.

### Laboratory Experiments

- 1) Preparation of Phenol-formaldehyde resin.
- 2) Determination of viscosity of lubricants by Redwood viscometer.
- 3) Determination of acid value of lubricant oil.
- 4) Determination of saponification value of lubricant oil.
- 5) Determination of flash and fire point of lubricant.
- 6) Determination of the strength ( $\text{g L}^{-1}$ ) of strong acid and strong base/weak acid and strong base using conductometric titration method.
- 7) To prepare Urea formaldehyde (U-F) resin.
- 8) To synthesize Thiokol rubber using sodium tetra sulphide with 1,2-dichloro ethane.
- 9) Investigatory project based on syllabus.

### Reference Books

1. O. P. Virmani and A. K. Narula, *Applied Chemistry-Theory and Practice*: New Age India Publishers, New Delhi, 2<sup>nd</sup> Edition, 2017.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*: Dhanpat Rai Publishing Company Ltd., New Delhi, 2006.
3. S. S. Dara, *A Text Book on Experiments and Calculations in Engineering Chemistry*: S. Chand and Company Ltd., New Delhi, 9<sup>th</sup> Edition, 2015.

## Branch Course-II

Course Code	:	CS16-16
Course Title	:	Programming using Python
Number of Credits	:	3.5
Prerequisites	:	
Course Type	:	IC

### Course Learning Objectives:

1. Building robust applications using Python programming.
2. Building multithreaded, platform-independent and GUI based python applications for business problems.

### Course outcomes:

1. Programming ability for solving simple business problems.
2. Design of robust and multithreaded python applications.
3. Familiarity of simple GUI interfaces.

### Course Content:

#### 1. The concept of data types:

Variables, Assignments; Immutable Variables; Numerical Types; Arithmetic Operators And Expressions; comments in the program; understanding error messages; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation; Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated); String manipulations: subscript operator, indexing, slicing a string.

#### 2. Lists, tuples, and dictionaries:

Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries; Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments.

#### 3. Simple Graphics and Image Processing:

"turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats, image processing; Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc). Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects; inheritance, polymorphism, operator overloading (`_eq_`, `_str_`, etc); abstract classes; exception handling, try block

#### 4. Graphical user interfaces:

Event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

### Reference Books:

1. T.R. Padmanabhan, Programming with Python, Springer, 1<sup>st</sup> Ed., 2016.
2. Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning., 1<sup>st</sup> Ed., 2012.

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### Program Specific Course

Course Code	:	CSPC-16
Course Title	:	Data Structures
Number of Credits	:	4
Prerequisites	:	Problems Solving and Programming Skills
Course Type	:	PC

#### Course Learning Objectives

1. This course introduces the concept of Data Structures used in various computer science applications
2. The students are introduced to understand and efficiently apply various data structures such as stacks, queues, linked lists, trees and graphs for solving various computing problems using C programming language.

#### Course Outcomes

1. Develop skill to identify and determine the usage of various data structures, operations, associated algorithms and implement their applications.
2. Apply knowledge of pointers, memory allocation and string handling for solving programming problems.
3. Understand the concept of trees and graphs, their implementation and applications.
4. Able to implement standard algorithms for searching and sorting.
5. Analyze efficiency of different algorithms using time and space complexity.

#### Course Content

##### 1. Pointers & File Handling:

Revision of Pointers and Dynamic Memory, Files and related operations.

Searching techniques: Linear and Binary, Sorting techniques: Selection, Bubble, Insertion, Merge sort, Quicksort.

##### 2. Simple Data Structures

Arrays based Linear Data Structures: Array storage, sparse arrays; Transpose, addition, and multiplication of sparse matrices, Stacks and Queues and their applications, multiple stacks and queues in an array.

##### 3. Linked Data Structures

Singly, Doubly & Circular Linked Lists; representation, operations and applications, linked stacks and queues. linked lists based polynomial addition.

##### 4. Advanced Data Structures

Trees, Basic concepts and definitions of a tree and binary tree and associated terminology, Binary tree traversal techniques, some more operations on binary trees, Heaps and heapsort.

#### Reference Books:

1. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, Universities Press, Hyderabad.
2. R.L. Kruse: Data Structures & Program Design in C, PHI.
3. D.F. Knuth: The art of Computer Programming Vol-1, Narosa Publications, 1985.
4. Byron S. Gottfried & J K Chhabra: Theory and Problems of Programming with C Language, Schaum's Outlines Series, TMH, 2005.

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Course Code	Course Category	Course Title	Teaching Schedule			Cred
			L	T	P/D	
CEPC11	PC	Engineering Mechanics	3	0	2	4

**Pre-requisites:** Knowledge of Applied Physics

**Course Objectives:**

1. To determine the static indeterminacy and kinematic indeterminacy of trusses and to analyse the truss.
2. To acquire basic knowledge of stress, strain due to various types of loading.
3. To draw SFD and BMD and also to draw through thickness variation of bending stresses and shear stress.
4. To apply the concept of Principal Stresses and Theories of Failure.
5. To analyse the behaviour of columns under uniaxial loading.

**Course Content:**

**Theory Content**

**Unit 1: Basic Concepts**

Concept of Rigid body and deformable bodies, Free body diagram, Types of beams, simple and continuous beams, type of supports and reaction.

Fundamentals of Determinate and Indeterminate structures, Analysis of plane trusses, Analysis of Plane frames.

**Unit 2: Stresses and Strains.**

Concept of stress and strain (linear, lateral, shear and volumetric), Hook's law, elastic constants and their relationship, stress-strain diagrams for brittle, elastic and plastic materials, generalized Hook's law.

Analysis of axially loaded members: Stresses, strains and deformations of the structures under concentrated loads, self-weight and temperature changes.

**Unit 3: Shear Force and Bending Moment Diagram.**

Concept of shear force diagram and bending moment diagram for different beams under various types of loading. Stresses due transvers loading on the beam (bending and shear stresses), concept of shear stresses due to twisting moment (Torsion).

**Unit 4: Principal Stresses and Strains**

Principal stresses and strains: concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress. Theories of failure: maximum normal stress, maximum shear stress and maximum strain theory

**Unit 5: Axially and Eccentrically Loaded Columns**

Axially loaded columns: concept of critical load and buckling load, Euler's formula for buckling load for various end conditions of columns, concept of equivalent length, Rankine's formula, safe load on column and limitations of Euler's formula.

**Laboratory Content**

1. Graphic Analysis of beams and trusses
2. Stress-strain relationship for brittle and ductile materials
3. Shear (Single & Double) test on mild steel.
4. Torsion test on mild steel.

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5. Impact (I & C) test on brittle and ductile materials
6. Compression test on timber (Parallel & Perpendicular)
7. Bending test on timber and plywood.
8. Compressive strength test on bricks
9. Flexural strength of flooring and roofing tiles.
10. Experimental and analytical study of behaviour of struts with various end conditions.
11. To determine elastic properties of a beam.
12. Experimental and analytical study of an elastically coupled beam.
13. Sway in portal frames - demonstration.

#### Reference Books

1. Merian, J.L., Kraige, L.G. Engineering Mechanics – Statics, 5th Edition, Wiley Publishers.
2. Beer & Johnston, Mechanics for Engineers, 4th Edition, McGraw-Hill.
3. Timoshenko, S.P., Young, D.H., Rao, J.V. Engineering Machines, 4th Edition, McGraw-Hill.
4. Singer, F.L. Strength of Materials, Third Edition, Harper and Row Publishers.
5. Hearn, E.J., Mechanics of Materials, Pergamon Press.
6. Beer and Johnston E. R. Mechanics of Materials, 3rd Edition, Tata McGraw Hill.
7. R. K. Bansal, "Strength of Materials", Laxmi Publications
8. S. Ramamurtham, "Strength of material", Dhanpat Rai Publication
9. S.S. Rattan, "Strength of Material", Tata McGraw-Hill Publication Co. Ltd.
10. B.K. Sarkar, "Strength of Material", McGraw-Hill.
11. Singer and Pytel, "Strength of materials", Harper and Row Publication.
12. R. C. Hibbeler, "Mechanics of Materials". Prentice Hall Publication.

#### Course Outcomes:

On completion of the course, learner will be able to

- CO1. DEFINE static indeterminacy and kinematic indeterminacy of trusses and able to analyse the trusses.
- CO2. PREDICT the stress strain behaviour of brittle and ductile materials and also able to define the relationship between load and deformation
- CO3. DRAW Shear force and bending moment diagram and also able to plot through thickness variation of bending stresses and shear stress.
- CO4. APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
- CO5. Analyse the behaviour of columns under uniaxial loading

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Course Code	EEPC10
Course Title	Electric Circuit Theory
Number of Credits	3-1-0=4
Prerequisites (Course Code)	---
Course category	IC/PC/PE/OE/MR/AU

### **COURSE OBJECTIVES:**

#### **To make students**

- OBJ1:** Understand standard signals, sources and its transformation, and apply network theorems to solve electric circuits
- OBJ2:** Understand and analyse magnetically coupled circuits and their electrical circuit equivalence, DC/AC circuits transient behaviour, and resonance in the circuits
- OBJ3:** Analyse and determine two-port networks, their characteristics, parameters, and characteristic impedances
- OBJ4:** Understand the concept of poles, zeros, frequency response, and Laplace transforms of electric circuits

### **Course Content**

#### **UNIT-I Mathematical Tools for Circuit Analysis**

**Laplace Transform:** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, inverse Laplace transform, transformed network with initial conditions

**Fourier Analysis:** Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to complex periodic signals, Fourier transform and convergence, Fourier transform of some functions

#### **UNIT-II Network Graphs and Network Theorems**

Introduction to graph theory, Classification of circuits, sources and signals, standard signals, source transformations, Network topology, graph matrices, formulation and solution of circuit equations based on graph theory, using different analysis techniques-circuit, cut set and mixed. Concept of duality, Network theorems and their applications-Superposition, reciprocity, Thevenin, Norton, Maximum power transfer, Millman, Substitution, Compensation and Tellegen's theorem.

