SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade.
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23		I / IV - B.Tech. I - Semester							
ARTIFICIAL INTELLIGENCE & DATA SCIENCE									
SCHEME OF INSTRUCTION & EXAMINATION **(With effect from 2023-24 admitted Batch onwards)**									
Course Code	**Course Name**	**Category**	**L**	**T**	**P**	**Cr**	**C.I.E.**	**S.E.E.**	**Total Marks**
B23HS1101	Communicative English	HS	2	0	0	2	30	70	100
B23BS1101	Linear Algebra & Calculus	BS	3	0	0	3	30	70	100
B23BS1103	Chemistry	BS	3	0	0	3	30	70	100
B23CE1101	Basic Civil & Mechanical Engineering	ES	3	0	0	3	30	70	100
B23CS1101	Introduction to Programming	ES	3	0	0	3	30	70	100
B23IT1101	IT Workshop	ES	0	0	2	1	30	70	100
B23BS1105	Chemistry Lab	BS	0	0	2	1	30	70	100
B23ME1102	Engineering Workshop	ES	0	0	3	1.5	30	70	100
B23CS1102	Computer Programming Lab	ES	0	0	3	1.5	30	70	100
B23HS1104	Health and wellness, Yoga and sports	HS	0	0	1	0.5	100	0	100
		TOTAL	**14**	**0**	**11**	**19.5**	**370**	**630**	**1000**

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS1101	**HS**	**2**	**--**	**--**	**2**	**30**	**70**	**3 Hrs.**

COMMUNICATIVE ENGLISH

(Common to all Programmes of Engineering)

Course Objectives:

1.	Facilitate effective Listening, Reading, Speaking and Writing skills among the students.
2.	Focus on the techniques of reading for better comprehension of academic texts and authentic materials.
3.	Provide knowledge of grammatical structures and vocabulary for the effective use of language in real-life contexts.
4.	Enable the students draft the essays, summaries, letters, e-mails, resume/CVs.
5.	Enhance LSRW skills to comprehend the audio/visual discourses, to develop presentation skills, to foster comprehending abilities and to equip the students with the mechanics of writing discourses.

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

S. No	Outcome	Knowledge Level
1.	**Identify** the context, topic, and thematic information from social or transactional dialogues and texts and construct textual discourses.	K4
2.	**Analyze** diverse literary genres from both semantic and syntactic perspectives, enhance vocabulary and develop proficiency in various writing styles.	K4
3.	**Analyze** grammatical structures to formulate sentences which helps better summarization of the texts.	K4
4.	**Integrate** an essay, a resume, a letter, and an E-mail message.	K4
5.	**Appraise** reading/listening texts, draft an essay, and write summaries based on global comprehension of the texts.	K4

SYLLABUS

UNIT-I (10Hrs)	**Lesson: HUMAN VALUES:** Gift of Magi (**Short Story**) **Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies, and interests introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation, Parts of Sentences. **Grammar:** Parts of Speech, Basic Sentence Structures, forming questions **Vocabulary:** Affixes (Prefixes/Suffixes), Root words, Synonyms, Antonyms.

UNIT-II **(10 Hrs)**	**Lesson: NATURE: The Brook by Alfred Tennyson (Poem)** **Listening:** Answering a series of questions about main ideas and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by formal, structured short talks/presentations. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Structure of a paragraph - Paragraph writing (specific topics) **Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions. **Vocabulary:** Homonyms, Homophones, Homographs.
UNIT-III **(10 Hrs)**	**Lesson: BIOGRAPHY: Elon Musk** **Listening:** Listening for global comprehension and summarizing the texts. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed. **Reading:** Reading the texts in detail by making basic inferences-recognizing and interpreting specific context-specific clues; strategies to use textual signs for comprehension. **Writing:** Summarizing, Note-making, Paraphrasing **Grammar:** Verbs-tenses; subject-verb agreement; Compounding, Collocational possibility. **Vocabulary:** Words often confused, Jargons
UNIT-IV **(10 Hrs)**	**Lesson: INSPIRATION: The Toys of Peace by** Saki **Listening:** Making predictions while listening to conversations/ transactional dialogues with and without audio/video. **Speaking:** Role plays for practice in functional and academic contexts -asking for and giving information/directions. **Reading:** Studying the importance of graphical representation - information transfer in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Significance and types of Letter Writing: Official Letters, Resume writing. **Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice **Vocabulary:** Compound words, Collocations.
UNIT-V **(10 Hrs)**	**Lesson: MOTIVATION:** The Power of Intrapersonal Communication (An Essay) **Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension from audio/video resources. **Speaking:** Formal oral presentations on topics from academic contexts **Reading:** Reading comprehension. **Writing:** Writing structured essays on specific topics. **Grammar:** Editing short texts–identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement, punctuation) **Vocabulary:** Technical Jargons

