Course Structure for
B. Tech. Programmes
For Academic Year 2023-24 onwards

The Course Structure for B. Tech. Programmes shall have the following categories of courses: -

Course Categories :

Sr. No.	Category
1.	Institute Core (IC)
2.	Non-Conventional Institute Core (NC)
3.	Program Core (PC)
4.	Program Elective (PE)
5.	Open Elective (OE)

Course category explanation:

Course category	Explanation
IC	Basic Sciences
	Engineering Arts and Sciences
	Humanities and Social Sciences
PC	Courses specific to the relevant discipline
PE	Elective Courses specific to the relevant discipline
OE	Elective Courses from any domain
NC	Courses only qualifying in nature

Department Abbreviations to be used in Course Codes

Department Abbreviation	Department
CE	Civil Engineering
ME	Mechanical Engineering
CS	Computer Engineering
CH	Chemistry
PH	Physics
HS	Humanities
MA	Mathematics
EE	Electrical Engineering
SW	Student Welfare
EC	Electronics & Communication Engineering
PI	Production & Industrial Engineering
IT	Information Technology

SEMESTER-WISE STRUCTURE OF CURRICULUM
B.TECH. PROGRAMMES A.Y. 2023-24

SEMESTER –I (BATCH 2023 onwards)

Sr. No.	Course Category	Course Title	Course code	Lecture (L) / Tutorial (T) / Practical (P) per week			Credits
				L	T@	P	
1.	IC	Communication Skills in English (for CoE, IT, AI & ML, IIOT and M&C)	HSIC 101	2	0	2	3#
		OR Financial Education (for CoE, IT, AI & ML, IIOT and M&C)	HSIC 103	3	0	0	
		Economics for Engineers (for EE, CE, ECE, ME & PIE)	HSIC 102	3	0	0	
		OR Business Studies (for EE, CE, ECE, ME & PIE)	HSIC 104				
2.		Differential Calculus and Differential Equations	MAIC 101	3	0	0	3
3.		Engineering Physics	PHIC 101	3	0	2	4
4.		Engineering Graphics (for EE, CE)	CEIC 101	1	0	3	2
		Engineering Graphics (for ME & PIE)	MEIC 101	1	0	3	
		Engineering Practice (for CoE, IT and ECE, AI & ML, IIOT and M&C)	MEIC 102	1	0	3	
5.		Problems Solving and Programming Using C (for CoE, IT, AI & ML)	CSIC 101	3	0	2	4
		Problems Solving and Programming using C (for EE, CE, ECE, ME, PIE, IIOT & M&C)	CSIC 103				
6.		Energy and Environmental Science	CHIC 101	2	0	2	3
7.	NC	Any one subject from Group-I (for CoE, IT, AI & ML, IIOT and M&C)	**NC ###	2	0	0	2#
		Any one subject from Group-II (for EE, CE, ECE, ME & PIE)	**NC ###	2	0	0	
8.		NCC/ Sports /Yoga	SWNC 101	0	0	2	1*
9.		NSS /Clubs/Technical Societies	SWNC 102	0	0	2	
	Total						**21**

***** Continuous Evaluation Model as per guidelines and the credit to be awarded at the end of 6th Semester based on Cumulative performance up to 6th Semester.

Minimum number of students required to register for the subject to be offered is 50 and maximum number is 80 in one lecture group.

@ In lieu of tutorial, wherever necessary, assignments and interactions with the students may be conducted at their own convenience by the faculty concerned.

****** Two letters signifying the Department offering the course.

###Three digits indicating course number.

SEMESTER-II (BATCH 2023 onwards)

Sr. No.	Course Category	Course Title	Course Code	Lecture (L) / Tutorial (T) / Practical (P) per week			Credits
				L	T@	P	
1.	IC	Communication Skills in English (for EE, CE, ECE, ME & PIE) OR Financial Education (for EE, CE, ECE, ME & PIE)	HSIC 101	2	0	2	3#
			HSIC 103	3	0	0	
		Economics for Engineers (for CoE, IT, AI & ML, IIOT and M&C) OR Business Studies (for CoE, IT, AI & ML, IIOT and M&C)	HSIC 102 HSIC 104	3	0	0	
2.		Integral Calculus and Difference Equations	MAIC 102	3	0	0	3
3.		Advanced Engineering Physics (for CE, ME & PIE)	PHIC 102	3	0	2	4
		Advanced Engineering Physics (for ECE)	PHIC 103	3	0	2	
		Advanced Engineering Physics (for EE)	PHIC 104	3	0	2	
		Advanced Engineering Physics (For IIoT)	PHIC 105	3	0	2	
		Digital System Design (for CoE, IT, AI & ML and M&C)	CSIC 100	4	0	0	
4.		Engineering Practice (for CE, EE, ME & PIE)	MEIC 102	1	0	3	2
		Engineering Graphics (Web Design) ^ (For CoE, ECE, IT, AI & ML, IIOT and M&C)	CSIC 102	1	0	3	
5.		Chemistry (for CE, ME & PIE)	CHIC 102	3	0	2	4
		Chemistry (for EE, and ECE)	CHIC 103	3	0	2	
		Programming using Python (for CoE, IT, AI & ML, IIOT and M&C)	CSIC 104	3	0	2	
6.	NC	Any one subject from Group-I (for EE, CE, ECE, ME & PIE)	**NC ###	2	0	0	2#
		Any one subject from Group-II (for CoE, IT, AI & ML, IIOT and M&C)	**NC ###	2	0	0	
7.		NCC/ Sports /Yoga	SWNC 101	0	0	2	1*
8.		NSS /Clubs/Technical Societies	SWNC 102	0	0	2	
9.	*PC*	*Programme specific course*	***PC ###*	*3/4*	*0*	*2/0*	*4*
	Total						**22**

***** Continuous Evaluation Model as per guidelines and the credit to be awarded at the end of 6th Semester based on Cumulative performance up to 6th Semester.

^ Treated as a practical course (not integrated), evaluation will be as per practical course

Minimum number of students required to register for the subject to be offered is 50 and maximum number is 80 in one lecture group.

@ In lieu of tutorial, wherever necessary, assignments and interactions with the students may be conducted at their own convenience by the faculty concerned.

****** Two letters signifying the Department offering the course

Three digits indicating course number

LIST OF NON-CONVENTIONAL INSTITUTE CORE COURSES:

Group	Course	Course Code
I	Human Values and Social Responsibility	HSNC 101
	Sanskrit Language Skills	HSNC 102
	Hindi Language Skills	HSNC 103
	Telugu Language Skills	HSNC 104
	Constitution of India	HSNC 105
	Vedic Mathematics	MANC 101
II	Indian Knowledge Systems	HSNC 106
	Teachings of Gita	HSNC 107
	French Language Skills	HSNC 108
	German Language Skills	HSNC 109
	Japanese Language Skills	HSNC 110
	Thought Lab and Practices	HSNC 111
III	NCC/ Sports /Yoga	SWNC 101
	NSS /Clubs/Technical Societies	SWNC 102

NOTE:

1. ***The examination / evaluation of the theory / practical / integrated courses is proposed to be as per the existing scheme. However, the attendance component of the awards (10 marks) is proposed to be merged with the Mid Sem. tests/Viva-voce marks, while the Assessment on Indian Knowledge System through report/Viva-voce will be part of Teacher assessment component of marks and this component will be renamed as Teacher & IKS Assessment for theory courses.***
2. ***The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.***

Evaluation Scheme for B.Tech. programmes

(Applicable for the students admitted in academic year 2023-24 onwards)

	SUB-COMPONENT	Weightage
(a)	**Theory Courses**	
1	Two Mid Semester Exams.	20+20=40
2	Teacher & IKS Assessment (through viva-voce, Home Assignments, on the Spot tests, Short Quizzes etc.)	10
3	End Semester Examination	50
(b)	**Practical Courses**	
1	Mid Semester Evaluation (to be conducted in regular Practical Classes)	40
2	Teacher Assessment (through viva-voce, lab. reports & class work etc.)	20
3	End Semester Examination	40
(c)	***Integrated Courses (L/T+P)**	
1	Internal evaluation of theory and practical component of course	50
2	End semester evaluation of theory and practical component of course	50
(d)	For Seminars, Projects, Training, Comprehensive viva, General Fitness evaluation, the weightage will be decided by Departmental Review/Academic Committees.	
(e)	For Non-Conventional Institute Core Courses, the evaluation will be done in the ongoing classes throughout the semester on a regular basis through assignments/quizzes/viva-voce etc. by respective teachers. These courses being qualifying in nature; the student will be awarded A+ grade on qualifying the course. The student who fails to qualify, will be awarded F grade in the course and he/she will have to qualify the course in the subsequent semesters as re-appear candidate.	

Note:

The students must get minimum 40% marks separately in internal and external component of the course to qualify. In Non-Conventional Institute Core Courses also the student must get minimum 40% marks to qualify the course.

***** Evaluation process and guidelines will be followed as per Annexure-A appended herewith.

Evaluation and Grading System

The student will be awarded Letter Grade which indicates the level of performance in a course and has a Grade Point for the purpose of computing the Cumulative Grade Point Average (CGPA) as per the tables given below:

All Courses (except Non-Conventional Institute Core Courses)

Marks obtained & Grade	Performance	Grade Point
85 ≤ A+ ≤ 100	Excellent	10
75 ≤ A < 85	Very Good	09
65 ≤ B < 75	Good	08
50 ≤ C < 65	Average	06
40 ≤ D < 50	Pass	04
0 ≤ F < 40	Re-appear	00

Non-Conventional Institute Core Courses

Marks obtained & Grade	Performance	Grade Point
40 ≤ A+ ≤ 100	Satisfactory	10
0 ≤ F < 40	Re-appear	00

A student who earns an F Grade in a course shall have to re-appear in that course in the subsequent examination (s).

The CGPA is the weighted average of all the grades and computed as follows:

$CGPA = \sum CiGi / \sum Ci$

The Ci denotes credits assigned to i^{th} course and Gi indicates the Grade Point equivalent to the Letter Grade obtained by the student in the i^{th} course.

Note:

The Percentage of marks obtained by a student be calculated as = CGPA multiplied by 9.00.