#### **UNIT-III Network Analysis and Behaviour**

Introduction to non-linear circuits and their analysis. Analysis of circuits with dependent sources, Time constants and Transient response under DC and AC excitations. Analysis of magnetically coupled circuits, Series and parallel resonance circuits, bandwidth and Q-factor, response with variation in parameters and frequency.



#### **UNIT-IV: Multi Port Network Representation and Analysis**

Two-port networks, characteristics and parameters, interrelationships of parameters, image & iterative impedance, concept of characteristic impedance, scattering parameters, insertion loss, interconnection of 2-port networks, analysis of terminated 2-port networks, extensions to multiport networks.

Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), Restriction on location of Poles and Zeros, Time domain behaviour from Pole- Zero plots.

#### **Text Books:**

1. W. H. Hayt, J. E. Kemmerley, J. D. Phillips and S. M. Durbin, "Engineering Circuit Analysis", 9<sup>th</sup> Edition, McGraw Hill, New Delhi.
2. M. E. Van Valkenburg and T. S. Rathore, "Network Analysis", Revised 3<sup>rd</sup> Edition, PHI, New Delhi, 2019.

#### **Reference Books:**

3. Franklin. F, Kuo, "Network Analysis and Synthesis", 2nd Edition, Wiley India Ltd., New Delhi, 2006
4. K. S. Suresh Kumar, "Electric Circuits and Networks", Pearson Learning, New Delhi, 2008.
5. Charles K. Alexander and Matthew N.O. Sadiku "Fundamentals of Electric Circuits", 4<sup>th</sup> Edition, McHrawHill
6. M Nahvi, Joseph Edminister, K Rao, "Electric Circuits, Schaum's Outline Series", July 2017

#### **COURSE OUTCOMES:**

- CO1. Analyse behaviour of linear circuits by using Laplace transform and Fourier transform
- CO2. Represent and analyse an electric network by using graph theory and Analyse an electric circuit considering multiport network concept and understanding the basics of network theorems and applying the same for analysing the circuit behaviour
- CO3. Understand and apply electricity and magnetism concepts to magnetically coupled circuits, Analysis of series and parallel resonant circuits
- CO4. Represent and analyse characteristics and parameters of multiport networks and concept of characteristic impedance

#### **Note:**

- (i) The faculty member is expected to explore and be acquainted with the existing Indian Knowledge in the domain of the course and share with the students.
- (ii) The students are expected to do the necessary study of the existing Indian Knowledge in the domain of the course, prepare the report, and submit the same to the concerned faculty member at the end of the semester.

### **CIRCUIT THEORY**

Course Code	:	ECPC11
Course Title	:	Circuit Theory
Number of Credits		4 (L=3, T=0, P=2)
Prerequisites (Course code)	:	MATH, PHYSICS
Course Type	:	PC

#### **Course Learning Objectives**

The aim of this course is to make student competent in analyzing electrical circuits, apply Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources.

#### **Course Content**

##### **UNIT I**

##### **BASIC CIRCUITS & NETWORK THEOREMS**

Ohm's Law, Kirchoffs laws, DC and AC Circuits, Resistors in series and parallel circuits, Mesh and node analysis for D.C and A.C. circuits, Initial conditions. Network reduction: voltage and current division, source transformation, star delta conversion. Theorems: Thevenin's, Norton's, Superposition, Maximum power transfer, Substitution, and Reciprocity Theorems.

##### **UNIT II**

##### **RL, RC and RLC CIRCUITS & RESONANCE**

Series and parallel resonance, their frequency response, Quality factor and Bandwidth, Self and mutual inductance, Coefficient of coupling, Tuned circuits, Single tuned circuits, Time domain response of RL, RC and RLC Circuits, Bandwidth and High  $Q$  circuits.

##### **UNIT III**

##### **S – DOMAIN ANALYSIS OF CIRCUITS**

Complex Frequency, Definition of the Laplace Transform, Laplace Transforms of Simple Time Functions, Inverse Transform Techniques, Basic Theorems for the Laplace Transform, The Initial Value and Final Value Theorems,  $Z(s)$  &  $Y(s)$ , Nodal and Mesh Analysis in  $s$ -Domain, Additional Circuit Analysis Techniques, Poles, Zeros, and Transfer Functions, Convolution Function, RL, RC, and RLC Circuits analysis.

## UNIT IV

### TWO-PORT NETWORKS

Two-Port Networks, Admittance Parameters, Some Equivalent Networks, Impedance Parameters, Hybrid Parameters, Transmission Parameters.

#### Reference Books:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6<sup>th</sup> edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGrawHill, 4<sup>th</sup> edition, New Delhi, 2001.
3. M.E. Van Valkenburg, Ahmed Rumel, "Network Analysis", Prentice-Hall of India Pvt.Ltd.; 3rd edition, 2006.

#### Course outcomes

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

1. Apply KCL and KVL in electrical circuits to calculate current, voltage and power in typical linear electric circuits.
2. Apply circuit theorems and reduce more complicated circuits into the Thevenin's and Norton's equivalent circuits.
3. Analyze AC and DC Circuits.
4. Analyze resonance circuits and to develop transfer functions.
5. Understand Two-Port networks and its parameters.

*Ch* *by* *Dr. S. K. Sharma* *M. Ashish* *Vish Gupta*

### Circuit Theory Lab (ECPC11)

S. No.	Experiment	Objectives
1	DC Measurement	<ul style="list-style-type: none"> <li>To understand the basics of DC (direct current) circuits.</li> <li>To use a digital multimeter (DMM) to measure DC voltage, current and resistance.</li> <li>To verify the valid measurement condition for a digital multimeter.</li> </ul>
2	Network Analysis Methods	<ul style="list-style-type: none"> <li>To analyze a resistive circuit using (i) nodal and (ii) mesh analysis.</li> <li>To understand Thevenin's and Norton's theorems.</li> <li>To verify the superposition principle.</li> </ul>
3	AC Measurement	<ul style="list-style-type: none"> <li>To understand the basics of AC (alternating current) circuits.</li> <li>To use an oscilloscope to display and record a waveform.</li> <li>To use an oscilloscope to measure frequency, period, voltage (magnitude, peak-to-peak, maximum, minimum, etc), DC offset, etc. of the waveform.</li> <li>To use a digital multimeter to measure AC voltage and current.</li> </ul>
4	First and Second order circuits	<ul style="list-style-type: none"> <li>To study the step response of first order circuits.</li> <li>To understand the concept of the time constant.</li> <li>To study the step response of second order circuits.</li> <li>To understand the difference between overdamped, critically damped and underdamped responses.</li> <li>To determine theoretically and experimentally the damped natural frequency in the underdamped case.</li> </ul>
5	Sinusoidal Steady State	<ul style="list-style-type: none"> <li>To understand and calculate the power factor of a passive circuit.</li> <li>To verify that resistive components dissipate power while reactive components do not.</li> </ul>
6	Transfer Functions	<ul style="list-style-type: none"> <li>To study the transfer function of a circuit.</li> <li>To use the transfer function to find the specified frequency specified in the different cases.</li> </ul>
7	Series and Parallel Resonance	<ul style="list-style-type: none"> <li>To study the behavior of series and parallel LC circuits at resonance.</li> <li>To understand the resonance frequency, cut-off frequency, bandwidth and quality factor of a resonance circuit.</li> <li>To determine if a circuit is inductive or capacitive.</li> <li>To understand the circuit behavior at resonance.</li> </ul>

**Note:** The details of the experiments, circuit diagrams, simulation procedure and hardware implementation are described in the lab manual.

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## B. TECH. (2<sup>nd</sup> SEMESTER) MECHANICAL ENGG.

Course Code	MEPC-10
Course Title	Thermodynamics
Number of Credits	03
Prerequisites (Course code)	NIL
Course Type	PC

### Course Objectives:

1. To make students aware of the basic concepts, terminology of the thermodynamics.
2. To make the students understand the various laws of thermodynamics and their application.
3. To make students know about the feasibility of various thermodynamic processes.
4. To make students understand the various general thermodynamic relations.

### Concepts of Thermodynamics

(5 hrs)

Definition, Classical and statistical thermodynamics, Macroscopic and microscopic approaches, thermodynamic system, state, boundary, surroundings and universe, thermodynamic properties, thermodynamic equilibrium, Quasi-static process, zeroth law of thermodynamics, work and heat transfer.

### The First Law of Thermodynamics

(7 hrs)

First law for a closed system; Application of the First Law to non-flow processes viz constant volume, constant pressure, constant internal energy processes; Reversible adiabatic and reversible polytrophic processes; Steady Flow Energy Equation and its application to water, steam and gas turbines, pumps, compressors boilers, condensers, nozzles etc; Transient flow processes; PMM-I, Enthalpy.