Textbooks:	
1.	Pathfinder: Communicative English for Undergraduate Students,1stEdition, Orient Black Swan, 2023 (Units1,2 & 3)
2.	Empowering with Language by Cengage Publications, 2023(Units4 &5)
Reference Books:	
1.	Dubey, ShamJi &Co. English for Engineers, Vikas Publishers, 2020
2.	Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3.	Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4.	Lewis, Norman. Word Power Made Easy-The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.
e-Resources:	
Grammar:	
1.	www.bbc.co.uk/learningenglish
2.	https://dictionary.cambridge.org/grammar/british-grammar/
3	www.eslpod.com/index.html
4	https://www.learngrammar.net/
5	https://english4today.com/english-grammar-online-with-quizzes/
6	https://www.talkenglish.com/grammar/grammar.aspx
Vocabulary:	
1	https://www.youtube.com/c/DailyVideoVocabulary/videos
2	https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS1101	BS	3	--	--	3	30	70	3 Hrs.

LINEAR ALGEBRA & CALCULUS

(Common to all Programmes of Engineering)

Pre-requisites: Calculus of functions of a single variable and Matrices.

Course Objectives: Student will learn

1	Concepts of linear algebra and methods of solution of linear simultaneous algebraic equations.
2	Eigen values, Eigen vectors and quadratic forms.
3	Problems and applications of Mean value theorems
4	Application of partial differentiation for determining maxima/minima of functions.
5	Concepts of double, triple integrals and its applications.

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

S.No	Outcome	Knowledge Level
1	**Solve** a given system of linear algebraic equations	K3
2	**Develop** the matrix algebra techniques that are needed by engineers for practical applications.	K3
3	**Utilize** mean value theorems for real life problems	K3
4	**Apply** the concept of partial differentiation in various engineering applications	K3
5	**Evaluate** double, triple integrals and their applications.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Matrices** Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method. System of linear equations: Consistency and solution of Homogeneous and Non-Homogeneous equations, Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.
UNIT-II (10Hrs)	**Eigen values, Eigenvectors and Orthogonal Transformation** Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.
UNIT-III (10Hrs)	**Calculus** Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT-IV (10Hrs)	**Partial differentiation and Applications (Multi variable calculus)** Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers, Differentiation under integral sign.
UNIT-V (10Hrs)	**Multiple Integrals (Multi variable Calculus)** Double integrals, change of order of integration, triple integrals, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text Books:	
1.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2.	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:	
1.	Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, PearsonPublishers, 2018, 14th Edition.
2.	Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, AlphaScience International Ltd., 2021 5th Edition(9th reprint).
3.	Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5thEdition.
4.	Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9thedition
5	Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. ChandPublications,2014, Third Edition (Reprint 2021)

e-Resources	
1.	https://nptel.ac.in/courses/111101115
2.	https://nptel.ac.in/courses/111104085
3.	https://nptel.ac.in/courses/111104092

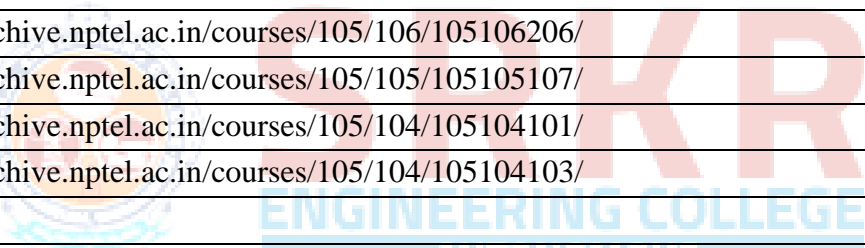| Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS1103	BS	3	--	--	3	30	70	3 Hrs.