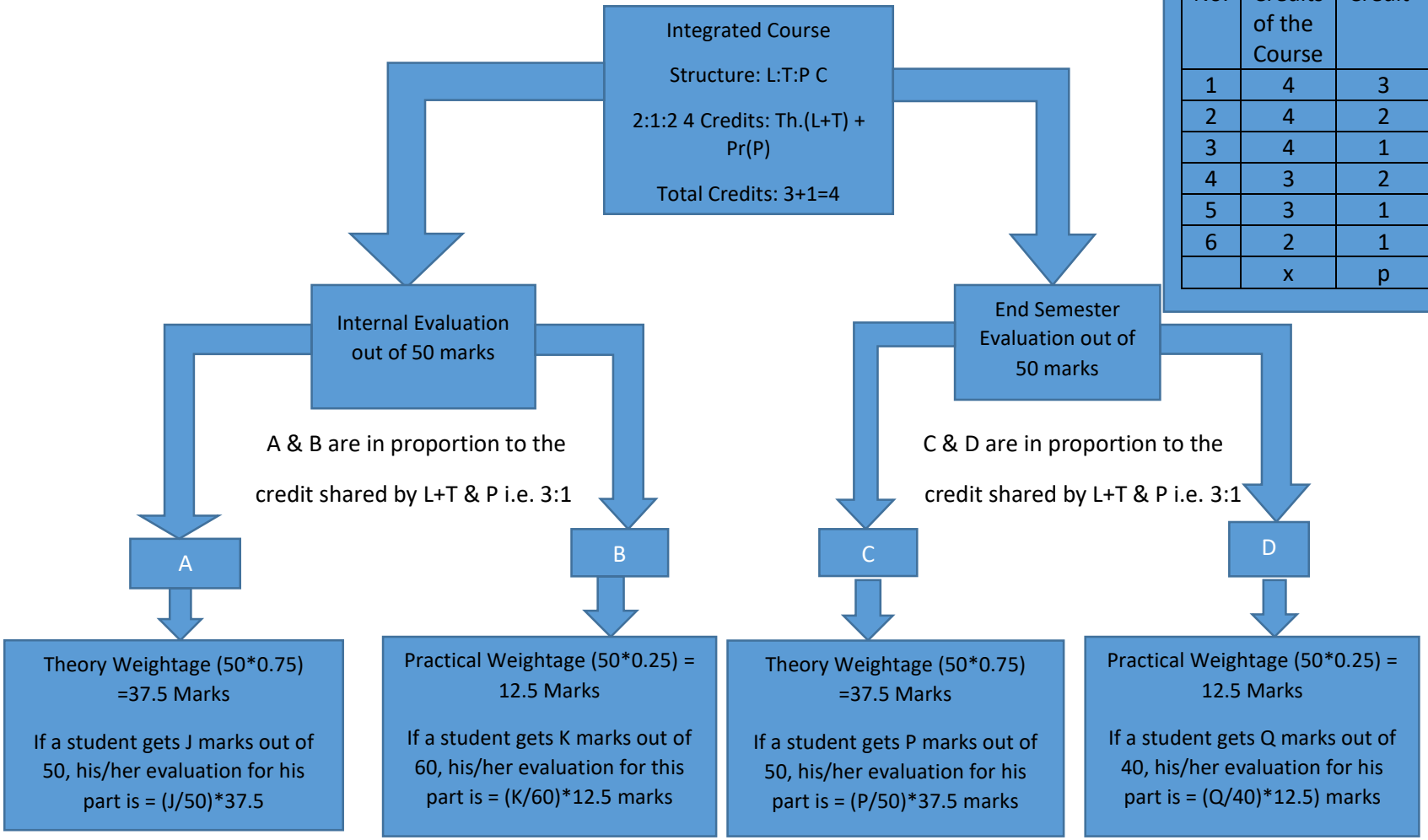
Annexure-A

Sr.No.	Important points related to evaluation	Definitions/Process to be followed
1.	Integrated Courses	Where Theory (T) and/or Tutorial (T) and Practical (P) are integral part. The course no. is unique for theory and practical portion. The L T P structure would be 2 1 2, 2 0 2 or similar having credits as 3:1, 2:1 or similar.
2.	Detention Cases	Where total attendance of Theory, Tutorial and Practical parts is less than minimum required attendance (<75%)
	2.1	The students having less than minimum required attendance (i.e. less than 75%) are declared Detained.
	2.2	The detained students having attendance less than 50% have to compulsorily repeat such course with junior batch
	2.3	The detained students having attendance ≥ 50% but < 75% have two options, as (i) Repeat Theory and Practical part of the course (ii) Opt 'D' Grade in the course. For this, students are required to fill up the relevant form available at Institute website. Students will be allowed to appear in the end semester exam. (theory as well as practical), but after clearing, he/she will be awarded only 'D' grades.
3.	Evaluation Process	(i) Internal Evaluation (50 marks) (ii) End Sem. Evaluation (50 marks)
Sample example for evaluation process is enclosed as Annexure-I.	3.1	Internal Evaluation of 50 marks is further having weightage of Theory and Practical parts according to Credit assigned to them. Thus 50 marks of internal component of Theory part and 60 marks of Internal component of Practical part are mapped into 50 marks each and then their weightage is computed as per the ratio of credits shared by them.
	3.2	External Evaluation of 50 marks is similarly having weightage of Theory and Practical parts according to Credit assigned to them. Thus 50 marks of External component of Theory and 40 marks of External component of Practical are mapped into 50 marks each and then their weightage is computed as per the ratio of credits shared by them.
4.	Passing the Course 4.1	To pass Internal components, the student must secure 40% marks out of 50 marks i.e. 20 marks.
	4.2	To pass External components, the student must secure 40% marks out of 50 marks i.e. 20 marks and the student should not remain absent in End semester exam of Theory and Practical part.
	4.3	If a student remains absent in End semester exam. of Theory and/or Practical part, then he/she will be declared re-appear in End Sem. Evaluation irrespective of total marks obtained. In such case, he/she has to re-appear in End Sem. Exam. of Theory as well as Practical part.
	Award of Grades	The Grades in the courses shall be awarded on the basis of total marks obtained in Internal Evaluation and End Sem. Evaluation if not opted for D grade as per 2.3 (ii).
5.	Re-appear	(I) Reappear in Internal Evaluation (Theory and Practical) (E) Reappear in End Sem. Evaluation (Theory and Practical)

	5.1	The student who is not detained and scores less than 40% marks in Internal evaluation shall be declared re-appear in Internal component, in such case, the student must re-appear as sessional improvement in Theory as well as Practical part of the course.
	5.2	The student who is not detained, scores less than 40% marks in End Semester evaluation and not appeared in End Semester Evaluation of Theory or Practical or both shall be declared re-appear in End Semester Component. In such case, the student must re-appear in End Sem. Exam. of Theory as well as Practical part of the course.

Annexure-I

Example of Evaluation Procedure for Integrated Courses



A+B out of 50, **External**= C+D out of 50, **Total**= (A+B+C+D) out of 100

Table of Multiplying Factor for theory and practical components according to Credit D

Sr. No.	Total Credits of the Course	Theory Credit	Practical Credit	Theory Multiply Factor	Practical Multiply Factor
1	4	3	1	3/4 =0.75	1/4 = 0.25
2	4	2	2	2/4 = 0.50	2/4 = 0.50
3	4	1	3	1/4 = 0.25	3/4 =0.75
4	3	2	1	2/3 = 0.66	1/3 = 0.33
5	3	1	2	1/3 = 0.33	2/3 = 0.66
6	2	1	1	1/2 = 0.50	1/2 = 0.50
	x	p	q	p/x	q/x

Attendance requirement for being eligible to appear in the end semester examinations

Minimum requirement of attendance for being eligible to appear in the end semester examinations shall be 75%.

However, this may be relaxed upto a maximum of 10% i.e. upto 65% by the Director. An extra relaxation of upto 5%, over and above the already existing relaxation of a maximum of 10%, may be granted by the Director under special circumstances, on the specific recommendations of concerned HoD/School Coordinator, to meet the minimum attendance requirement of 75%. Those having attendance below 65% are not allowed to appear for the end-semester examination of that/those course (s) and shall be notified as 'Detained'. All such students, depending upon their attendance shall be further categorized into two categories A & B, as follows:

Category A: (Attendance between 50 % to 64 %) A student has two options

Option 1: To repeat the course through classroom/lab studies and obtain whatever grade he/she can obtain

Option 2: He/She is permitted to attend classes of the next semester and can appear for the mid-semester examinations of that/those course(s) when the opportunity is available. However, such student is restricted to a grade of 'D' only.

Category B: (Attendance below 50%) Such students have to mandatorily repeat that/those course (s).

A Tabular presentation is given below:

Attendance	Course of Action
75%or more	Eligible to appear for the End- semester examination
65% - 74%	Eligible to appear for the End- semester examination with the permission of the Director
50% - 64%	Detained Two options a) Repeat the course (s) through classroom / lab teaching b) To appear for mid-semester examination in that/those course(s) and settle for a max of 'D' grade
Below 50%	Detained To repeat classes

SYLLABUS
OF
1st SEMESTER
OF
B.TECH.
(ALL PROGRAMS)

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Programme: B. Tech

Course Title: Communication Skills in English

Course Category: IC **Internal: 50 Marks**
Course Code: HSIC 101 **Theory: 50 Marks**
Credits: 3 (L-2, P-2) **Total: 100 Marks**
Semester: 1st/2nd **Time: 3 hrs**

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.

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.

Suggested Readings

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

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Programme: B. Tech

Course Title: Financial Education

Course Category: IC **Internal: 50 Marks**
Course Code: HSIC 103 **Theory: 50 Marks**
Credits: 3 (L-2, T-1) **Total: 100 Marks**
Semester: 1st/2nd **Time: 3 hrs**

Course Objectives

The purpose of this course is to empower the students with sound financial knowledge and financial management skills for their long-term financial being. The course is designed with the strong belief that financial well-being has a positive correlation with the overall well-being of an individual as well as society.

Note for Examiner

The number of questions to be set will be six covering the entire syllabus. The examinees will be required to attempt five questions. All questions shall carry equal marks.

UNIT-I Foundations of Finance

Need for Financial Planning, Financial Goals, Financial Management: Concept, Finance Function. Banking in India: Concepts of Banking, Types of Bank Accounts and Deposits

UNIT-II Investment Management-I

Investment Goals: Basic Investment Objectives, Time Frame, Assessing Risk Profile, Diversification and Asset Allocation.

UNIT-III Investment Management-II

Investment and Saving alternatives for a Common Investor: Insurance, Stocks, Bonds, etc. Stock Markets: Primary and Secondary Markets. Criteria for Stock Selection.

UNIT-IV Financial Planning and Mutual Funds

Financial Planning: Concept and Objectives. Mutual Funds: Concept and History of Mutual Funds in India. Types of Mutual Funds.

Course Outcomes

After the completion of this course, students will be able to acquire financial management skills-essential life skills for 21st Century. It will also enhance their financial literacy and equip them with knowledge and skills critical to make financial decisions.

Suggested Readings

1. Financial Management – I.M. Pandey (Vikas Publishing House, New Delhi)
2. Financial Management—MY Khan & PK Jain (Tata McGraw Hill)
3. Financial management—Sheeba Kapil (Pearson)

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Programme: B. Tech

Course Title: Economics for Engineers

Course Category: IC **Internal: 50 Marks**
Course Code: HSIC 102 **Theory: 50 Marks**
Credits: 3 (L-2, T-1) **Total: 100 Marks**
Semester: 1st/2nd **Time: 3 hrs**

Course Objectives

- To enable students to understand the economics principles applicable to engineering.
- To learn 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 Production, Cost and Firms

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

Unit III: Engineering Economy

Time value of money: Single-Payment and Uniform Series, Nominal and Effective Interest Rates, Evaluation Methods: Present Worth Analysis, Annual Worth Analysis, Rate of Return Analysis

Unit IV: Indian Economy

Nature and size of Indian Economy, Problems- Poverty, Unemployment, Inflation, measures for controlling these problems, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools.

Course Outcomes

- The Students will be able to understand the concepts of economics and will also learn 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.
- They would also learn the implications of monetary and fiscal policies in Indian economy.