### The Second Law of Thermodynamics

(10 hrs)

Limitations of the First Law, Heat source & sink, Heat engine, Refrigerator & Heat Pump, The Second Law, Kelvin Planck and Clausius statements; Reversible & Irreversible processes; the Carnot theorem, Absolute temperature scale, Inequality of Clausius, characteristics of Entropy, Entropy change for open & closed systems, Third Law of Thermodynamics, Validity & limitations of the Laws of Thermodynamics.

## **General Thermodynamic Relations**

(8 hrs)

Maxwell Relations, specific heat relations, energy equations; relations between internal energy and entropy, Joule Thomson Coefficient, Clausius Clapeyron's equation, Application of thermodynamic relations. Availability and the Gibbs function, Availability of a closed system, Availability of steady flow system, The Gibbs function and the steady flow system.

## **Properties of Fluids**

(10 hrs)

Properties of liquids and vapours; P-V, P-T, T-S and H-S diagrams for a pure substance (water), Tables of properties, Expansion of steam, Hyperbolic, Isentropic and throttling processes; determination of dryness fraction, Properties of a perfect gas; Equation of state; Property relation for internal energy, enthalpy & heat capacities of an ideal gas, P-V-T surface, Triple point, Real gases, properties of real gases, Vander Waals equations, Reduced equation of state, Generalized compressibility charts, Virial equation. Properties of ideal gas mixtures.

## **Course Outcomes:**

1. The students will be able to understand the basic concepts, terminology, and laws of thermodynamics.
2. The students will be able to apply laws and concepts of thermodynamics in the energy and exergy analysis of different type of thermodynamic systems
3. The students will be able to check the feasibility of a thermodynamics process
4. The students will be able to develop different thermodynamic relations and mathematical formulations for the analysis of a system.

## **Reference Books:**

1. Engg. Thermodynamics: Roger, GFC & Mayhew, Y.R, ELBS
2. Engg. Thermodynamics: Nag, P.K., TMH
3. Engg. Thermodynamics: Achuthan, M., TMH.

## B. TECH. (2<sup>nd</sup> SEMESTER) PRODUCTION & INDUSTRIAL ENGG.

Course Code	PRPC-11
Course Title	Manufacturing Processes
Number of Credits	03
Prerequisites (Course code)	NIL
Course Type	PC

### Course Learning Objectives:

1. To understand the basic terminologies related to manufacturing processes.
2. To introduce the basic concepts and fundamental knowledge of engineering materials and various processes such as casting, forming, machining, & welding etc. for manufacturing a product.
3. Be able to select a different manufacturing process based on requirement of applications.
4. The objective of this course is to prepare the students to understand the fundamental concepts and processes based on these basic manufacturing processes.

### Course Content:

#### Unit I

Introduction to manufacturing, classification of manufacturing, fundamental properties of Engineering materials including metals and alloys, polymers, ceramics and composites, plastic processing techniques: compression moulding and injection moulding, thermoforming moulding, moulding cycle time .

[6 hrs]

#### Unit II

##### **Casting**

Pattern materials, types of allowances, type of patterns, type of mould, desirable properties of moulding materials, core, core print, type of cores, CO2 casting, expandable and permanent mould casting, sand casting, shell casting, plaster casting, investment casting, die casting, centrifugal castings, casting defects & remedies advantages, disadvantages and application of casting.

##### **Machining**

Definition, classification, Lathe: parts and accessories, specifications, various operations on lathe.

[14 hrs]



### Unit III

#### **Forming**

Deformation of metals, elastic and plastic deformation, metal working processes: cold and hot working, forging, rolling, extrusion, wire and tube drawing.

#### **Sheet metal process & operations**

Introduction to shearing, blanking and punching, notching, trimming, lancing, nibbling, bending, stretching, embossing and coining.

Sheet metal forming, Sheet metal cutting, Slitting Process,

**[10 hrs]**

### Unit IV

Definition and classification, thermit welding, electric arc welding: MMAW, SAW, TIG, MIG, gas welding, resistance welding, brazing and soldering, welding defects and remedies.

**[10 hrs]**

#### **Course Outcomes:**

At the end of the course student will be able to

1. Decide and recommend cost effective and reliable engineering materials for the development of an existing and innovative product.
2. Decide and recommend appropriate manufacturing processes for a product under given conditions and constraints.
3. Appreciation of the different classes of defects and knowledge acquisition of various casting methodologies including the understanding the application of reverse engineering through casting.
4. Develop the operational flow visibility in manufacturing process & fundamental skills within working practices.

#### **Reference Books:**

1. P. N. Rao, Manufacturing Technology (Vol. 1 & 2), McGraw Hill Education.
2. M P Groover, Principles of Modern Manufacturing, Wiley.
3. Kalpakjian, Manufacturing Processes for Engineering Materials, Pearson Education India.
4. Amitabha Ghosh & A K Mallik, Manufacturing Science, Affiliated East-West Press Pvt. Ltd.



### **Programme Outcomes (B.Tech. Production & Industrial Engineering)**

PO1: To impart education in Mechanical Engineering for all-round development of students in order to serve the global society.

PO2: To enable the students to apply fundamentals and principles of Mechanical engg. to solve any new problem in the field of engineering.

PO3: To Promote awareness among the students about the importance of multi-disciplinary engineering approach.

PO4: To develop techno-commercial skills among students such as research aptitude and entrepreurial ability to cater the societal problems.

PO5: To prepare students for continuous learning even after graduating from the institute.

### **Course Outcomes (PRPC-11, Manufacturing Process)**

1. Decide and recommend cost effective and reliable engineering materials for the development of an existing and innovative product.
2. Decide and recommend appropriate manufacturing processes for a product under given conditions and constraints.
3. Decide the appropriate effective metal forming and sheet metal working process.
4. Use the appropriate welding and allied process.

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Course Code	Course Category	Course Title	Teaching Schedule			Cred
			L	T	P/D	
CEPC11	PC	Engineering Mechanics	3	0	2	4

**Pre-requisites:** Knowledge of Applied Physics

**Course Objectives:**

1. To determine the static indeterminacy and kinematic indeterminacy of trusses and to analyse the truss.
2. To acquire basic knowledge of stress, strain due to various types of loading.
3. To draw SFD and BMD and also to draw through thickness variation of bending stresses and shear stress.
4. To apply the concept of Principal Stresses and Theories of Failure.
5. To analyse the behaviour of columns under uniaxial loading.

**Course Content:**

**Theory Content**

**Unit 1: Basic Concepts**

Concept of Rigid body and deformable bodies, Free body diagram, Types of beams, simple and continuous beams, type of supports and reaction.

Fundamentals of Determinate and Indeterminate structures, Analysis of plane trusses, Analysis of Plane frames.

**Unit 2: Stresses and Strains.**

Concept of stress and strain (linear, lateral, shear and volumetric), Hook's law, elastic constants and their relationship, stress-strain diagrams for brittle, elastic and plastic materials, generalized Hook's law.

Analysis of axially loaded members: Stresses, strains and deformations of the structures under concentrated loads, self-weight and temperature changes.

**Unit 3: Shear Force and Bending Moment Diagram.**

Concept of shear force diagram and bending moment diagram for different beams under various types of loading. Stresses due transvers loading on the beam (bending and shear stresses), concept of shear stresses due to twisting moment (Torsion).

**Unit 4: Principal Stresses and Strains**

Principal stresses and strains: concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress. Theories of failure: maximum normal stress, maximum shear stress and maximum strain theory

**Unit 5: Axially and Eccentrically Loaded Columns**

Axially loaded columns: concept of critical load and buckling load, Euler's formula for buckling load for various end conditions of columns, concept of equivalent length, Rankine's formula, safe load on column and limitations of Euler's formula.

**Laboratory Content**

1. Graphic Analysis of beams and trusses
2. Stress-strain relationship for brittle and ductile materials
3. Shear (Single & Double) test on mild steel.
4. Torsion test on mild steel.

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5. Impact (I & C) test on brittle and ductile materials
6. Compression test on timber (Parallel & Perpendicular)
7. Bending test on timber and plywood.
8. Compressive strength test on bricks
9. Flexural strength of flooring and roofing tiles.
10. Experimental and analytical study of behaviour of struts with various end conditions.
11. To determine elastic properties of a beam.
12. Experimental and analytical study of an elastically coupled beam.
13. Sway in portal frames - demonstration.

#### Reference Books

1. Merian, J.L., Kraige, L.G. Engineering Mechanics – Statics, 5th Edition, Wiley Publishers.
2. Beer & Johnston, Mechanics for Engineers, 4th Edition, McGraw-Hill.
3. Timoshenko, S.P., Young, D.H., Rao, J.V. Engineering Machines, 4th Edition, McGraw-Hill.
4. Singer, F.L. Strength of Materials, Third Edition, Harper and Row Publishers.
5. Hearn, E.J., Mechanics of Materials, Pergamon Press.
6. Beer and Johnston E. R. Mechanics of Materials, 3rd Edition, Tata McGraw Hill.
7. R. K. Bansal, "Strength of Materials", Laxmi Publications
8. S. Ramamurtham, "Strength of material", Dhanpat Rai Publication
9. S.S. Rattan, "Strength of Material", Tata McGraw-Hill Publication Co. Ltd.
10. B.K. Sarkar, "Strength of Material", McGraw-Hill.
11. Singer and Pytel, "Strength of materials", Harper and Row Publication.
12. R. C. Hibbeler, "Mechanics of Materials". Prentice Hall Publication.