CHEMISTRY

(Common to AIDS, AIML, CSBS, CSG & CIC)

Course Objectives:

1.	Familiarize the students with different application-oriented topics like new generation engineering materials, storage devices, different instrumental methods etc
2.	Lay the foundation for practical application of chemistry in engineering aspects
3.	Impart technological aspects of applied chemistry

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

S.No	Outcome	Knowledge Level
1.	**Apply** the knowledge of electrochemistry principles **to design** energy storage devices and **understanding** the principle, mechanism of corrosion and utilization of various techniques to control corrosion.	K3
2.	**Design and construct** engineering products like semiconductors, solar cells, and nanomaterials for societal applications	K3
3.	**Analyze** atomic, molecular orbitals of organic, inorganic molecules to identify structure, bonding, molecular energy levels**.**	K4
4.	**Develop** polymer composites, synthetic polymers and formulation of polymers and their **use in design** for sustainable development.	K3
5.	**Utilize** the principles of spectroscopic technique and instrumental techniques in **analyzing** the structure and properties of molecules	K3

SYLLABUS

UNIT-I **(10Hrs)**	**Electrochemistry and Applications** Electrodes–electrode potential, determination of electrode potential by calomel electrode, electrochemical cell, Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell- Polymer Electrolyte Membrane Fuel cells (PEMFC). **Electrochemical sensors** – potentiometric sensors with examples, amperometric sensors with examples. **Corrosion:** Introduction to corrosion, metal oxide formation by dry corrosion, Pilling Bedworth ratios and uses, electrochemical theory of corrosion, galvanic corrosion, differential aeration cell corrosion, Factors affecting the corrosion, cathodic protection- sacrificial anodic method-impressed current cathodic protection method- and anodic protection-galvanizing, tinning, and electroplating of copper and silver.
UNIT-II **(10 Hrs)**	**Modern Engineering materials** **Semiconductors** – Introduction, basic concept- intrinsic, extrinsic, and compound semi-

	conductors, application **Solar Cell:** construction and working of a solar cell **Super conductors**-Introduction basic concept (Type-1 and Type-2), applications. **Nanomaterials:** Nanometals and nanometal oxides, chemical methods of preparation of nanometals and metal oxides -sol-gel method, chemical precipitation method and biological methods (plant material derived synthesis), Properties and applications of nanomaterials – catalysis, medicine, sensors, etc(Any five applications).
UNIT-III **(10 Hrs)**	**Structure and Bonding Models:** Fundamentals of Quantum mechanics, Schrodinger Wave equation (time independent), significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, N_2. π-molecular orbitals of butadiene and benzene, calculation of bond order.
UNIT-IV **(10 Hrs)**	**Polymer Chemistry** Introduction to polymers, chain growth polymerization with specific examples and mechanism (free radical addition) of polymer formation. Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, Kevlar. Elastomers–Buna-S, Buna-N–preparation, properties, and applications. Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).
UNIT-V **(10 Hrs)**	**Instrumental Methods and Water Analysis** Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Hard water and soft water-Determination of total hardness by EDTA method, Determination of Dissolved oxygen by Winkler's method

Textbooks:

1.	Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013
2.	A text book of applied chemistry (for first year B.Tech students) by IV Kasi Viswanath, Bhagavathula S Diwakar, B. Govindh, IIP Publishers, Banglore, 2021

Reference Books:

1.	H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2.	A textbook of Engineering Chemistry by Shika Agarwal
3.	Fernandez, A., Engineering Chemistry, Owl Book Publishers, ISBN 9788192863382
4.	Manjooran K. S., Modern Engineering Chemistry, Kannatheri Publication
5.	Kaurav, Engineering Chemistry with Laboratory Experiments. PHI, ISBN 9788120341746
6.	Wiley India, Engineering Chemistry, ISBN 978812654320
7.	Skoog and West, Principles of Instrumental Analysis, 6/e,Thomson,2007.
8.	K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc

	Graw Hill Education (India) Pvt Ltd, New Delhi 2016
9.	M. J. Sienko, R. A. Plane, Chemistry: Principles and Applications, 3rd ed., McGraw-Hill publishers, 1980

e-Resources

1.	L. Tembe, Kamaluddin, M. S. Krishnan, Engineering Chemistry (NPTEL Web-book) http://nptel.ac.in/downloads/122101001/
2.	https://home.iitk.ac.in/~mohite/Composite_introduction.pdf
3.	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fsriindu.ac.in%2Fwp-content%2Fuploads%2F2019%2F03%2F1-Electrochemistry-Batteries.pptx&wdOrigin=BROWSELINK

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CE1101	ES	3	--	--	3	30	70	3 Hrs.

BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to AIDS, AIML, CE, CSBS, CSG, CIC & ME)
PART A: BASIC CIVIL ENGINEERING

Course Objectives:

1.	Get familiarized with the scope and importance of Civil Engineering sub-divisions
2.	Introduction to basic civil engineering materials and construction techniques.
3.	Introduce the preliminary concepts of surveying.
4.	Acquire preliminary knowledge on Transportation and its importance in nation's economy.
5.	Get familiarized with the importance of quality, conveyance and storage of water.