Suggested Readings

- N. Gregory Mankiw. Principles of Microeconomics,
- Krugman, Paul, and Robin Wells. Microeconomics. New York, NY
- WG Sulliman, EM Wicks and CP Koelling, Engineering Economy, Pearson
- Chan S Park, Fundamentals of Engineering Economics, Always Learning
- Anindya Sen, Microeconomics, OUP India
- Leland T. Blank & Anthony J. Tarquin, Engineering Economy, McGraw-Hill
- Hal R. Varian Intermediate Microeconomics, W. W. Norton and Company
- Ruder Dutt and Sundaram, Indian Economy, S. Chand

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Programme: B. Tech

Course Title: Business Studies

Course Category: IC **Internal: 50 Marks**
Course Code: HSIC 104 **Theory: 50 Marks**
Credits: 3 (L-2, T-1) **Total: 100 Marks**
Semester: 1st/2nd **Time: 3 hrs**

Course Objectives

- The course is designed to introduce the concepts of business to the students.
- The course aims to acquaint the students about business processes from beginning to the end.

Unit I: Fundamentals of Business

Business: Meaning and Characteristics of Business, Objectives of Business. Classification of Business Activities: Industry and Commerce, Industry types: Primary, Secondary and Tertiary. Types of Businesses: Sole Proprietorship, Partnership, Limited Liability Company, Private and Public company. Formation of Company: stages and required documents.

Unit II: Sources of Business Finance

Business Finance: Concept and Importance. Types of Sources of Finance: Long-term Sources (Equity Shares, Preference shares, Debentures, Term Loans, Retained earnings, Loan from financial institutions, etc.), Short Term Sources (Trade Credit, Accrued Expenses, Commercial Papers, Public Deposits etc.)

Unit III: Small Business and Entrepreneurship Development

Entrepreneurship Development (ED): Concept, Characteristics and Need. Process of Entrepreneurship Development: Start-up India Scheme, Intellectual Property Rights and Entrepreneurship. Small Scale Enterprise: Classification and Roles; Issues and Challenges faced by Small Scale Enterprises, Government schemes for small scale industries.

Unit IV: Business Services and Social Responsibility of Businesses

Business services: Meaning and Types, Emerging Modes of Business, E-business: Concept, Scope and Benefits, E-commerce, EDI, Web-based Marketing, Role of Internet and Risk Management; Social Responsibility of Business. Role of Business in Sustainable Development.

Course Outcomes

- The course would help the students in understanding different forms and numerous processes of a business.
- The course would sensitize the students to practice the ethical behaviour of the businesses.

Suggested Readings

Business Studies: Learners Book, Oxford Successful
Business Studies: 2018/19 Undergraduate Guide, University of Huddersfield
Business Studies: Fourth Edition, Ian Chambers and David Gray, CP.

Course Code MAIC 101	Differential Calculus and Differential Equations	L - T - P - C 3 - 1 - 0 - 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 Objective:

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

Unit 1: **8L**

Matrix Theory: 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: **8L**

Multivariable Calculus: Limits, continuity and differentiability of multivariable functions, Partial differentiation and its geometrical interpretation, Total differential, Composite function, Taylor's and Maclaurins 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: **8L**

Ordinary Differential Equations: 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 Legendres linear differential equations).

Unit 4: **8L**

Applications of Differential Equations: 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.

Unit 5: **8L**

Laplace Transforms: 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, 9th Edition, Wiley India Pvt. Ltd., 2011.

2. Paras Ram, Engineering Mathematics through Applications, 2nd Edition, CBS Publishers, 2015.

Reference Books:

1. G. B. Thomas and R.L. Finney, Calculus and analytical geometry, 9 th 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:

At the end of the course, the student 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

DEPARTMENT OF PHYSICS

(B. TECH. 1ST Sem. All Branches)
(CORE COURSES)

PHIC101: ENGINEERING PHYSICS

L	T	P	Credits	Total contact hours
2	1	2	4	60

Pre-requisite: ...

Brief Description about the course: This course includes the fundamentals of physics essential for various engineering disciplines pertaining to quantum mechanics, electromagnetism, lasers and optical fiber technology. Moreover, theory of relativity and the nuclear technology for sustainable energy applications are included.

Course Content

UNIT-I (7 hrs.)

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 equations, Particle in 1-D potential box, Quantum Tunnelling Phenomenon.

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

UNIT-II (7 hrs.)

Physics of Solids: Crystal Structure, Space Lattice, Translation vectors; Crystal Symmetry, Miller indices, Simple and close-packed crystal structures with examples, Free electron theory: Drude's Theory of Conduction; Quantum theory of free electrons, Fermi-Dirac distribution function, Fermi–level and Fermi Energy; Density of States, equilibrium and extrinsic carrier concentration.

UNIT-II (7 hrs.)

Laser Physics: Basic principle and characteristics of lasers, Einstein's coefficients, Types of the Lasers: He-Ne laser, Semiconductor Laser, Applications of Lasers in research and industry, Safety protocols of lasers.

Fundamentals of Optical Fiber: Acceptance angle, Numerical aperture, Classification of optical fibres, Fiber losses, Fiber manufacturing, Applications of optical fibre in industry and communications.

UNIT-IV (7 Hours)

Special Theory of Relativity: Frame of references: inertial and non-inertial, Galilean transformation, The Michelson-Morley experiment, Postulates of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition, Variation of mass with velocity, Mass-energy equivalence.

Nuclear Technology: Interaction of radiation with matter, Neutron cross-section, Nuclear Reaction, Moderators, Reactor criticality, Nuclear reactors for power generation, Safety protocols.

Text Books/Reference Books

T-1: S.O.Pillai, **"Solid state Physics"**, New age International publishers, 2012.
T-2: A. Beiser, **"Concepts of Modern Physics"**, McGraw-Hill, 2008.
R-1: D.J. Griffiths, "**Introduction to Electrodynamics"**, PHI Learning Publishers, New Delhi, 2012.
R-2: S. M. Sze, K. K. Ng, **"Physics of Semiconductor Devices"**, United Kingdom, Wiley, 2021.
R-3: M. A. Wahab, **"Solid State Physics",** Narosa, 2022.
R-4: John Lilley, **"Nuclear Physics, Principles and applications"**, Wiley, 2016.

Course Outcomes:

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

CO1: Develop the skills to apply various Physics concepts in tackling real life engineering problems.

CO2: Apply the ideas of Quantum Mechanics and Electromagnetic Theory for designing and development of various technological equipments.

CO3: Understand various technological domains of applicability of Crystal Physics, Theory of Relativity, and Nuclear technology.

CO3: Design and develop relevant applications based on fundamentals of Optics, LASERs, and Optical Fibers.

DEPARTMENT OF PHYSICS

(B. TECH. 1ST Sem. All Branches)
(CORE COURSES)

PHIC101: ENGINEERING PHYSICS (Practical)

List of the 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.

B.Tech. (Civil Engineering) - Syllabi of various courses

CEIC101 Engineering Graphics

Pre-requisite: None

L	T	P/D	Credits	Total contact hours
2	0	3	3	5

Brief description of the course: This course will provide students with adequate knowledge and experience in preparing engineering drawings using AutoCAD and help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned engineering drawings.

Course Content:

Unit 1. Orthographic Projections (6 hrs)

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.

Unit 2. Projections of Straight Lines and Planes (6 hrs)

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, trances 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.

Unit 3. Projections of Solids (8 hrs)

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.

Unit 4. Generating Drawings in AutoCAD (4 hrs)

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.

Text Books/Reference:

1. Engineering Drawing by P. S. Gill
2. Elementary Engineering Drawing by N. D. Bhatt
3. Engineering Drawing & Graphics using AutoCAD by T. Jeyapoovan

Course Outcomes:

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

CO1. Produce geometric construction, multi-view, dimensioning and detail drawings of typical 3-D engineering objects.

CO2. Apply the skill for preparing detail drawing of engineering objects.

CO3. Understand and visualize the 3-D view of engineering objects.

CO4. Understand and apply computer software to prepare engineering drawing.

DEPARTMENT OF MECHANICAL ENGINEERING
MEIC101: ENGINEERING GRAPHICS*

Pre-requisite: Nil

*Not to be treated as integrated course

L	T	P	Credits	Total contact hours
1	0	3	3	40

Brief Description about the course:

This course develops the ability of visualization of different objects through technical drawings. Also, useful in developing the computer drafting skill for communication of concepts, ideas in the design of engineering products.

Unit – I

Introduction: Overview of the course, Lines Lettering and Dimensioning: Types of lines, Lettering, Dimensioning, Geometrical Construction of Polygons, Scales.
Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Projection and section of solids **(10 hrs)**

Unit – II

Isometric Projections: Isometric scale. Isometric projections of simple solids and their combinations.
Curves: Conics. Cycloid. Epicycloid. Hypocycloid. Involute. Spiral. **(10 hrs)**

Unit – III

Intersections: Interpenetration of simple solids i.e. prism with prism. Cylinder with cylinder. Cylinder with prism, cone-with cylinder and cone with prism (axis of solids horizontal or vertical only). **(10 hrs)**

Unit – IV

Development: Development of right and oblique prism. Cylinder. Cone and pyramids. Sectioned solids.
Computer Aided Drafting: Practicing projections, intersections and development using drafting software such as AUTOCAD. **(10 hrs)**

Text Books / Reference

1. Luzadder W.J., Fundamentals of Engineering Drawing – Prentice Hall India, 1993
2. French and Vierk, Fundamentals of Engineering Drawing – McGraw Hill, 1996
3. Narayana K.L., Kannaiah.P., Engineering Drawing – Scitech Publications, Chennai, 2014.
4. Venugopal K., Engineering Drawing – New Age International, 2004
5. Natarajan K.V., A text book on Engineering Drawing – Classic prints, 2000

6. Gopalakrishna K.R., Engineering Drawing – Subash Stores, 2000
7. Bhatt N.D., Engineering Drawing – Charotar Publications, 2000
8. Sham Tickoo, AutoCAD 2017 for Engineers & Designers, Dreamtech Press, 23 rd Edition, 2016.

Course Outcomes

CO 1: Sketch conics and different types of solids

CO2: Appreciate the need of Sectional views of solids and Development of surfaces of solids.

CO3: Perform conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

DEPARTMENT OF MECHANICAL ENGINEERING
MEIC-102: ENGINEERING PRACTICE

Pre-requisite: None

L	T	P	Credits	Total contact hours
1	0	3	2	14

Brief Description about the course:

Engineering Practice is a subject in Mechanical Engineering that aims at imparting knowledge and skill components in the field of basic workshop technology. It encompasses the understanding of tools and materials used in various sections of workshop for making simple components.

UNIT- I

Introduction: Introduction to various shops/sections and workshop layouts, Safety norms.
Fitting shop: Introduction, classification of metals: ferrous and nonferrous, fitting tools: measuring and marking tools, marking schemes for a fitting job, cutting tools: files, specifications and uses, hacksaw, chisels, clamping tools: Vice, U-clamp, striking tools: hammers, taps and tapping process. **(4 hrs)**

UNIT- II

Carpentry shop: Introduction, wood working: types of woods and their applications, advantage of wood, seasoning of wood, carpentry tools: measuring tools, marking tools, cutting tools: saws, chisels, planning tools, drilling tools, striking tools, drilling tools, Carpentry Joints, wood working lathe.