#### Course Outcomes:

On completion of the course, learner will be able to

- CO1. DEFINE static indeterminacy and kinematic indeterminacy of trusses and able to analyse the trusses.
- CO2. PREDICT the stress strain behaviour of brittle and ductile materials and also able to define the relationship between load and deformation
- CO3. DRAW Shear force and bending moment diagram and also able to plot through thickness variation of bending stresses and shear stress.
- CO4. APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
- CO5. Analyse the behaviour of columns under uniaxial loading

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Course Code	EEPC10
Course Title	Electric Circuit Theory
Number of Credits	3-1-0=4
Prerequisites (Course Code)	---
Course category	IC/PC/PE/OE/MR/AU

### **COURSE OBJECTIVES:**

#### **To make students**

- OBJ1:** Understand standard signals, sources and its transformation, and apply network theorems to solve electric circuits
- OBJ2:** Understand and analyse magnetically coupled circuits and their electrical circuit equivalence, DC/AC circuits transient behaviour, and resonance in the circuits
- OBJ3:** Analyse and determine two-port networks, their characteristics, parameters, and characteristic impedances
- OBJ4:** Understand the concept of poles, zeros, frequency response, and Laplace transforms of electric circuits

### **Course Content**

#### **UNIT-I Mathematical Tools for Circuit Analysis**

**Laplace Transform:** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, inverse Laplace transform, transformed network with initial conditions

**Fourier Analysis:** Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to complex periodic signals, Fourier transform and convergence, Fourier transform of some functions

#### **UNIT-II Network Graphs and Network Theorems**

Introduction to graph theory, Classification of circuits, sources and signals, standard signals, source transformations, Network topology, graph matrices, formulation and solution of circuit equations based on graph theory, using different analysis techniques-circuit, cut set and mixed. Concept of duality, Network theorems and their applications-Superposition, reciprocity, Thevenin, Norton, Maximum power transfer, Millman, Substitution, Compensation and Tellegen's theorem.

#### **UNIT-III Network Analysis and Behaviour**

Introduction to non-linear circuits and their analysis. Analysis of circuits with dependent sources, Time constants and Transient response under DC and AC excitations. Analysis of magnetically coupled circuits, Series and parallel resonance circuits, bandwidth and Q-factor, response with variation in parameters and frequency.



#### **UNIT-IV: Multi Port Network Representation and Analysis**

Two-port networks, characteristics and parameters, interrelationships of parameters, image & iterative impedance, concept of characteristic impedance, scattering parameters, insertion loss, interconnection of 2-port networks, analysis of terminated 2-port networks, extensions to multiport networks.

Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), Restriction on location of Poles and Zeros, Time domain behaviour from Pole- Zero plots.

#### **Text Books:**

1. W. H. Hayt, J. E. Kemmerley, J. D. Phillips and S. M. Durbin, "Engineering Circuit Analysis", 9<sup>th</sup> Edition, McGraw Hill, New Delhi.
2. M. E. Van Valkenburg and T. S. Rathore, "Network Analysis", Revised 3<sup>rd</sup> Edition, PHI, New Delhi, 2019.

#### **Reference Books:**

3. Franklin. F, Kuo, "Network Analysis and Synthesis", 2nd Edition, Wiley India Ltd., New Delhi, 2006
4. K. S. Suresh Kumar, "Electric Circuits and Networks", Pearson Learning, New Delhi, 2008.
5. Charles K. Alexander and Matthew N.O. Sadiku "Fundamentals of Electric Circuits", 4<sup>th</sup> Edition, McHrawHill
6. M Nahvi, Joseph Edminister, K Rao, "Electric Circuits, Schaum's Outline Series", July 2017

#### **COURSE OUTCOMES:**

- CO1. Analyse behaviour of linear circuits by using Laplace transform and Fourier transform
- CO2. Represent and analyse an electric network by using graph theory and Analyse an electric circuit considering multiport network concept and understanding the basics of network theorems and applying the same for analysing the circuit behaviour
- CO3. Understand and apply electricity and magnetism concepts to magnetically coupled circuits, Analysis of series and parallel resonant circuits
- CO4. Represent and analyse characteristics and parameters of multiport networks and concept of characteristic impedance

#### **Note:**

- (i) The faculty member is expected to explore and be acquainted with the existing Indian Knowledge in the domain of the course and share with the students.
- (ii) The students are expected to do the necessary study of the existing Indian Knowledge in the domain of the course, prepare the report, and submit the same to the concerned faculty member at the end of the semester.

## **CIRCUIT THEORY**

Course Code	:	ECPC11
Course Title	:	Circuit Theory
Number of Credits		4 (L=3, T=0, P=2)
Prerequisites (Course code)	:	MATH, PHYSICS
Course Type	:	PC

### **Course Learning Objectives**

The aim of this course is to make student competent in analyzing electrical circuits, apply Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources.

### **Course Content**

#### **UNIT I**

##### **BASIC CIRCUITS & NETWORK THEOREMS**

Ohm's Law, Kirchoffs laws, DC and AC Circuits, Resistors in series and parallel circuits, Mesh and node analysis for D.C and A.C. circuits, Initial conditions. Network reduction: voltage and current division, source transformation, star delta conversion. Theorems: Thevenin's, Norton's, Superposition, Maximum power transfer, Substitution, and Reciprocity Theorems.

#### **UNIT II**

##### **RL, RC and RLC CIRCUITS & RESONANCE**

Series and parallel resonance, their frequency response, Quality factor and Bandwidth, Self and mutual inductance, Coefficient of coupling, Tuned circuits, Single tuned circuits, Time domain response of RL, RC and RLC Circuits, Bandwidth and High  $Q$  circuits.

#### **UNIT III**

##### **S – DOMAIN ANALYSIS OF CIRCUITS**

Complex Frequency, Definition of the Laplace Transform, Laplace Transforms of Simple Time Functions, Inverse Transform Techniques, Basic Theorems for the Laplace Transform, The Initial Value and Final Value Theorems,  $Z(s)$  &  $Y(s)$ , Nodal and Mesh Analysis in  $s$ -Domain, Additional Circuit Analysis Techniques, Poles, Zeros, and Transfer Functions, Convolution Function, RL, RC, and RLC Circuits analysis.

## UNIT IV

### TWO-PORT NETWORKS

Two-Port Networks, Admittance Parameters, Some Equivalent Networks, Impedance Parameters, Hybrid Parameters, Transmission Parameters.

#### Reference Books:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6<sup>th</sup> edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGrawHill, 4<sup>th</sup> edition, New Delhi, 2001.
3. M.E. Van Valkenburg, Ahmed Rumel, "Network Analysis", Prentice-Hall of India Pvt.Ltd.; 3rd edition, 2006.

#### Course outcomes

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

1. Apply KCL and KVL in electrical circuits to calculate current, voltage and power in typical linear electric circuits.
2. Apply circuit theorems and reduce more complicated circuits into the Thevenin's and Norton's equivalent circuits.
3. Analyze AC and DC Circuits.
4. Analyze resonance circuits and to develop transfer functions.
5. Understand Two-Port networks and its parameters.

*Ch* *by* *R. S. Sharma* *M. Ashok* *Vish Gupta*



### Circuit Theory Lab (ECPC11)

S. No.	Experiment	Objectives
1	DC Measurement	<ul style="list-style-type: none"> <li>To understand the basics of DC (direct current) circuits.</li> <li>To use a digital multimeter (DMM) to measure DC voltage, current and resistance.</li> <li>To verify the valid measurement condition for a digital multimeter.</li> </ul>
2	Network Analysis Methods	<ul style="list-style-type: none"> <li>To analyze a resistive circuit using (i) nodal and (ii) mesh analysis.</li> <li>To understand Thevenin's and Norton's theorems.</li> <li>To verify the superposition principle.</li> </ul>
3	AC Measurement	<ul style="list-style-type: none"> <li>To understand the basics of AC (alternating current) circuits.</li> <li>To use an oscilloscope to display and record a waveform.</li> <li>To use an oscilloscope to measure frequency, period, voltage (magnitude, peak-to-peak, maximum, minimum, etc), DC offset, etc. of the waveform.</li> <li>To use a digital multimeter to measure AC voltage and current.</li> </ul>
4	First and Second order circuits	<ul style="list-style-type: none"> <li>To study the step response of first order circuits.</li> <li>To understand the concept of the time constant.</li> <li>To study the step response of second order circuits.</li> <li>To understand the difference between overdamped, critically damped and underdamped responses.</li> <li>To determine theoretically and experimentally the damped natural frequency in the underdamped case.</li> </ul>
5	Sinusoidal Steady State	<ul style="list-style-type: none"> <li>To understand and calculate the power factor of a passive circuit.</li> <li>To verify that resistive components dissipate power while reactive components do not.</li> </ul>
6	Transfer Functions	<ul style="list-style-type: none"> <li>To study the transfer function of a circuit.</li> <li>To use the transfer function to find the specified frequency specified in the different cases.</li> </ul>
7	Series and Parallel Resonance	<ul style="list-style-type: none"> <li>To study the behavior of series and parallel LC circuits at resonance.</li> <li>To understand the resonance frequency, cut-off frequency, bandwidth and quality factor of a resonance circuit.</li> <li>To determine if a circuit is inductive or capacitive.</li> <li>To understand the circuit behavior at resonance.</li> </ul>

**Note:** The details of the experiments, circuit diagrams, simulation procedure and hardware implementation are described in the lab manual.

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## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU11
Course Title	Human Values & Social Responsibility
Number of Credits	2 (2L + 0T)
Prerequisites (Course Code)	----
Course Category	AUDIT COURSE (AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

- To help students understand the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.
- To enable the students to understand harmony and its relevance at all the levels.
- To create awareness about social responsibility among students and make them socially responsible citizen.

### Unit-I: Human Values

Definition and Classification of Values: Extrinsic Values, Universal and Situational Values, Physical, Environmental, Sensuous, Economic, Social, Aesthetic, Moral and Religious Values. The Problem of Hierarchy of Values and their Choice.

### Unit-II: Ethics and Holistic Life

Human Life, its Aim and Significance: The Concept of a successful life, happy life and a meaningful life. Harmony in Personal and Social Life: Concept of the Good, the Right and the Beautiful.

### **Unit-III: Social Responsibility**

Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.

#### **Course Outcomes**

At the end of the Course, students will be able to understand the concept of contemporary ethics at different levels: Individual, Local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view. Further, they will be able to develop their ability to create a balance between their individual freedom and social responsibilities and also enable them to identify personal, professional and social values and integrate them in their personality after cross examination.

#### **Reference Books**

1. Lillie William, An Introduction of Ethics, Allied Publisher, Indian Reprint 1955.
2. William, K Frankena, Ethics, Prentice Hall of India, 1988.
3. Dr. Awadesh Pradhan, Mahamana ke Vichara, B.H.U., Vanarasi, 2007.
4. RR Gaur, R Sangal, G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010
5. A Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
6. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
7. Fernando A.C. Business Ethics. An Indian Perspective, Pearson Education, New Delhi.
8. Cambell Jones, Martin Parker & Rene Ten Bos , For Business Ethics, Routledge, New York, 2005.
9. Philip Kotler & Nancy Lee, Corporate Social Responsibility, Wiley- India Edition, New Delhi.
10. Kolja Paetzold, Corporate Social Responsibility: An International Marketing Approach, Diplomica Verlag, GmbH, Hamburg, Germany.
11. William B. Werther Jr. & David Chandler, Strategic Corporate Social Responsibility, Sage Publications, California.

#### **Note**

It is further proposed to do away with the attendance component of the awards in the internal

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU12
Course Title	Sanskrit Language Skills
Number of Credits	2 (2L+0P)
Prerequisites (Course code)	----
Course Category	AUDIT COURSE (AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

- To make students acquainted with the journey of Sanskrit literature.
- To make students develop a comprehensive idea about Sanskrit language, literature, and Philosophy.

### Course Contents

- शब्दस्वरूप एवं भेद
- उच्चारण-स्थान एवं प्रयत्न
- पद संरचना
  - (क) पदस्वरूप, भेद एवं प्रयोग
  - (ख) सुबन्तपद
  - (ग) तिङन्तपद
- वाक्य संरचना
  - (क) वाक्यस्वरूप भेद एवं प्रयोग
  - (ख) कर्तृवाच्य
  - (ग) कर्मवाच्य
  - (घ) भाववाच्य
- कारक परिचय
  - (क) कारकस्वरूप, भेद एवं प्रयोग
  - (ख) तिङन्तपद

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU13
Course Title	Hindi Language Skills
Number of Credits	2 (2L + 0T)
Prerequisites (Course Code)	-----
Course Category	AUDIT COURSE (AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

1. हिंदी भाषी क्षेत्रों में तकनीकी शिक्षा के प्रचार-प्रसार हेतु ।
2. हिंदी भाषी विद्यार्थी तकनीकी शिक्षा का हिंदी भाषा में ज्ञान अर्जित कर सकें।
3. सरकारी कार्यालयों में तकनीकी क्षेत्र में रोजगार हेतु।
4. विदेशों में हुए तकनीकी अनुसंधान को ज्यों का त्यों लेने की बजाय अपनी भाषा में अनुवाद कर राष्ट्रीय विकास में योगदान हेतु ।

### Course Contents

#### Unit: I उद्देश्यपूर्ण हिंदी - संक्षिप्ताक्षर, पल्लवन और नोट्स

- उद्देश्यपूर्ण हिंदी - अर्थ और रूप
- संक्षेपण - संक्षेपण प्रक्रिया की विशेषताएं और नियम
- पल्लवन - पल्लवन प्रक्रिया की परिभाषा और नियम
- पल्लवन और व्याख्या के बीच अंतर
- नोट- परिभाषा सैद्धांतिक आधार और वर्गीकरण

#### Unit: II शब्दावली अर्थ और रूप

- परिभाषा शब्द - परिभाषा, अर्थ और रूप
- व्यावसायिक और वाणिज्यिक विषयों पर तकनीकी शब्दावली
- समान दिखने वाले लेकिन थोड़े भेदभावपूर्ण शब्दों की मान्यता

#### Unit: III व्यापार या वाणिज्यिक पत्र लेखन

- सामान्य रूप से अक्षरों के प्रकार
- बिजनेस / कमर्शियल पत्र लिखने के लिए आवश्यक शैली

1. వర్ణమాల: అచ్చులు, హల్లులు, క్ష-ర ట త పలు స్వరాలు.

గ శ ట డ ద ట లు, సర్వ వర్ణాలు రామరేం: రెండు అక్షరాల  
పదాలు, మూడు అక్షరాల పదాలు మరియు నాలుగు అక్షరాల  
పదాలు. అచ్చులు మరియు హల్లులు సుస్థిరమైనవి. 7

2. గుణింపాలు: గుణింప పదాలు మరియు గుణింప అక్షరాలు:  
తలకట్టు, దేర్లు, గుడి, గుడిదేర్లు, కొమ్మ, కొమ్మదేర్లు,  
పెట్టెలు, పెట్టెదేర్లు, పిచ్చం, బిచ్చం, పిచ్చు దేర్లు,  
పెట్టెలు, సున్న (ఉనుస్పారం). బిచ్చులు: రామరేం, చదువరేం  
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3. ద్విత్వోక్తం, సంయుక్తోక్తం మరియు సుదైర్ఘ్యోక్తం: రామరేం  
మరియు చదువరేం. పదయోగం. 8

తెలుగు పదాలు: బాసర, వేమన, సుమతి పదాలు మరియు అచ్చులు.

4. స్థాయి రచన, పదయోగం, పదయోగం. ప్రతిపదాలు. 7  
యాదవరేం: సందులు, సమస్యలు

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU15
Course Title	Constitution of India
Number of Credits	2 (2L+0T)
Prerequisites (Course code)	----
Course Category	AUDIT COURSE (AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

- To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To understand the functioning of Union, State and Local Governments in Indian federal system.

### Unit-I: Introduction to Constitution

Meaning and Importance of the Constitution, Salient features of Indian Constitution. Preamble of the Constitution of India. Fundamental Rights. Directive Principles of State Policy and Fundamental Duties: their enforcement and their relevance.

### Unit-II: Union Government and Judiciary

Union Executive: President, Vice-president, Prime Minister, Council of Ministers. Union Legislature: Parliament and Parliamentary proceedings. Appointment and Transfer of Supreme Court and High Court Judges, Powers and Functions.

### Unit-III: State Governments

State Executive: Governor, Chief Minister, Council of Ministers. State Legislature: State Legislative Assembly and State Legislative Council.

### Reference/Text Books



## VEDIC MATHEMATICS

### Course Objectives:

1. To provide the students the chance to discover the potential of Vedic mathematics
2. To develop excellent numerical math skills in students
3. To help students discover and comprehend basic arithmetic calculation methods
4. To teach students how to quickly and accurately do everyday calculations using the concepts of Vedic mathematics

### Course Outcomes:

By successfully completing this course, the learner will be able to:

1. Execute elementary arithmetic calculations quickly and accurately
2. Will be able to build tables of any value
3. Will be able to perform products of huge numbers fast
4. Gain proficiency in computing the numbers' square and cube roots.
5. Perform complex computations quickly.

### Module – I

History and Evolution of Vedic Mathematics, Introduction of Basic Vedic Mathematics Techniques in Multiplication (Special Case, Series of 9, Series of 1 etc), Tables etc., Comparison of Standard Methods with Vedic Methods.

### Module – II

Various techniques to carry out basic operations covering Addition, Subtraction, Multiplication, Division, Complements and Bases, Vinculum number, General multiplication (Vertically Crosswise).

### Module – III

Multiplications by numbers near base, Verifying answers by use of digital roots, Divisibility tests, Division of numbers near base, Comparison of fractions.

### Module – IV

Applications of Vinculum, Different methods of Squares (General method, Base method, Duplex method etc.). Cubes, Cube roots, Square roots, General division, Quadratic Equations, Simultaneous Equations, Use of various Vedic Techniques for answering numerical aptitude questions from Competitive Examinations

### Reference Books:



- 1) Bhatiya Dhaval, Vedic Mathematics Made Easy, Jaico Publishing House
- 2) V. G. Unkalkar, Magical World of Mathematics (Vedic Mathematics), Vandana Publishers, Bangalore

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मार्गदर्शक  
विभाग,  
राष्ट्रीय प्रौद्योगिकी संस्थान  
फ़ोन-136119.