Foundry Shop: Introduction, foundry hand tool, ladle, moulding machines, furnaces. **(6hrs)**

UNIT- III

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

UNIT IV

Welding Shop: Introduction, classification of welding processes, Types of welding Joint, advantages, disadvantage and applications of welding, arc welding & gas welding equipment's, soldering & brazing. **(2hrs)**

Text Books / Reference:

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. Workshop Technology- Baker
7. Mechanical Workshop Practice by K C John, PHI Learning
8. Workshop Practices, H S Bawa, Tata McGraw-Hill, 2009

Course Outcomes

CO1: Comprehend the selection and use of different fitting tools.

CO2: Demonstrate the use of various carpentry and foundry tools.

CO3: Identify various lathe operations and recommend tools for machining of materials

CO4: Learn the fundamentals of arc and gas welding with appropriate safety measures

Course Code	**:**	**CSIC 101**
Course Title	**:**	**Problems Solving and Programming Skills (for CO, IT & AI &ML)**
Number of Credits	**:**	**4**
Prerequisites	**:**	
Course Type	**:**	**IC**

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

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.

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 Code	**:**	**CSIC 103**
Course Title	**:**	**Problems Solving and Programming Skills (for ECE, EE, ME, PIE and CE)**
Number of Credits	**:**	**4**
Prerequisites	**:**	
Course Type	**:**	**IC**

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

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.

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.

B. Tech. 1st Semester

(2023-24 onwards)

Course Code	:	**CHIC101 (Common for all branches)**			
Course Title	:	**Energy and Environmental Science**			
Number of credits	:	**L**	**T**	**P**	**Total**
		2	**0**	**1**	**3**
Prerequisites (Course code)	:	**Nil**			
Course Type	:	**IC**			

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:

Unit	Course Description	L (Hrs.)
Unit 1	**Environment, Ecosystems and Biodiversity** **Environment:** Multidisciplinary nature, scope and importance, Need for public awareness. **Ecosystems:** Concept, types, structure and functions, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids, Energy flow in an ecosystem. **Biodiversity:** Values of biodiversity, hot spots and threats to biodiversity, conservation.	6
Unit 2	**Natural Resources** **Renewable and non-renewable resources:** Natural resources and associated problems. **Forest resources:** Use and over-exploitation, deforestation, case studies, Timber extraction, Mining, Dams and their effects on forest and tribal people.	8

	Water resources: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water, Dams – benefits and problems. **Mineral resources:** Use and exploitation, Environmental effects of extracting and using mineral resources, case studies. **Food resources:** World food problems, Changes caused by agriculture and overgrazing, Effects of modern agriculture, Fertilizer-pesticide problems, Water logging, Salinity, case studies. **Energy resources:** 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. **Solar energy:** Basics of solar energy, solar thermal energy, photovoltaic (PV) solar cells, advantages and disadvantages, environmental impacts and safety. **Wind energy:** Energy fromwind turbines, India's wind energy potential, off shore wind energy, environmental benefits and impacts.	
Unit 3	**Environmental Pollution** **Air pollution:** Sources and effects of pollutants, primary and secondary pollutants, controlmeasures. *Acid rain*: Impacts on human communities and agriculture. *Green-house effect:* Definition, causes and consequences. Depletion of ozone layer, destruction of ozone layer by CFC, consequences, effect of ozone modification, Photochemical smog, Bhopal gas tragedy. **Water pollution:** 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. **Thermal pollution**: Causes, effects and control measures. **Solid waste management:** Causes, effects and control measures of urban and industrial wastes. **Nuclear hazards:** Causes, effects and control measures.	**10**
Unit 4	**Social Issues and the Environment** **From unsustainable to sustainable development**: Urban problems related to energy, Water conservation, Rain water harvesting, Watershed management.	**6**

	Environmental Ethics: Issues and possible solutions, consumerism and waste products, *Acts:* 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.	
	Total	**30**

Reference Books:

1. A. Basak, *Environmental Studies*: Pearson Education; 1st 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, 2nd 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, 8th 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, 3rd Edition, 2017.
8. A. Kaushik and C.P. Kaushik, *Perspectives in Environmental Studies:* New Age International (P) Limited, 7th Edition, 2021.

Course Outcomes:

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

CO-1	Know the environmental pollutants and their health effects and environmental remediation and management.
CO-2	Understand the principles of renewable energy systems and explore theenvironmental impact of various energy sources
CO-3	Understand interrelationships among science, technology, and environment
CO-4	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 Ca^{2+} and 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, 2nd Edition, 2017.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*: Dhanpat Rai Publishing company Ltd., New Delhi, 2006.

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC101**
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 complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness & prosperity, which are 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.
- To enable the students to understand harmony and its relevance at all the levels and to create awareness about social responsibility among students & make them socially responsible citizens.

Unit-I: Human Values

Definition Features and Importance. Classification of Values: Intrinsic and Extrinsic Values, Universal and Situational Values, Personal and Social Values, Physical, Environmental, and Economic Values, 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 Personal, Group and Business Ethics. Creating a Value Based Work Culture in hostel, classroom and other places in the Campus and Society.

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. It will 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. Varanasi, 2007.
4. RR Gaur, R Sangal, G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010
5. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
6. Fernado A.C. Business Ethics. An Indian Perspective, Pearson Education, New Delhi.
7. Cambell Jones, Martin Parker & Rene Ten Bos, For Business Ethics, Routledge, New York, 2005.
8. Philip Kotler & Nancy Lee, Corporate Social Responsibility, Wiley- India Edition, New Delhi.
9. 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 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

2

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC102**
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

- शब्द स्वरूप एवं भेद
- उच्चारण-स्थान एवं प्रयत्न
- पद संरचना
  (क) पदस्वरूप, भेद एवं प्रयोग, (ख) सुबन्तपद, (ग) तिङन्तपद
- वाक्य संरचना
  (क) वाक्य स्वरूप भेद एवं प्रयोग
  (ख) कर्तृवाच्य
  (ग) कर्मवाच्य
  (घ) भाववाच्य
- कारक परिचय
  (क) कारक स्वरूप, भेद एवं प्रयोग
  (ख) विभक्तियों का अर्थ
- सन्धि परिचय-सन्धि स्वरूप, भेद एवं प्रयोग
- शाब्द बोध-प्रक्रिया एवं कारण
- संस्कृत सम्भाषण

Reference/Text Books

Sanskrit Chayanika, Published by KU, Kurukshetra

Course Outcomes

At the end of the Course, students will be able to attain greater understanding of different areas of Sanskrit Language and Literature; Understand issues pertaining to origin & evolution of Sanskrit Language.

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	**HSNC103**
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. 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 पेपर लिखने के लिए उपयोगी टिप्स, वाणिज्यिक पत्र लेखन नियम
- आदेश/मांग/शिकायत/एजेंट नियुक्ति/एजेंसी लेनदेन के पत्रों के नमूने

Reference/Text Books

1. उद्देश्यपूर्ण हिंदी और कविता (डॉ नरेश मिश्रा)
2. राजभाषा हिंदी, पेशेवर और तकनीकी प्रकृति (डॉ. बहादुर सिंह)

Course Outcomes

पाठ्यक्रम हिंदी के अध्ययन, चिंतन और उद्देश्यपूर्ण क्षेत्र में सक्रिय रहने के लिए छात्रों, हिंदी प्रेमियों के लिए प्रेरणा का स्रोत साबित होगा। इसके साथ ही यह छात्रों को रोजगार और तकनीकी शिक्षा में महत्वपूर्ण सहयोग देगा।

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	**HSNC104**
Course Title	**Telugu 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

Unit-I

1. తెలుగు వర్ణమాల :: అచ్చులు, హల్లులు, క చ ట త ప, గ జ డ ద బ లు :: సరళ పదాలు వ్రాయడం, : రెండు అక్షరాల పదాలు, మూడు అక్షరాల పదాలు, మరియు, నాలుగు అక్షరాల పదాలు, అచ్చులు మరియు హల్లులను గుర్తించడము.

Varna Mala: alphabets of Telugu script; Achhulu ==Vowels, Hallululu ==consonants, { ka, cha, ta, ta pa; ga, ja, da, da, ba, } Writing simple telugu words; two letter words, three letter words, four letter words, Identification of vowels and consonants: (7)

Unit-II

2. గుణింతాలు : గుణింత పదాలు మరియు గుణింత అక్షరాలు. తలకట్టు, దీర్ఘం, గుడి, గుడి దీర్ఘం , కొమ్ము, కొమ్ము దీర్ఘమ్, ఎత్వం, ఏత్వం, ఐత్వం, ఒత్వం, ఓత్వం, ఔత్వం, సున్న (అనుస్వరం, విసర్గః) ఒత్తులు: చదవడం, వ్రాయడం

How to read and write telugu script of letters and words: ==
Gunintalu = how to add vowels to consonants in telugu and their pronunciation;
Guninta aksharaalu, guninta padalu: Talakattu, deergham, gudi, gudideergham, kommu, kommu deergham, etvam, etvam-deergham, itvam, otvam, otvam-deergham, autvam, sunna (poorna bindu), visarga, (anu swaram)
Reading and writing of letters and clubbing of letters Combination of two or more alphabets: read and write. (8)

Unit-III

3. దిత్వాక్షరం, సంయుక్త అక్షరం, మరియు సంశ్లేష అక్షరం, :: వ్రాయడం, చదవడం. పదజాల వినియోగం;;
తెలుగు పద్యాలు, భాస్కర, వేమన, సుమతి పద్యాలు, మరియు తాత్పర్యాలు

Combination and clubbing of two or more alphabets of same alphabets/letter or different alphabets/letters
Ditvaksharam, sumyuktaksharam, sumsleshaksharam, == reading and writing: Usage of combined telugu letters in words
Basic 4-line stanzas/ poems/ rhymes: of Telugu written by poet Bhaskara; Poet-Vemana; Poet-Sumati; and their literal meaning, (These rhymes are having internal message OR hidden message – similar to Idioms and proverbs) (8)

Unit-IV

4. స్వీయరచన, పదజాల వినియోగం, ప్రతి పదార్థాలు,.
   వ్యాకరణం:: సందులు, సమాసములు

Paragraph writing: == Self-writing == sweeya rachana; use in your own words and construct sentences; synonyms and antonyms in telugu == prati padaarthalu;
Telugu grammar: vyakaranam: sandhulu, samasalu. (7)

Reference books/ Text Books

1. Learn Telugu in 30 days: by Dr. Diwakarla Venkata Avadhani, Publshers: Andhra Pradesh Sahitya Academy, Saifabad, Hyderabad – 500004

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	**HSNC105**
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 Govts. 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

M.V. Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication, 2005.
Durga Das Basu, "Introduction to the constitution of India", (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga Publication.
R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.

Course Outcomes

At the end of the Course, students will be able to Understand and explain the significance of Indian Constitution as the fundamental law of the land. Exercise his fundamental rights in proper sense. Analyse the Indian political and judiciary system.

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(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	**HSNC106**
Course Title	**Indian Knowledge System**
Number of Credits	**2 (2L)**
Prerequisites (Course Code)	**----**
Course Category	**AUDIT COURSE (AU)**

Semester: Odd/Even **Internal: 50 Marks**
Total: 50 Marks

Course Objectives

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system and to make the students understand the traditional knowledge and analyse it and apply it to their day to day life.