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**DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES**

<b>Course Code</b>	<b>HSAU16</b>
<b>Course Title</b>	<b>Indian Knowledge System</b>
<b>Number of Credits</b>	<b>2 (2L+0T)</b>
<b>Prerequisites (Course code)</b>	----
<b>Course Category</b>	<b>AUDIT COURSE (AU)</b>

**Semester: Odd/Even**

**Internal: 50 Marks**

**Total: 50 Marks**

**Course Objectives**

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System.
2. To make students acquaint with the facets of traditional knowledge & their relevance and help them be able to apply it to their day to day life.

**UNIT-I: Indian Knowledge System: An Introduction**

Defining Indian Knowledge System. Importance of Ancient Knowledge, The IKS Corpus. Introduction to Traditional Knowledge: Concept & Definition, Nature, Scope and Importance of Traditional Knowledge. The Vedic Corpus: Introduction to Vedas, The Four Vedas. Philosophical System: Development and Unique Features. Bhagavad Gita

**UNIT-II: Science, Engineering and Technology in IKS**

Mathematics: Unique Aspects of Indian Mathematics, Great Mathematicians and their Contributions. Astronomy: Unique Aspects of Indian Astronomy, Historical Developments of Astronomy in India. Engineering & Technology: Indian S&T Heritage, Metals and Metalworking Technology, Literary Sources for S&T. Traditional Medicine System.

**UNIT-III: Humanities and Social Sciences in IKS**

Health, Wellness & Psychology: Definition of Health, Emotional Intelligence, Yoga & its Relevance to Health & Wellness. Indian Approach to Psychology. Governance and Policy.

**Reference Books**

Mahadevan, B., Bhat, V.R. & Nagendra Pavana RN, (2022). Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning

**Note**

It is further proposed to do away with the attendance component of the awards in the internal assessment. A note may be appended with each course on the following instructions:

- (i) The faculty member is expected to explore and be acquainted with the existing Indian Knowledge in the domain of the course and share with the students.
- (ii) The students are expected to do the necessary study of the existing Indian Knowledge in the domain of the course, prepare the report, and submit the same to the concerned faculty member at the end of the semester.
- (iii) The faculty member will evaluate the reports and award marks to the students with maximum cap being the equivalent of attendance component marks

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU17
Course Title	Teachings of Gita
Number of Credits	2 (2L + 0T)
Prerequisites (Course Code)	----
Course Category	AUDIT COURSE(AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

- To develop a deeper understanding of the *BhagavadGita*.
- To inculcate the teachings of the *BhagavadGita* in real life in order to lead a more meaningful and spiritual life.
- To initiate a culture of contemplation and spirituality for maintaining a balance between material and spiritual needs.

### Unit-I: Introduction to Bhagavad Gita

Bhagavad Gita: Meaning, Origin and History. Reading and understanding of the text, analysis of the Bhagavad Gita with reference to the age in which it was composed and its contemporary relevance. Ethical Teachings of Bhagavad Gita.

### Unit-II: Teachings of Bhagavad Gita: Chapter 2

The focus will be on how teachings of Gita as mentioned in Chapter 2 can be applied to overcome problems in real life like management of stress, control over mind, ethical decision making, leadership skills and problems of justice etc. Concept of Jyanayoga, Karmayoga and Bhaktiyoga.

### Unit-III: Teachings of Bhagavad Gita: Chapter 3

The focus will be on how teachings of Gita as mentioned in Chapter 3 can be applied to overcome problems in real life like management of stress, control over mind, ethical decision making and leadership skills etc.

### Course Outcomes

At the end of the Course, students will be able to develop an understanding of the *Bhagavad Gita* and they will be able to apply its teachings in their daily lives.

**DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES**

<b>Course Code</b>	<b>HSAU18</b>
<b>Course Title</b>	<b>French Language Skills</b>
<b>Number of Credits</b>	<b>2 (2L+0T)</b>
<b>Prerequisites (Course code)</b>	----
<b>Course Category</b>	<b>AUDIT COURSE (AU)</b>

**Semester: Odd/Even**

**Internal: 50 Marks**

**Total: 50 Marks**

**Course Objectives**

1. To introduce basic language skills in French Language.
2. To build confidence among students in speaking French Language with correct pronunciation.

**UNIT-I: Basic Elements of Grammar**

- a) Determinants
- b) Preposition
- c) Adjective: demonstrative, interrogative and possessive.
- d) Pronoun: Personal, possessive, demonstrative, interrogative
- e) Present Tense, Past tense, Future tense and Imperfect tense
- i) Adverb
- j) Imperative
- k) Comparative and superlative

**UNIT-II: Translation**

English to French, French to English

**UNIT-III: Introduction to Culture and Civilization**

Short questions on day-to-day life in France i.e. names of cities, rivers, mountains, periodicals, authors, important abbreviations, etc.

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	HSAU19
Course Title	German Language Skills
Number of Credits	2 (2L+0T)
Prerequisites (Course code)	----
Course Category	AUDIT COURSE (AU)

Semester: Odd/Even

Internal: 50 Marks

Total: 50 Marks

### Course Objectives

1. To introduce basic language skills in German Language.
2. To build confidence among students in speaking German Language with correct pronunciation.

### UNIT-I: Basic Elements of Grammar

- a) Wo, woher, wohin
- b) Wer, was, wie.
- c) Wie viel, wie viele, wie lange, Uhrzeiten..
- d) Akkusativ, einen, keinen, doch usw.
- e) Modalverben.
- f) Wenn, weil, wann, warum.
- g) Dativ
- h) Praepositionen mit Akkusativ und Dativ wie aus, bei, durch, fuer usw.
- i) Perfekt mit haben und sein.

### UNIT-II: Translation

English to German, German to English

### UNIT-III: Introduction to Culture and Civilization

Short questions on day-to-day life in Germany i.e. names of cities, rivers, mountains, periodicals, authors, important abbreviations, etc.



## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

<b>Course Code</b>	<b>HSAU20</b>
<b>Course Title</b>	<b>Japanese Language Skills</b>
<b>Number of Credits</b>	<b>2 (2L+0T)</b>
<b>Prerequisites (Course code)</b>	----
<b>Course Category</b>	<b>AUDIT COURSE (AU)</b>

**Semester:** Odd/Even

**Internal:** 50 Marks

**Total:** 50 Marks

### **Course Objectives**

1. To introduce basic language skills in Japanese Language.
2. To build confidence among students in speaking Japanese Language with correct pronunciation.

### **UNIT-I: Basic Elements of Vocabulary and Grammar**

#### **UNIT-II: Translation**

English to Japanese, Japanese to English

#### **UNIT-III: Introduction to Culture and Civilization**

Short questions on day-to-day life in Japan i.e. names of cities, rivers, mountains, periodicals, authors, important abbreviations, etc.

### **Course Outcomes**

At the end of the course, students will be able to learn and communicate effectively in Japanese Language on day to day basis and will also be able to manage basic communication in Japanese.

## DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

<b>Course Code</b>	<b>HSAU21</b>
<b>Course Title</b>	<b>Thought Lab</b>
<b>Number of Credits</b>	<b>2 (2L+0T)</b>
<b>Prerequisites (Course code)</b>	----
<b>Course Category</b>	<b>AUDIT COURSE (AU)</b>

**Semester:** Odd/Even

**Internal:** 50 Marks

**Total:** 50 Marks

### Course Objectives

- To introduce importance of mind power, meditation, positive thoughts etc.
- To have insights and experience of mind power, meditation, positive thoughts etc.
- To preserve and disseminate mind power, meditation, positive thoughts etc. for further research and societal applications.

<b>S. N.</b>	<b>Name of Experiment</b>
1	Providing impactful visualization of meditation using VR headset.
2	Measuring Human Energy field, Health Status, Chakras Status using Aura Scan.
3	Wearable Xant device for mind waves study.
4	Giving Psychological access to all by using Mind Charger.
5	Measuring memory power using MPM tool.
6	Mind and Body detoxification practices.
7	For study of brain waves, Muse device.
8	Pulse oximeter, BP monitor.

NATIONAL INSTITUTE OF TECHNOLOGY  
KURUKSHETRA

Date: 7.11.2022

**Minutes of the meeting held on 7.11.2022 regarding B.Tech. curriculum  
revision in line with NEP-2020 in the office of Dean (Acad.).**

A meeting for finalizing the guidelines for evaluation of the courses NCC/NSS/Yoga/Sports/Clubs/Technical Societies under new B.Tech. scheme to be placed before the 48<sup>th</sup> Senate scheduled to be held on 7.11.2022 was held in the office of the Dean (Acad.) on 7.11.2022 at 3.30 p.m. The following were present:

1. Prof. Dixit Garg, Dean (SW) In Chair
2. Prof. Sathans, Dean (Acad.)
3. Prof. Umesh Ghanekar, Prof. I/C (Physical Education)
4. Prof. V.K. Bajpai, ANO
5. Dr. Saurabh Chanana, Prof. I/C (Technical Societies)
6. Dr. M. Senthil Kumar, Faculty I/C (Colors Club)
7. Dr. Vijay Verma, NSS Programme Officer
8. Sh. Shahabuddin, SAS officer
9. Ms. Pallavi Rai, SAS officer

After detailed deliberations, the guidelines and course contents were finalized which are enclosed.

  
(Pallavi Rai)

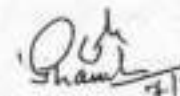
  
(Shahabuddin)

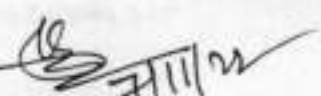
  
(Vijay Kumar Verma)

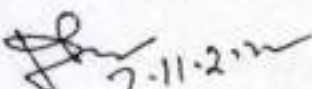
  
(Saurabh Chanana)

  
(V.K. Bajpai)

  
(M. Senthil Kumar)

  
(Umesh Ghanekar)

  
(Sathans)

  
(Dixit Garg)

## NATIONAL CADET CORPS

### INSTITUTIONAL TRAINING SYLLABUS

#### INTRODUCTION

1. Institutional Training being conducted in the Colleges and Schools is the principal means of training in the NCC. The aim of the training is to nurture core values, enhance awareness and give exposure to basic military skills and knowledge. Emphasis will be on practical training. Case studies, wherever possible will be used to facilitate active participation and better assimilation. Examples from India's freedom struggle and wars fought by India, post-independence, should supplement relevant subjects to generate secular and patriotic fervour. The instructors and the cadets must grasp the importance of this training and participate actively.

2. Principles of Training In keeping with the changing environment, the principles of NCC Training are:-

- (a) Junior Division (JD)/ Junior Wing (JW) to be for two years while Senior Division (SD)/ Senior Wing (SW) will be for three years
- (b) Separate syllabi for JD/JW and SD/SW.
- (c) Modified syllabus for professional educational institutes of repute to encourage enrolment of cadets
- (d) Revised curriculum for training in a military environment with greater emphasis on soft skill development, awareness of social responsibilities and adventure and sports.
- (e) Uniformity in syllabus for boys and girls.
- (f) Common Syllabus for all three wings to be approximately 60 to 70% and Specialised Service Syllabus training will be 30 to 40%.



(iii)

(g) Emphasis on practical training.

(h) Conduct of periodic composite training ensuring continuity for better learning assimilation and its application.

3. Common subjects will comprise about 70% of the periods and Specialised Service Subjects will be 30%. The breakdown of periods are as under:-

<u>Ser No</u>	<u>Subject</u>	<u>No of Periods</u>			
		<u>First Year</u>	<u>Second Year</u>	<u>Third Year</u>	<u>Total</u>
<u>Senior Division/Wing</u>					
(a)	Common Subjects	66	72	72	210
(b)	Specialised Subjects	24	33	33	90
	TOTAL	90	105	105	300
<u>Junior Division/Wing</u>					
(c)	Common Subjects	85	85	--NA--	170
(d)	Specialised Subject	35	35		70
	TOTAL	120	120		240

4. In addition to this syllabus, State Directorates will conduct Social Service Activities in the form of rallies of any nature to carry social messages in the form of posters, street plays, placards etc

<u>Legend</u>	
<u>Abbreviation</u>	<u>Type</u>
L	Lecture
D	Demonstration
Di	Discussion
P	Practice
V	Video

  
H/1/2022

**BLOCK SYLLABUS**  
**COMMON SUBJECTS: SD/SW (ALL WINGS)**

Ser No	Subject	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total Periods
1.	The NCC	03	00	00	03
2.	National Integration and Awareness	06	06	06	18
3.	Drill	16	19	08	43
4.	Weapon Training	12	10	10	32
5.	Personality Development & Leadership	10	15	20	45
6.	Disaster Management	03	03	04	10
7.	Social Awareness & Community Development	05	05	06	16
8.	Health & Hygiene	05	04	07	16
9.	Adventure	02	06	07	15
10.	Environment Awareness and Conservation	02	02	02	06
11.	Obstacle Training	02	02	02	06
<b>TOTAL</b>		<b>66</b>	<b>72</b>	<b>72</b>	<b>210</b>

*[Signature]*  
 21/12/2022



**BLOCK SYLLABUS**  
**SPECIALISED SUBJECTS: SD/SW (ARMY)**

Ser No	Subject	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total Periods
1	Armed Forces	04	04	02	10
2	Map Reading	07	08	09	24
3	Field Craft & Battle Craft	05	07	09	21
4	Introduction to Infantry Weapons & Equipment	02	04	05	11
5	Military History	03	05	05	13
6	Communication	03	05	03	11
<b>TOTAL</b>		<b>24</b>	<b>33</b>	<b>33</b>	<b>90</b>

*[Signature]*  
 21/11/2022

**BLOCK SYLLABUS**  
**SPECIALISED SUBJECTS: SD/SW (AIR)**

Ser No	Subject	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total Periods
1.	General Service Knowledge	02	02	02	06
2.	Air Campaigns	00	02	04	06
3.	Aircraft Recognition	00	04	00	04
4.	Modern Trends	00	00	02	02
5.	Principles of Flight	03	04	03	10
6.	Airmanship	06	02	02	10
7.	Navigation	00	03	02	05
8.	Meteorology	00	01	04	05
9.	Aero-Engines	01	04	01	06
10.	Airframes	02	02	02	06
11.	Instruments	02	03	02	07
13.	Aircraft Particulars	02	00	00	02
14.	Aeromodelling	06	06	09	21
<b>TOTAL</b>		<b>24</b>	<b>33</b>	<b>33</b>	<b>90</b>

*[Signature]*  
 7/11/2022

**BLOCK SYLLABUS****SPECIALISED SUBJECTS SD/SW (NAVY)**

Ser No	Subject	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total Periods
1	Naval Orientation	08	06	03	17
2	Naval Warfare and Its Components	00	04	03	07
3	Naval Communication	03	04	01	08
4	Navigation	00	06	03	09
5	Seamanship				
	(a) Anchor Work	01	01	00	02
	(b) Rigging	02	00	00	03
	(c) Boat Work	04	05	01	10
6	Fire Fighting, Flooding and Damage Control	00	02	02	04
7	Ship and Boat Modelling	02	03	14	19
8	Search and Rescue	01	00	01	02
9	Swimming	01	03	05	09
<b>TOTAL</b>		<b>24</b>	<b>33</b>	<b>33</b>	<b>90</b>

## **National Service Scheme**

### **Overall Objective:**

Development of Student's personality through community service.

### **Aims & Objective of NSS:**

- i. To understand the community in which they work;
- ii. To understand themselves in relation to their community;
- iii. To identify the needs and problems of the community and involve them in problem solving process.
- iv. To develop among themselves a sense of social and civic responsibility;
- v. To utilize their knowledge in finding practical solution to individual and community problem;
- vi. To develop competence required for group-living and sharing of responsibilities;
- vii. To gain skills in mobilizing community participation;
- viii. To acquire leadership qualities and democratic attitude;
- ix. To develop capacity to meet emergencies and natural disasters;

### **Obligations of NSS Volunteers:**

To work for two continued years along with their studies, putting in 120 hours service each year and participating in one special camping programme.

### **Joining NSS:**

Simply by enrolling/registering yourself in NSS unit through the Programme Officer concerned.

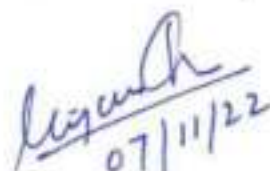
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**Evaluation:**

NSS Certificate: Total 240 hours of **social service** in two years duration. Of which 20 hours for orientation course, 30 hours for campus work and the remaining 70 hours for community services in a year. Further a seven-day special camp will be attended by the NSS Volunteer in the adopted village.

However, a student who participates in various activities of NSS during the 1<sup>st</sup> to 6<sup>th</sup> semester then he/she will earn certain hours of NSS work depending upon the nature of the tasks.

Further, it should be noted that a total of at least 60 hours of activities are required to complete the one-credit course of the curriculum.

  
07/11/22  
(DR. VIJAY VERMA)

## Guidelines for Evaluation of Students in Technical Societies/ Student Clubs at the end of 6<sup>th</sup> Semester

Students will be evaluated based on

- a) Their performance as a member/ post holder of chosen society/club.
- b) Their participation/prizes won in various activities/ events/workshops/contests organized by technical societies/student clubs.
- c) Their participation/prizes won in inter-college contests/festivals organized by institutes of national repute.
- d) Other innovations/extraordinary achievements e.g. patents, start-ups, professional performances etc.

Students excelling in any of above areas consistently since his/her induction in the institute, proven through certificates/ letters of recommendations/ other proofs, will be awarded the highest grades.



No. Acad/Miscell/2/5102  
4/11/22

**Physical Education & Sports Section  
National Institute of Technology,  
Kurukshetra – 136119**

PESS/2022/.....494

Dated: 4/11/2022

**Syllabus and Evaluation Scheme of Yog  
Compulsory for up to B.Tech 6<sup>th</sup> Semester Students**

Course Code:  
Course Title: Yog

L	T/P	C
0	02	1

**Introduction:** Yog education in Institute can immensely contribute to health of students by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

**Objectives of the course:**

- To enable the student to have good physical and mental health.
- To improve cognitive ability.
- To improve the level of consciousness.

**UNIT-I**

**Introduction to Yog**

- ❖ Brief introduction to origin of Yog, Psychological aspects leading to origin of Yog, Hindu Mythological concepts about origin of Yog
- ❖ History and Development of Yog
- ❖ Etymology and Definitions of Yog, Aim and Objectives of Yog, Misconceptions about Yog, True Nature of Yog
- ❖ General Introduction to Schools of Yog
- ❖ Principles of Yog, Yog Practices for Health and Harmony

**UNIT-II**

**Yog and You**

- ❖ **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- ❖ **Aarogya** - Prevention, Cure and Remedies.
- ❖ Life Management and Development.