UNIT-I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, the vedic corpus, Philosophical system, wisdom through ages.

UNIT-II

Cognitive biomarkers of creativity with IKS perspectives. Positivity: Traditional approaches. Happiness: objective and subjective measures of wellbeing, life satisfaction, positive affect, negative affect and happiness. Resilience: Developmental and clinical perspectives. Self-regulation and self-control, optimism, self-esteem. Spirituality and well-being. Self and Identity in modern Psychology and Indian thought.

UNIT-III

Health and Psychology; Emotional intelligence, yoga way of life, Indian approach to Psychology. Consciousness; levels, body-mind relationship. Indigenous perspective of Psychology: self and motivation.

Course Outcomes

At the end of the course, students will be able to identify the concept of traditional knowledge and its importance with the need and importance of protecting traditional knowledge. They will able to understand, connect & explain basics of Indian traditional knowledge to modern scientific perspective.

Recommended Books

1. Mahadevan, M., Bhat, V.R. & Pavana N. (2022). Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning
2. Baumgardner, SR & Crothers, MK (2009). Positive Psychology. Prentice Hall/Pearson Education.
3. Cornelissen, R.M., Misra G. & Varma S. (2014). Foundations & Applications of Indian Psychology. Pearson Education.

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(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.

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DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC107**
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 *Bhagavad Gita.*
- To inculcate the teachings of the *Bhagavad Gita* 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 learn to implement the teachings of the *Bhagavad* Gita in real life situation.

Reference Books

1. Sri Aurobindo, "Bhagavad Gita and Its Message" by Shri Aurobindo. Lotus Publishers, 1996.
2. Shrimad Bhagavad Gita, Geeta Press, Gorakhpur, 1923.
3. Juan Macaro, The Bhagavad Gita, Penguin Books, 2003.
4. Pandit Aryamuni, Vedic Gita, 2019.
5. Jack Hawley, The Bhagavad Gita: A Walkthrough for Westerners, New World Library, 2011.

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:

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(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	**HSNC108**
Course Title	**French 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 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 and 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.

Course Outcomes

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

Reference Books

Connexions –I Didier

Connexions –II Didier

Connexions-3 by Régine Mérieux et Yves Loiseau

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DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC109**
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.

Course Outcomes

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

Reference Books

Deutsch als Fremdsprache, IA (BNS 1A)
Deutsch als Fremdsprache 1B (BNS 1B)
Sprachkurs 3

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:

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DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC110**
Course Title	**Japanese 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 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.

Reference Books

Minna no Nihongo (1-1), Goyal Publishers—Chapters 01 to 12

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:

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DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Course Code	**HSNC111**
Course Title	**Thought Lab and Practices**
Number of Credits	**2 (2L)**
Prerequisites (Course Code)	**----**
Course Category	**AUDIT COURSE (AU)**

Semester: Odd/Even **Internal: 50 Marks**
Total: 50 Marks

Course Objectives: This introductory course input is intended

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

Unit I Thoughts

What are thoughts, Source of thoughts, Types of thoughts, Effect of thoughts on emotional and physical health, Understanding interrelationship between thoughts and actions, Tree of consciousness, Exercises

Unit II Meditation

Introduction to Meditation, Knowing the self, Understanding and connecting to the supreme, Benefits of meditation, achieving The Eight Powers using meditation, Exercises.

Unit III Mind and Body management

Stress Management, Sleep management, nourishing various body organs using innate qualities of the self, exploring 7 energy centers of the body, Body Mind Detoxification, Exercises.

Unit IV The Law of Attraction

Positive affirmations, the art of Visualization, Karma Philosophy. Happiness. Exercises.

Unit V Applications

Exploring various instruments to identify the mind and body health status using Karada Scan, Muse, VR headset etc., Case Study on power of thoughts – Water experiment by Masaru Emoto, SWOC analysis of the self, Exercises.

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

a. Will be able to learn the importance of mind power, meditation, positive thoughts etc.
b. Gain proficiency in interdisciplinary aspects of mind power, meditation, positive thoughts etc.
c. Will be able to learn mind power, meditation, positive thoughts etc for further research and societal applications.

Reference Books

1. BK Shivani, “Happiness Unlimited”.
2. Jagdish Chandra Hasija, “Yog ki vidhi aur sidhi”.
3. Dr Girish Patel, “Positive Health”.

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Evaluation criterion for NCC Cadets

Following criterion is proposed to be adopted for the evaluation of NCC cadets for the practical course of NCC/NSS/Yoga

A: Internal Evaluation (During semester):

(i) Attendance:	20 marks (for 90 % attendance full marks)
(ii) Discipline:	10 Marks
(iii) Drill performance & Body bearing:	10 marks
(iv) Participation in social activities:	10 marks
(v) Domain knowledge:	10 marks (Through oral viva)

B: End sem evaluation: (At the end of the semester)

(i) Discipline:	10 Marks
(ii) Drill performance & Body bearing:	15 marks
(iv) Domain knowledge:	15 marks (Through oral viva)

C: After end of the 6^{th} semester: Bonus marks 10 for each B & C certificate is proposed to be added in final marks subject to total marks does not exceed 100

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 fervor. 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%.
   (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 Specilalised Service Subjects will be 30%. The breakdown of periods are as under:-

Sr. No.	Subject	No. of Periods			
		First Year	Second Year	Third Year	Total
Senior Division/Wing					
(a)	Common Subject	66	72	72	210
(b)	Specilised Subject	24	33	33	90
	Total	**90**	**105**	**105**	**300**

Junior Division/Wing

(c)	Common Subject	85	85		170
				--NA—	
(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.

Legend	
Abbreviation	Type
L	Lecture
D	Demonstration
DI	Discussion
P	Practice
V	Video

BLOCK SYLLABUS

COMMON SUBJECTS: SD/SW (ALL WINGS)

Sr. No.	Subject	1st Year	2nd Year	3rd 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
Total		**66**	**72**	**72**	**210**

BLOCK SYLLABUS
SPECIALISED SUBJECTS: SD/SW (ARMY)

Sr. No.	Subject	1st Year	2nd Year	3rd 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
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (AIR)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	General Service Knowledge	02	02	02	06
2.	Air Compaigns	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
12.	Aircraft Particulars	02	00	00	02
13.	Aeromodelling	06	06	09	21
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (NAVY)

Sr. No.	Subject	1st Year	2nd Year	3rd 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.	Searmanship				
	(a) Anchor Work	01	01	00	02
	(b) Rigging	03	00	00	03
	(c) Boat Work	04	05	01	10
6.	Fire Fighting, Flodding 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
Total		**24**	**33**	**33**	**90**

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

Course Code: SWNC101	**L**	**T/P**	**C**
Course Title: Sports	**0**	**4**	**2**

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

Unit-2

(Practical-Sports Specific) Each student has to compulsorily opt for one game/sport so that he/she can be assessed on their performance in the same accordingly for all the 03 years.

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 - (CITIUS, RUN FOR Unity, Prabhat Pheri etc.)	30 marks
3. Viva/Subject Knowledge-	20 marks
4. Practical Exam at the end of 6th Sem (Modified Fitness Test)-	40 marks

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

Syllabus and Evaluation Scheme of Yog
Compulsory for up to B.Tech 6th Semester Students

Course Code: SWNC101	**L**	**T/P**	**C**
Course Title: Yoga	**0**	**4**	**2**

Introduction: Yog education in Institute can immensely contribute to health of children 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, HinduMythological concepts about origin of Yog
- History and Development of Yog
- Etymology and Definitions of Yog, Aim and Objectives of Yog, Misconceptions about Yog, TrueNature 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

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, Kapalbhati, Gomukhasana Matsyaasana, Anuloma-Viloma.
- **Hypertension:** Procedure, Benefits & Contraindications for Tadasana, Katichakransan, 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-vardhaka (for the cheeks)
Karnashakti-vardhaka (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)
Udarasakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)

Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Muladhara-chakra-suddhi (for the rectum)
Upasthatatha-svadhisthana-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, Sheetali 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 Sports Related Activities -	**30 marks**
3. Viva/Subject Knowledge-	**20 marks**
4. End Semester Practical Exam (Yogic Practice)-	**40 marks**

National Service Scheme (NSS)

Course Title: NSS/CLUBS/TECHNICAL SOCITIES Course Code: SWNC102;

LTP: 004 Credit: 2 (Semester 1 to 6)

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 a problem-solving process.

iv. To develop among themselves a sense of social and civic responsibility.

v. To utilize their knowledge in finding practical solutions to individual and community problems.

vi. To develop the competence required for group living and sharing responsibilities.

vii. To gain skills in mobilizing community participation.

viii. To acquire leadership qualities and a democratic attitude.

ix. To develop capacity to meet emergencies and natural disasters.

Joining NSS:

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

Guidelines for Evaluating NSS Students

Curriculum's 1-credit Course (Semester 1 to 6)

For the curriculum's credit award to students under NSS, the following procedure will be adopted:

Students should engage in various NSS activities (listed in Annexure-1) for at least 240 hours in three years (minimum 40 Hrs/semester).

The attendance records of students will be maintained by their unit's respective Programme Officer.

A student who participates in different activities of NSS during the 1st to 6th semester then he/she will earn certain hours per activity depending upon his/her role and responsibilities carried out by the volunteer as per the following rules:

S.No.	Role	No. of Hours
1	Audience	Upto 5 Hours
2	Active Participation	Upto 7 Hours
3	Organizer	Upto 10 Hours

Distribution of Marks: Total 100 (20+20+20+40)

Class Attendance: 20

Discipline & Punctuality: 20

Event Knowledge: 20

Comprehensive Viva (for all activities held during the entire semester): 40

Annexure-1 (Tentative NSS Activities Planned for an Academic Year)

Activities
Vanmohotsava Week (5-7 days) (Environment Enrichment & Tree Plantation) (Nearby places like public institutions, adopted villages/slum areas, and wasteland and other such activities)
Disaster Management (Workshops, awareness camps for Relief and rescue work inoculation and immunization, distribution of medicines, essential goods)
Adopted village (visiting some nearby villages and deciding 2-3 villages to be adopted for literacy promotion and basic facilities like drinking water, pucca/kutchha road, school shed/buildings, cooperative/self-employment scheme, etc.)
Independence Day (Participation in the college celebration)
Literacy Week (Pledge-taking ceremony, Visit to adopted village/slum to organize dialogue and discussion, Putting up hoardings and banners at prominent places in the local area)
Health Service & Awareness (Integrated Child Development Programme, Health Education, HIV/AIDS Awareness Programme, Motivating parents to send children to school and other such activities)
"**Annual NSS Day Celebrations**" of NSS
Digital Transactions Awareness Programs ("Startup India – Stand up India")
Blood Donation Camp in collaboration with NITKAA
Autumn Camp (**4-6 days)** in a nearby village (Youth for Sustainable Development with a focus on Watershed Management & Wasteland Development or some other theme)
Gandhi Jayanti (Quiz competition, Speech, Communal Harmony DAY, and other such activities)
Quami Ekta Week (National Integration Day, Welfare of Minorities Day, Cultural Unity Day, Women's Day, Conservation Day)
Swachhta Pakhwada (various activities like cleanliness campaigns in campus, locality, road safety, and other such activities engaging GOI Ministries/Departments initiatives)

Legal Literacy-Social Justice (Lecture by relevant person and other activities
World AIDS Day (creating awareness among school and college-going students, organizing lectures, public discussions, film shows, rallies and street plays)
Energy Conservation Day (awareness programme and other activities
National Youth Week (Lectures/Symposia on the philosophy and teaching of Swami Vivekanand, Mahatma Gandhi; Debate on the role of youth in the contemporary situation; Essay/drawing competitions amongst youth)
Republic Day (Participation in the college celebration)
Nasha Mukti Abhiyan (Awareness on the part of Tobacco Free Society; campaigns, posters, programmes in Hostels)
Women's Week (Special programmes regarding the significant role of women and girl child; Prominent women leaders lectures; awareness programmes and other such activities)
National Safety Day/ Week (Activities based on a theme provided by National Safety Council (GOI))
Life Skills and Vocational Training Programmes (Industry professional for lectures, competitions and other such activities)
Career Guidance (For college students through prominent speakers; NSS volunteers going to schools to provide guidance to 9-12th students and other such activities)
Environment Enrichment & Climate Change (Special programmes like lectures, campaigns, posters and other such activities)
World Bicycle Day Celebration
Other Activities: Activities suggested by Institute, State NSS Unit, MHRD, GOI Ministries etc.

Guidelines for evaluation of student activities under Students Clubs

(1st to 6th Semester: 02 credit)

The Students Clubs provide facilities and the right environment to develop extra-curricular skills in the students, in addition to the academic knowledge imparted by the Institute. Twelve (12) different clubs are working under Students Clubs which organized various events (workshops, guest lecturers etc.) and competitions, to instil the spirit of healthy competition among students, throughout the year. A national level mega cultural festival under the name CONFLUENCE is organized every year. Students can earn course credit by participating in various events organised by the student's club and assisting in coordinating these events as a member of these clubs.

For the credit award to students under students club, following is recommended:

1. Students must engage in club activities for 240 hours in three years (40 hours in one semester).
2. The evaluation criterion and activity hours will be calculated as follows:

SNo	Evaluation Criterion	Number of hours credited	Distribution of Max Marks 100 (Weightage 80%)
1.	Participation as an Audience	0.5 hour* number of event hours	--
2.	Participation as an Performer	(a) 06 hours for full day activity (b) 03 hours for half day activity	10 05
3.	Prize/Award/Recognition (intra - college events)	05 hours	20
4.	Prize/Award/Recognition (inter - college events)	10 hours	30
5.	Organization of event	(a) 12 hours for full day activity (b) 06 hours for half day activity	20 10
6.	Sponsorship Note: Number of hours will be equally divided among students involved where minimum Rs. 25,000/- per students must be ensured.	(a) 15 hours for sponsorship upto 01 Lakh (b) 30 hours for sponsorship upto 05 Lakh (c) 40 hours for sponsorship more than 05 Lakh	(a) 15 (b) 30 (c) 40 Note: Marks will be divided equally in team members, if any

3. The comprehensive viva-voce (**Weightage 20%**) will be conducted at the end of every semester.
4. Documents required as proof:

a. **Participation**: A certificate of participation duly signed by the organizing club's faculty-in-charge. All clubs will maintain a record of certificates issued for verification.
b. **Prize/Reward/Recognition**: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean (SW)/Professor-in-charge of Students Club.
c. **Organization**: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed.
d. **Sponsorship**: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of hours and marks as per criterion 6.

Note:

1. Faculty in charges of the individual clubs must ensure at least 40 hours of activities per semester and must keep the record of number of hours for each and every student involved/ registered for clubs.
2. Further, workload of two (02) hours per week should be included as teaching load for faculty in-charges (FIC) and Professor In-charges (PIC) in order to ensure smooth conduct of activities of the clubs.
3. It is recommended to make provision for earned leave for organising events in non-working days.

Guidelines for evaluation of student activities under Technical Societies
(Semester 1st to 6th: 240 hrs.: 1 credit)

There are 12 societies/clubs currently under technical societies which conduct various events (competitions, workshops, guest lectures, meetings etc.) throughout the year and one major event TECHSPARDHA, the annual technical festival is conducted once a year. Each of this society/club is headed by a team of students usually from final year of their programme under the guidance of a faculty-in-charge.

Under new curriculum for B. Tech students, the activities of all technical societies/clubs are to be considered as an audit course. The credit for this course will be awarded at the end of 6th semester.

Students can earn course credit by participating in various events organised by the technical societies and help in coordinating these events as a member of these societies/clubs. The selected heads of societies/clubs under supervision of faculty-in-charge will ensure that each member is engaged in the activities of society/club for at least 40 hours in each semester (240 hours in 6 semesters) to fulfil the requirement of award of credits

At the end of sixth semester the evaluation of student will be carried by a committee of faculty-in-charges of the technical societies. They will be awarded points on following criterion:

Sr. No.	Criterion	Semester I and II (max 20 marks)	Semester III and IV (max 30 marks)	Semester V and VI (max 50 marks)
1.	Participation	1/event	1.5/event	2/event
2.	Prize/Award/ Recognition (intra-college events)	2/event	3/event	4/event
3.	Prize/Award/ Recognition (inter-college events)	4/event	6/event	8/event
4.	Organization	4/event	6/event	8/event
5.	Sponsorship	4/ (Rs10K worth of sponsorship individually)	6/ (Rs20K worth of sponsorship individually)	8/ (Rs40K worth of sponsorship individually)

The committee will duly verify the credentials of each candidate and award marks on above criterion. Student will be awarded a grade as per institute norms.

Documents required as proof:

a. Participation: A certificate of participation duly signed by the organizing club's faculty-in-charge. All societies/clubs to maintain a record of certificates issued for verification.
b. Prize/Reward/Recognition: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean(R&C)/Professor-in-charge of Technical Societies.
c. Organization: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed, duly signed by the faculty-in-charge of the organizing club.
d. Sponsorship: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of marks as per criterion 5.

Bearing in mind that the activities of clubs/societies are a part of curriculum now, following recommendation may kindly be considered:

1. Adequate space may be allocated to each society/club for conducting meeting, storing materials and equipment and keeping records.
2. Adequate staff and office space be provided to professor-in-charge (Technical Societies) keep track of purchases, maintain accounts and records and secretarial assistance.
3. An engagement of one hour per week in the load of faculty-in-charge be shown in timetable to compensate for time devoted to the activities of club/societies.

Course Code MAIC 102	Integral Calculus and Difference Equations	L - T - P - C 3 - 1 - 0 - 4

Pre-Requisites:
The basic knowledge of Differentiation, Integration, Summation, Scalars, Vectors and Trigonometrical functions.

Course Objective:

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

Unit 1: **8L**

Power Series Solutions and Special Functions: The Strum-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: **8L**

Multiple Integrals: 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: **8L**

Vector Calculus : 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: **8L**

Difference Equations and Z - Transforms: 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.

Unit 5: **8L**

Fourier Series: 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, 9th Edition, Wiley India Pvt. Ltd., 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 the course, the student 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

DEPARTMENT OF PHYSICS

(B. TECH. 2nd Sem. for CE, ME & PIE Branches)
(CORE COURSES)

PHIC102: ADVANCED ENGINEERING PHYSICS

L	T	P	Credits	Total contact hours
2	1	2	4	60

Pre-requisite: PHIC101

Brief Description about the course: The course consists of mechanical and thermal properties of materials and their applications. The concepts of Magnetic Materials, Superconductors, and Nanotechnology are included for the application in futuristic technologies.

Course Content

UNIT-I (7 Hours)

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 (7 Hours)

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-Boltazmann, Bose–Einstein, and Fermi-Dirac statistics.

UNIT-III (7 Hours)

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.

UNIT-IV (7 Hours)

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, Applications of nanotechnology.

Text Books/Reference Books

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

Course Outcomes:

At the end of the course Students will be able to:
CO1: Develop the skill to apply various physics concepts for advance engineering problems.
CO2: Apply fundamentals of mechanical and thermal properties of materials for technological applications.
CO3: Apply the concepts of Magnetic Materials, Superconductors, and Nanotechnology.
CO4: Design and develop materials for industrial applications.

DEPARTMENT OF PHYSICS

(B. TECH. 2nd Sem. for CE, ME, PIE, ECE, EE, and IIoT Branches)
(CORE COURSES)

ADVANCED ENGINEERING PHYSICS (PRATICAL)

List of the Experiments:

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

DEPARTMENT OF PHYSICS

(B. TECH. 2nd Sem. For ECE Branch)
(CORE COURSES)

PHIC103: ADVANCED ENGINEERING PHYSICS

L	T	P	Credits	Total contact hours
2	1	2	4	60

Pre-requisite:PHIC101

Brief Description about the course: The course is focused on the electronic and semiconducting properties of materials to understand theories relevant to the engineering principles of Semiconductor devices. The content consists of topics related to the technical and strategic problems, electronic devices, their operations and applications.

COURSE CONTENTS

UNIT-I (7 H)

BAND THEORY OF SOLIDS: Periodic structures, Origin of Energy Bands- Bloch Theorem, Kronig-Penney Model (qualitative), E-K diagram, Brillouin Zones- extended, reduced and periodic zone schemes, Electrons and Holes, Concept of effective mass, Material classification, Direct and Indirect Band gap semiconductors.

UNIT-II (7 H)

SEMICONDUCTOR PHYSICS: Crystal properties, Elemental and Compound semiconductors, Density of States, Doping- donors and acceptors, Equilibrium and extrinsic carrier concentration, Carrier transport, Drift and Diffusion current, Mobility, Einstein relation, Excess carrier generation and recombination.

UNIT-III (7 H)

PHYSICS OF JUNCTIONS: Types of junctions: Metal-Metal; Metal-Semiconductor; Semiconductor-Semiconductor- Homo-junction and Hetero-junction, Metal-Insulator junction, Metal-Insulator-Semiconductor junction Concepts of Quasi-Fermi levels, Carrier

transport equations and solutions, PN Junctions- Abrupt junction: Electric field, Potential, Capacitance profiles, ideal diode, real diode and their characteristics.

UNIT-IV (7 H)

DEVICES AND APPLICATIONS: Bipolar Junction Transistor- Structure, Operation, and Transport Characteristics, BJT as amplifiers; JFET- Structure, Operation, and Transport Characteristics; MOSFET- Structure, Operation-Condition of inversion, and Transport Characteristics, C-V characteristics, MOSFET types.

COMPOUND SEMICONDUCTORS - Requirements for high speed circuits, Materials- Binary and Ternary compound semiconductors, Dopants and impurities in GaAs and InP.

Text Books/References/Video lectures

T-1: Charles Kittel, **"Introduction to Solid State Physics"**, John Wiley publication, 2013.

T-2: S. M. Sze, **"Semiconductor Devices: Physics and Technology"**, John Wiley publication, 2013.

R-1: Ben G. Streetman, **"Solid State Electronic Devices"**, Prentice-Hall of India, 2012.

R-2: Jaspreet Singh, **"Semiconductor Devices-Basic Principles"**,John Wiley publication, 2008.

R-3: Donald A. Neamen, **"Semiconductor Physics and Devices: Basic Principles"**,4th Edition, McGraw-Hill publication, 2012.