**UNIT-III**

**Yog for Health Promotion –**

- ❖ Brief introduction to human body
- ❖ Role of yog for health promotion
- ❖ Yogic attitudes and practices
- ❖ Holistic approach of yog towards the health and diseases
- ❖ Introduction to yog diet and its relevance and importance in Yog Sadhana
- ❖ Dincharya and Ritucharya with respect of yogic lifestyle

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## UNIT-IV

### Yog as Preventive measure for Lifestyle Disease

- ❖ **Obesity:** Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Pavanmuktasana, Matsayasana, Halasana, Pachimottansana, Ardha – Matsyendrasana, Dhanurasana, Ushtrasana, Suryabedhan pranayama.
- ❖ **Diabetes:** Procedure, Benefits & Contraindications for Katichakrasana, Pavanmuktasana, Bhujangasana, Shalabhasana, Dhanurasana, Supta-vajarasana, Paschimottanasana, Ardha-Mastendrasana, Mandukasana, Gomukasana, Yogmudra, Ushtrasana, Kapalabhati.
- ❖ **Asthma:** Procedure, Benefits & Contraindications for Tadasana, Urdhwahastottansana, UttanMandukasana, Bhujangasana, Dhanurasana, Ushtrasana, Vakrasana, Kapalabhati, Gomukhasana Matsyaasana, Anuloma-Viloma.
- ❖ **Hypertension:** Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Uttanpadasana, Ardha Halasana, Sarala Matyasana, Gomukhasana, UttanMandukasana, Vakrasana, Bhujangasana, Makarasana, Shavasana, Nadishodhanapranayam, Sitlipranayam.

## UNIT-V (Yogic Practice)

### 1. YOGIC SUKSMA VYAYAMA

Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)

Prarthana (Prayer)

Buddhi-tatha-dhritishakti-vikasaka (for developing will power)

Smaranashakti-vikasaka (for improving the memory)

Medhashakti-vikasaka (for improving the intellect and memory)

Netrashakti-vikasaka (for the eyes)

Kapolashakti-varadhaka (for the cheeks)

Karnashakti-varadhaka (for the ears)

Grivashakti-vikasaka (for the Neck)

Grivashakti-vikasaka (for the Neck)

Grivashakti-vikasaka (for the Neck)

Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)

Bhuja-bandhashakti-vikasaka

Kohinishakti-vikasaka

Bhuja-vallishakti-vikasaka

Purna-bhujashakti-vikasaka (for the arms)

Mani-bandhashakti-vikasaka

Kara-prsthashakti-vikasaka

Kara-talashakti-vikasaka

Anguli-mulashakti-vikasaka (for the fingers)

Anguli- shakti-vikasaka (for the fingers)

Vaksa-sthalashakti-vikasaka (for the chest)

Vaksa-sthalashakti-vikasaka (for the chest)

Udarashakti-vikasaka (for the abdomen)

Udarashakti-vikasaka (for the abdomen)

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Udarasakti-vikasaka (for the abdomen)  
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Kati shakti-vikasaka (for the waist)  
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Muladhara-chakra-suddhi (for the rectum)  
Upasthatatha-svadhithana-chakra-suddhi (for the genital organs)  
Kundalinishakti-vikasaka (for the kundalini)  
Janghashakti-vikasaka (for the thighs)  
Janghashakti-vikasaka (for the thighs)  
Janushakti-vikasaka (for the knees)  
Pindalishakti-vikasaka (for the calves)  
Pada-mulashakti-vikasaka  
Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)  
Padangulishakti-vikasaka (for the toes)

## 2. YOGSANA (Sitting Postures)

Dandasana, Swastikasana, Padmasana, Vajrasana, Supta Vajrasana, Kagasana, Utkatasana, Gomukhasana, Ushtrasana, Shashankasana, Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana, Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

## 3. YOGSANA (Supine lying Postures)

Pavanamuktasan, Utthana-padasana, Ardha Halasana, Halasana, Setubandha Sarvangasana, Sarvangasana, Matsyasana, Chakrasana, Shavasana

## 4. YOGSANA (Prone lying Postures)

Makarasana, Bhujangasana, Shalabhasana, Dhanurasana, Kapotasana, Raja Kapotasana

## 5. PRANAYAMA (with Antar & Bahya Kumbhaka)

Surya-bhedi and Chandra-bhedi Pranayama, Ujjayi Pranayama, Sheetal Pranayama, Shitkari Pranayama, Bhastrika Pranayama

## 6. BANDHA

Jivha Bandha, Jalandhara Bandha, Uddiyana Bandha, Mula Bandha, Maha Bandha, Tri Bandha

## 7. PRACTICES LEADING TO MEDITATION

Ajapa Dharana, Yog Nidra, Practices leading to Breath Meditation, Practices leading to Om Meditation

## 8. YOGSANA

Siddhasana, Bhadrasana, Baddha Padmasana, Uttitha Padmasana, Bhunamanasana, Hanumanasana, Bakasana, Kukkutasana, Garbhasana, Matsyendrasana, Marjariasana, Padangusthasana, Hastapadangusthasana, Garudasana, Vatayanasana, Natarajasana, Mayurasana, Padma Mayurasana, Sirshasana and its variations, Ekapada and Dwipada Kandarasana

## 9. MUDRAS

Yog Mudra, Maha Mudra, Shanmukhi Mudra, Shambhavi Mudra, Kaki Mudra, Tadagi Mudra, Vipareet Karni Mudra, Simha Mudra

**Distribution of Marks: Total 100 (10+30+20+40)**

1. Class Attendance / Punctuality –	10 marks
2. Active Participation in Yog Related Activities- (International Day of Yog, Annual Athletic Meet etc.)	30 marks
3. Viva/Subject Knowledge-	20 marks
4. End Semester Practical Exam (Yogic Practice)-	40 marks

  
107-11-2012  
SAS Officers

  
7/11/2012  
Professor I/C (Physical Education)

Dean (Academic)



No. Acad/WM/2022/5704  
4/09/11/2022

**Physical Education & Sports Section  
National Institute of Technology,  
Kurukshetra – 136119**

PESS/2022/.....497.....

Dated 07.11.2022

**Syllabus and Evaluation Scheme of Physical Education & Sports  
Compulsory for up to B.Tech 6<sup>th</sup> Semester Students**

Course Code:  
Course Title: Physical Education & Sports

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**Course Objective**

Physical Education and Sports develop confidence, contributing to academic performance and mental health. Physical activity is a great way to relieve stress, promoting positive physical and mental health and enhanced learning aptitude. The class duration of 90 minutes will be divided into 02 segments comprising of Units 1 and 2.

- First 30 minutes of the class will be an interactive session where the students will be oriented and introduced to the different aspects of Physical Education and Sports.
- In the next 60 minutes of the class every students shall practice different skills and techniques of Athletics comprising of Track and Field events or any other specific games/sports of their choice.

**Syllabus**

**Unit 1**

**Introduction to Physical Education**

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education

**Sports awards and honours**

- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

**Olympic Movement**

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values

**Physical Fitness, Wellness & Lifestyle**

- Meaning & Importance of Physical Fitness
- Components of Physical fitness
- Components of Health related fitness Meaning & Importance of Wellness, Components of wellness

- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle: Importance of Balance Diet etc.

#### **Fundamentals of Anatomy & Physiology in Physical Education and Sports**

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

#### **Kinesiology, Biomechanics & Sports**

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Biomechanical principles & its application in sports. (Laws of motion, Friction, Projectile etc.)

#### **Postures**

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.
- Concept & advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis, Corrective Measures for Postural Deformities

#### **Training and Planning In Sports**

- Meaning of Training
- Warming up and limbering down
- Skill, Technique & Style

#### **Psychology & Sports**

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.

#### **Doping**

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

#### **Sports Medicine**

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention and Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

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*P.F.*



## Unit-2

### (Practical-Sports Specific)

Each student will be given practical knowledge about the basic fundamentals of various games and sports and Athletic Events be it Track or Field thereby developing the skill.

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball etc.

1. History of the Game/Sport.
2. Latest General Rules of the Game/Sport.
3. Specifications of Play Fields and Related Sports Equipment.
4. Important Tournaments and Venues.
5. Sports Personalities.
6. Proper Sports Gear and its Importance

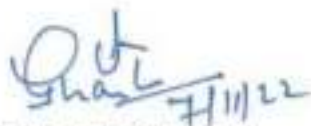
#### **REFERENCE BOOKS:**

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Health and Physical Education – NCERT

### **Distribution of Marks: Total 100 (10+30+20+40)**

- |  |          |
|--|----------|
| 1. Class Attendance / Punctuality –  | 10 marks |
| 2. Active Participation Sports Related Activities -<br>(CITIUS, RUN FOR Unity, Prabhat Pheri etc.) | 30 marks |
| 3. Viva/Subject Knowledge-   | 20 marks |
| 4. Practical Exam at the end of 6 <sup>th</sup> Sem (Modified Fitness Test)-                       | 40 marks |

**Note** – PWD Students will be exempted from taking part in physical activities and the Modified Physical Fitness Test.

  
7/11/22

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