R-4: M.S.Tyagi, "**Introduction to Semiconductor Materials and Devices**" Wiley, 1991.

V-1: Solid State Devices - (Electronics and Communication Engineering course from IIT Madras) NPTEL Lecture Videos by Prof. S. Karmalkar from IIT Madras.

V-2: High Speed Devices and Circuits - (Electronics and Communication Engineering course from IIT Madras) NPTEL Lecture Videos by Prof. K.N. Bhat from IIT Madras.

Course Outcomes:

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

CO1: Solve and realize Electronics Engineering problems and challenges.

CO2: Understand fundamentals of semiconducting properties of materials for technological applications.

CO3: Realize the operation mechanism of various electronic devices.

CO4: Solve technical and strategic problems related to electronic devices and operations.

DEPARTMENT OF PHYSICS

(B. TECH. 2nd Sem. For EE Branch)
(CORE COURSES)

PHIC104: ADVANCED ENGINEERING PHYSICS

L	T	P	Credits	Total contact hours
2	1	2	4	60

Pre-requisite: PHIC101

Brief Description about the course: This course provides the knowledge of the electrical and magnetic fields for simple configurations under static and dynamic electromagnetism relevant to the engineering systems and devices. The propagation of EM waves and Maxwell's equation in different forms and different media are elaborated.

Course Contents

UNIT-I (6 Hours)

Vector Calculus & Electrodynamics: Vectors, Gradient, Divergence, Curl and their physical significance, Divergence theorem, Stoke's thereom.

Electrostatics: Electric field due to distributed charges configurations lines of charges, Uniform plane surface and spherical volume charge distributions: Behavior of conductors and dielectric in electrostatic fields, Boundary conditions.

UNIT-II (8 Hours)

Magnetostatics: Biot - Savart's Law, Ampere's Circuital Law and their Applications, capacitance and inductance calculations for simple configurations; Time varying fields-displacement current, wave equation for Poynting vector, electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Boundary conditions, Poynting theorem, Maxwell's equations.

UNIT-III (6 Hours)

Magnetic Materials and Superconductors: Magnetization M, relation between B, H & M. Bohr megneton, Hysteresis loss, Antiferromagnetism, Ferromagnetism & Ferrites, Orbital diamagnetism, Atomic magnetic moments, orbital diamagnetism, Classical theory of Paramagnetism, Ferromagnetism, molecular field theory and domains, applications of magnetic materials, Type I and II Superconductors, London equation, Applications of superconductivity.

UNIT-IV (8 Hours)

Electromagnetic Theory: Wave equation, Uniform plane waves, Plane wave propagation in dielectric and conducting media, Reflection and refraction of plane wave (Normal incidence) , Wave propagation in bounded media, Ground waves, Sky waves and space waves,

Wave Guides: Parallel plane guide, TE, TM and TEM waves, Rectangular and cylindrical wave guides, resonators and Planes transmission line; Strip lines, Micro strip line.

TextBooks/Reference Books

T-1: M. N. O. Sadiku, Elements of Electromagnetics, Oxford University Publication, 2014.
T-2: W. Hayt, Engineering Electromagnetics, McGraw Hill Education, 2012.
R-1: A. Pramanik, Electromagnetism-Problems with solution, Prentice Hall India, 2012.
R-2: Jaspreet Singh, John Wiley, Semiconductor Devices-Basic Principles, publication 2008.
R-3: Arthur Beiser, Tata McGraw Hill, Concept of Modern Physics, publication, 2003.
R-4: Pramanik, Electromagnetism - Theory and applications, PHI Learning Pvt. Ltd, New Delhi, 2009.
R-5: A. S. Vasudeva, Modern Engineering Physics, S. Chand.

Course Outcomes

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

CO1: understand the physics underlying the electric and magnetic fields.
CO2: understand the operation mechanism of basic laws of electromagnetism relevant to the engineering principles of materials and devices.
CO3: understand the applications of EM waves, Maxwell's equation in different forms and different media.

DEPARTMENT OF PHYSICS

(B. TECH. 2nd Sem. For IIoT Branch)
(CORE COURSES)

PHIC105: ADVANCED ENGINEERING PHYSICS (THEORY)

L	T	P	Credits	Total contact hours
2	1	2	4	60

Pre-requisite: PHIC101

Brief Description about the course: This course is focused on the working principle of different types of sensors and development of sensors utilizing advanced sensing materials. Fabrication techniques and applications in AI and IIoT are elaborated.

Course Contents

UNIT-I (7 L)

Principles of Sensors and Actuators: Fundamentals and Physics of sensors and Actuators (sensing and actuation mechanisms), physical effects, measurement, measurement standards, measurement errors, Static and Dynamic Characteristics, reliability, aging test, failure mechanisms and their evaluation and stability study, Sensor signal amplification and filtering, Analog-to-digital conversion, Noise reduction techniques, Digital signal processing for sensor data.

UNIT-II (7 L)

Materials and Fabrication methods for Sensors: Semiconductors, Metal Oxides, Polymers, Metals, piezoelectric materials, optical glass fibres and Organic Materials; Sensor configurations and geometries, Thin/thick film formation techniques: Physical, chemical and Langmuir-Blodgett film formation techniques, Screen Printing Techniques, Lithography.

UNIT-III (7 L)

Sensors:
Optoelectronic sensors, Mechanical sensors, Thermal sensors, Magnetic sensors, Gas sensors, pressure sensors, chemical and bio sensors, Calibration methods and standards, Error sources and compensation techniques, Sensor fusion and multi-sensor systems.

UNIT-IV (7 L)

Sensor Systems and Applications:
Sensors for AI and IoT: Agriculture, health care, environmental monitoring and control, smart home, transportation, Smart Energy monitoring; robotic, nautical, aeronautical and space measurement systems; Flexible and wearable sensors; Sensors for lab on chip, sensor networks, Nanosensors and MEMS technology.

Text Books/Reference Books:

T-1: Clarence W. de Silva, "Sensors and Actuators- Engineering System and Instrumentation", CRC Press, Taylor &Francis Group, 2016.

T-2: S.C. Mukhopadhyay, "Next Generation Sensors And Systems", Sringer, 2016.

R-1: J. Fraden, "Handbook of Modern Sensors: Physical, Designs, and Applications", AIP Press, Springer, 2010.

R-2: D. Patranabis, "Sensors and Transducers", PHI Publication, New Delhi, 2003.

R-3: Ezzat G. Bakhoum, "Micro- and Nanoscale Sensors and Transducers", CRC press, 2019.

R-4: P.T. Moseley, B.C. Toefield "Solid State Gas Sensors", CRC Press, 1987.

R-5: S. M. Sze, "Semiconductor Sensors", Wiley-Interscience, 1994. ISBN: 978-0471546092.

Course Outcomes

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

CO1: Students will be able to design various sensors.

CO2: Students will learn about various materials and methods of fabrication of sensors.

CO3: Students will be familiarized to the practical approaches for different sensors and their utilization for AI and IIoT Applications.

Course Code	**:**	**CSIC 100**
Course Title	**:**	**Digital System Design**
Number of Credits	**:**	**4**
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 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 compliment 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 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 Code	**:**	**CSIC 102**
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 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.

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.

B. Tech. 2nd Semester

(2023-24 onwards)

Course Code	:	**CHIC102**			
Course Title	:	**Chemistry (For CE, ME and PIE)**			
Number of credits	:	**L**	**T**	**P**	**Total**
		2	**1**	**1**	**4**
Prerequisites (Course code)	:	**Nil**			
Course Type	:	**IC**			

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:

Unit	Course Description	L (Hrs.)
Unit 1	**Softening of Water and Phase Rule** **Softening of Water:** Boiler problems, Remedial Measures, Demineralization, Desalination, Advanced reverse osmosis (RO), Electro dialysis, Zeolite process, Ion-exchange process, MBD, Polished water. **Phase Rule:** Description of various terms (phase, component and degrees of freedom), One component system (water), Two component system (Pb-Ag, KI-H_2O), Technical applications: freezing mixtures, solders, safety plugs and freeze drying.	8

Unit 2	**Corrosion** 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).	**5**
Unit 3	**Advanced Engineering Materials** **Polymers:** 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. **Conducting Polymers:** Intrinsic and extrinsic polymers, Properties and applications of: Conducting polymers (Polythiophene and Polyaniline), Biodegradable polymers (Cellulose acetate and Polyhydroxy-Urethanes). **Construction Material:** Composition, setting and hardening of Portland cement. **High Energy Materials (HEM):** Introduction, Classification and Requirements of HEM, Some important explosives: RDX, DDNP, TNT, PETN (Structure and properties) and plastic explosives.	**10**
Unit 4	**Fuels and Lubricants** **Fuels:** 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. **Lubricants:** 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_2).	**7**
	Total	**30**

Reference Books:

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

Course Outcomes:

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

CO-1	Gain the basic knowledge about hardness of water, its disadvantages and the methods available to soften the water.
CO-2	Understand the concepts of phase rule and its application in making the alloys, freeze drying, freezing mixture, etc.
CO-3	Understand the mechanism of corrosion and ways to control the corrosion.
CO-4	Appreciate the concepts and applications involving advanced engineering materials such as polymers, cement and high energy materials.
CO-5	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, 2nd 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, 9th Edition, 2015.

B. Tech. 2nd Semester

(2023-24 onwards)

Course Code	:	**CHIC103**			
Course Title	:	**Chemistry (For ECE and EE)**			
Number of credits	:	**L**	**T**	**P**	**Total**
		2	**1**	**1**	**4**
Prerequisites (Course code)	:	**Nil**			
Course Type	:	**IC**			

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 important aspects of corrosion and its prevention.
- To impart knowledge of advanced engineering materials and their applications.

Course Content:

Unit	Course Description	L (Hrs.)
Unit 1	**Polymers** Introduction, classification, industrially important polymers: Liquid Crystal Polymers (LCP),Conducting polymers (CP), Interpenetrating Polymer Network (IPN), Polymer Blends and Polymer Composites, Smart Polymers or Stimuli-responsive Polymers, Biodegradable polymers, Flame retardant and thermally insulating polymers..	8
Unit 2	**Batteries** Introduction to primary, secondary and flow batteries, Construction, working principle, operation and applications of Zn-AgO, Zinc-air cell, Nickel-metal hydride, Lead-acid, and Lithium-ion batteries, Fuel cells: Methanol-Oxygen fuel cell, Solid oxide fuel cell (SOFC), Polymer electrolyte fuel cell (PEFC) and Molten carbonate fuel cell (MCFC).	9
Unit 3	**Corrosior** Introduction, dry and wet corrosion, electrochemical theory of corrosion, factors influencing corrosion (nature of metal and nature of environment), types of corrosion: Galvanic corrosion, stress corrosion, microbial corrosion, differential aeration corrosion (water line and pitting corrosion), corrosion control methods: protective coatings, inorganic coatings, cathodic protection (sacrificial anodic protection, impressed current cathodic protection), use of inhibitors.	6

Unit 4	**Engineering Materials** ***Photovoltaic materials:*** Introduction, present status in India, solar energy utilization and conversion, solar cells and dye sensitized solar cells- principle and applications. ***Nanomaterials:*** Introduction, Synthesis of nanomaterials (bottom-up and top-down approach), and nano materials (fullerene, graphene, and carbon nanotubes), their applications.	**7**
	Total	**30**

Reference Books:

1. W. D. Callister, D. G. Rethwisch, *Materials Science and Engineering: An introduction*: Wiley India Pvt. Ltd., New Delhi, 10th Edition, 2018.
2. P.C. Jain and M. Jain, *Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 16th Edition, 2015.
3. S. Chawla, *A Text Book of Engineering Chemistry*: Dhanpat Rai Publishing Company, New Delhi, 3rd Edition, 2017
4. S. S. Dara and S. S. Umare, *A Text Book of Engineering Chemistry:* S. Chand Publishing Company, New Delhi, 12th Edition, 2018.
5. D. Hull and T. W. Clyne, *An Introduction to Composite Materials*: Cambridge University Press, 2nd Edition, 1996, Online Edition 2012.
6. O. G. Palanna, *A Text Book of Engineering Chemistry*: McGraw Hill, New Delhi, 4th Reprint, 2012.
7. Puri, Sharma and Pathania, *Principles of Physical chemistry*: W. H. Freeman and Company, 48th Edition, 2021.

Course Outcomes:

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

CO-1	Learn the significance and applications of industrially important advanced polymers.
CO-2	Understand the basics of some important types of batteries and their working principles.
CO-3	Evaluate techniques to protect different metals from corrosion.
CO-4	Understand the chemistry involved in the synthesis and characterization of nanomaterials.

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 the strength (gL^{-1}) of strong acid and strong base/weak acid and strong base using conductometrictitration method.
4. To prepare Urea formaldehyde (U-F) resin.
5. To synthesize Thiokol rubber using sodium tetra sulphide with 1,2-dichloro ethane.
6. Determination of iron in iron ore solution.
7. Determination of calcium in cement extract solution.
8. Potentiometric titration of an acid vs base.
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, 2nd 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, 9th Edition, 2015.

Course Code	**:**	**CSIC 104**
Course Title	**:**	**Programming using Python**
Number of Credits	**:**	**4**
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 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, 1st Ed., 2016.
2. Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning,, 1st Ed., 2012.

Course outcomes:

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

CEPC101 Engineering Mechanics

Pre-requisite: Applied Physics

L	T	P/D	Credits	Total contact hours
3	0	2	4	5

Brief description of the course: The course is a problem-focused engineering class that helps civil engineering students develop the ability to understand and analyze static forces on a variety of structures and engineering applications. The course begins with fundamental concepts and principles to explain the importance of mechanics in the context of engineering and conservation equations. It introduces the techniques for analyzing the forces in the bodies, plane trusses and frames.
To understand the fundamental principles of stresses, strain and the relationship. To understand the estimation of various loads and load distributions on beams. To evaluate the principal stresses & Strains and use of Mohr's Circle. To learn the concepts in analysis and design of columns.

Course Content:
Theory Content:
Unit-I Basic Concepts (8 hrs)
Concept of Rigid body and deformable bodies, Free body diagrams, Types of beams, simple and continuous beams, type of supports and reactions.
Fundamentals of Determinate and Indeterminate structures, Analysis of plane trusses, Analysis of Plane frames.
Unit-II Stresses and Strains (8 hrs)
Concept of stress and strain (linear, lateral, shear and volumetric), Hooke's law, elastic constants and their relationship, stress-strain diagrams for brittle, elastic and plastic materials, generalized Hooke's law.
Analysis of axially loaded members: Stresses, strains and deformations of the structures under concentrated loads, self-weight and temperature changes.
Unit-III Shear Force and Bending Moment Diagram (7 hrs)
Concept of shear force diagram (SFD) and bending moment diagram (BMD) for different beams under various types of loading. Stresses due transverse loading on beams (bending and shear stresses), concept of shear stresses due to twisting moment (Torsion).
Unit-IV Principal Stresses and Strains (7 hrs)
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-V Axially and Eccentrically Loaded Columns (6 hrs)
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. Stress-strain relationship for brittle and ductile materials (Concrete Cube and Steel Bars).
2. Shear test on Concrete.
3. Compression test on timber/mortar Cube
4. Bending test on concrete beam/timber/plywood.
5. Compressive strength test on bricks
6. Flexural strength of flooring/roofing tiles.
7. Experimental and analytical study of behaviour of struts with various end conditions.
8. To determine elastic properties of a beam.
9. Experimental and analytical study of an elastically coupled beam.

10. Sway in portal frames - demonstration.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

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, Pergaman 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:

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

CO1. Define static indeterminacy and kinematic indeterminacy of structures, apply methods of analysis and be able to analyse trusses.

CO2. Understand the stress strain behaviour of brittle and ductile materials, State of Stress and also able to define the relationship between various elastic constants.

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.

Program Specific Course

Course Code	**:**	**CSPC 100/ITPC 100**
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 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.

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.

B.Tech. (Electrical Engineering)

Program Core: PC

Course Code	EEPC101
Course Title	Electric Circuit Theory
Number of Credits	4-0-0=4
Prerequisites (Course Code)	---
Course category	PC

COURSE OBJECTIVES:

OBJ1: To understand behaviour of Electric Circuit elements
OBJ2: To understand concept of poles, zeros, frequency response, and Laplace transforms of electrical networks
OBJ3: To understand standard signals, sources and its transformation, and apply network theorems to solve electrical circuits
OBJ4: To understand and analyse magnetically coupled circuits and their electrical circuit equivalence, Analyses of DC/AC circuits transient behaviour, and resonance in the circuits
OBJ5: To analyse and determine multi-port networks, their characteristics, parameters, and characteristic impedances

Course Content

UNIT-I Mathematical Preliminaries
Introduction to linear time invariant differential equations, free and forced solutions for simple electrical networks, Study of Laplace transform, its various properties and inverse Laplace transform, Introduction to the concept of network poles and zeros, frequency response. Introduction to graph theory.

UNIT-II Network Graphs and Network Theorems
Classification of circuits, sources and signals, standard signals, source transformations, Network topology, graph matrices, network ports, 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.

Test Books:

1. W. H. Hayt, J. E. Kemmerley, J. D. Phillips and S. M. Durbin, "Engineering Circuit Analysis", 9th Edition, McGraw Hill, New Delhi.
2. M. E. Van Valkenburg and T. S. Rathore, "Network Analysis", Revised 3rd 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", Textbook,
6. M Nahvi, Joseph Edminister, K Rao, "Electric Circuits, Schaum's Outline Series", 1 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

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT

ECPC-101 CIRCUIT THEORY

(B.Tech. ECE & IIOT)

Pre-requisite: Mathematics (MAIR-11)

L	T	P	Credits	Total contact hours
3	0	2	4	

Brief Description about the course:

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 current and node voltage method of analysis for D.C and A.C. circuits – Initial conditions. Network reduction: voltage and current division, source transformation – star delta conversion. Theorems: Thevenin's and 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 – Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – 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 Transfer Function.

UNIT IV

TWO–PORT NETWORKS

ONE–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 th edition, New Delhi, 2003.

2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGrawHill, New Delhi, 2001. 4th ED

3. M.E. Van Valkenburg, Ahmed Rumel, "Network Analysis", Prentice-Hall of India Pvt.Ltd.; 3rd edition

Course outcomes:

On completion of this course, you should be able to:

CO 1. Apply KCL and KVL in electrical circuits to calculate currents, voltages and powers in typical linear electric circuits
CO 2. Apply circuit theorems and reduce more complicated circuits into the Thevenin's and Norton's equivalent circuits.
CO 3. Analyze AC and DC Circuits.
CO 4. Describe circuit elements in phasor domain and perform steady-state analysis using phasors.
CO 5. Analyze resonance circuits and to develop transfer functions.
CO 6. To understand Two–Port networks and its parameters.

MECHANICAL ENGINEERING DEPARTMENT
MEPC- 103: THERMODYNAMICS

Pre-requisite: Nil

L	T	P	Credits	Total contact hours
3	1	0	4	4

Brief Description about the course

Thermodynamics, as a fundamental branch of physics, plays a crucial role in the field of Mechanical Engineering. While an engineer's education encompasses various areas of study, thermodynamics stands out by highlighting some of nature's fundamental physical laws: The First, Second, Third, and even the Zeroth Laws of Thermodynamics. For a mechanical engineer, achieving its comprehensive education involves grasping the essence of these basic laws, which is essential for true intellectual development. Moreover, for engineers, it becomes imperative to not only comprehend the essence but also apply these laws effectively in practical engineering scenarios.

UNIT I

Concepts of Thermodynamics: 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**.** **(4hrs)**

The First Law of Thermodynamics: 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 polytropic 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**.** **(6hrs)**

UNIT II

Properties of Fluids: 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 equation , Reduced equation of state, Generalized compressibility charts, Virial equation. Properties of ideal gas mixtures. (**12hrs)**

UNIT III

The Second Law of Thermodynamics**:** 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. (**10hrs)**

UNIT IV

General Thermodynamic Relations: 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. **(8hrs)**

Text Books/References

1. Rogers, GFC & Mayhew, Y.R, Engg. Thermodynamics, ELBS
2. Nag, P.K., Engg. Thermodynamics, TMH
3. Achuthan, M., Engg. Thermodynamics,TMH.
4. Cengel and Boles,Thermodynamics: An Engineering Approach, McGraw Hill, 8th edition, 2015.

Course Outcomes:

CO1: understand the basic concepts of thermodynamics such as heat, work, state etc.

CO2: identify the properties of substances on property diagrams and obtain the data from property tables.

CO3: apply First Law of Thermodynamics to open and closed systems

CO4: apply the Second Law of Thermodynamics and the concept of entropy to analyse the thermal efficiencies of heat engines.

MECHANICAL ENGINEERING DEPARTMENT
PIPC 101: MANUFACTURING PROCESSES

Pre-requisite: NIL

L	T	P	Credits	Total contact hours
4	0	0	4	52

Brief description about the course
It explores to an extensive view of manufacturing process techniques in different manufacturing environment and value addition of finished good products. The various manufacturing techniques such as Casting, semi-finished to finished products through machining operations, Forming, sheet metal operations and value enable welding techniques. It helps to understand the fundamental concepts and principles of different manufacturing process techniques and cost-effective selection decisions in different production environment requirements.

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 molding and injection molding, thermoforming molding, molding cycle time.

(**10 hrs)**

UNIT-II

Casting: Pattern materials, types of allowances, type of patterns, type of mould, desirable properties of molding 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.

(16 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 processes and operations: Introduction to shearing, blanking and punching, notching, trimming, lancing, nibbling, bending, stretching, embossing and coining, Sheet metal forming, Sheet metal cutting, Slitting Process.

(**12 hrs)**

UNIT-IV

Welding: definition and classification, thermite welding, electric arc welding: MMAW, SAW, TIG, MIG, gas welding, resistance welding, brazing and soldering, welding defects and remedies, factor affecting in sustainability in welding process.

(14 hrs)

NOTE:

The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

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.

Course Outcomes:

CO1: To understand the fundamental concepts of Manufacturing process techniques in different production environment.
CO2: To learn the various manufacturing defects and remedies in production environments
CO3: To understand the cost-effective and value enable manufacturing techniques selection in different industrial environments.
CO4: To understand the fundamental & sustainable welding techniques in different manufacturing environments.

Program Specific Course

Course Code	**:**	**AIPC 100**
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 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.

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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.

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.