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

S.No	Outcome	Knowledge Level
1.	**Identify** various sub-divisions within Civil Engineering, recognize their contributions to society, and utilize their understanding of the fundamental properties and attributes of Civil Engineering Materials to experiment with and apply prefabricated technology	K3
2.	**Apply** their understanding of the fundamental concepts of surveying by effectively utilizing the knowledge of measuring distances, angles, and levels as integral components in the surveying process	K3
3.	**Identify** the significance of Transportation in a nation's economy, recognize the engineering measures associated with it, and appreciate the importance of Water Storage and Conveyance Structures, fostering an understanding of social responsibilities related to water conservation	K3

SYLLABUS

UNIT-I (8 Hrs)	**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering- Scope of each discipline - Building Construction and Planning- Construction Materials- Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.
UNIT-II (8 Hrs)	**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.
UNIT-III (8 Hrs)	**Transportation Engineering** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple

	Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. **Water Resources and Environmental Engineering**: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Textbooks:	
1.	Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2.	Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.

Reference Books:	
1.	Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2.	Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3.	Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4.	Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5.	Indian Standard DRINKING WATER — Specification IS 10500-2012

e-Resources	
1.	https://archive.nptel.ac.in/courses/105/106/105106206/
2.	https://archive.nptel.ac.in/courses/105/105/105105107/
3.	https://archive.nptel.ac.in/courses/105/104/105104101/
4.	https://archive.nptel.ac.in/courses/105/104/105104103/

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives:	
1.	Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2.	Explain different engineering materials and different manufacturing processes.
3.	Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

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

S.No	Outcome	Knowledge Level
1.	**Apply** the use of engineering materials and importance of Mechanical Engineering in diverse sectors and industries.	K3
2.	**Apply** the Working of basic thermal engineering systems and different manufacturing processes.	K3
3.	**Illustrate** the basic operation of power plants and fundamentals of different mechanical power transmission systems, robotics, and their applications.	K3

	SYLLABUS
UNIT-I (8 Hrs)	**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Engineering Materials -** Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.
UNIT-II (8 Hrs)	**Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing and Smart manufacturing. **Thermal Engineering –** Working principle of Cochran and Babcock & Wilcox Boilers, Working of basic principle of domestic refrigerator and air-conditioner, IC engines classification-2-Stroke, 4-Stroke, SI/CI Engines, Introduction to Hybrid and Electric Vehicles.
UNIT-III (8 Hrs)	**Power plants –** Working principle of Steam, Diesel, Nuclear power plants. **Mechanical Power Transmission -** Belt Drives, Chain, Rope drives, Gear Drives and their applications. **Introduction to Robotics -** Joints & links and applications of robotics.

(**Note**: The course covers only the **basic principles** of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the **fundamentals** of the course)

Textbooks:

1.	An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.
2.	G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

Reference Books:

1.	Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2.	3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3.	Elements of Workshop Technology Vol-1 by S.K Hajra Choudhury &Nirjhar Roy, MPP Pvt. Ltd.
4.	Thermal Engineering by R K Rajput, Laxmi Publications Pvt. Ltd.
5.	Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
6.	Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
7.	Material science &Metallurgy by O.P.Khanna, Dhanpat Rai Publications
8.	Electric and Hybrid Vehicles by A.K.Babu, Khanna books,2nd Edition
9.	A course in Power Plant Engineering /Arora and Domkundwar/Dhanpatrai& Co.

e-Resources

1.	https://onlinecourses.nptel.ac.in/noc23_me78/preview?use
2.	https://onlinecourses.nptel.ac.in/noc23_me101/preview?user

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS1101	**ES**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

INTRODUCTION TO PROGRAMMING

(Common to AIDS, AIML, CSBS, CSG, CSE, CSIT, CIC, IT)

Course Objectives:

1.	Familiarize students with programming concepts such as data types, control structures, functions, and arrays.
2.	Gain knowledge of the operators, selection and repetition statements in C.
3.	Understand and Apply different programming concepts to deal with real world problems.

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

S.No	Outcome	Knowledge Level
1.	**Explain** fundamentals of computer, programming languages. **Use** appropriate data types for storing data and **choose** the operators for writing complex expressions in C.	K3
2.	**Make use of** Decision Making and Looping statements to **Solve** various problems in C.	K3
3.	**Solve** problems using Arrays and Strings for efficiently accessing homogenous data.	K3
4.	**Develop** programs using pointers, structures and unions.	K3
5.	**Develop** programs to handle functions for reusability and redundancy. **Apply** file-handling functions to read/write data to files.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Computer and Computer Languages:** History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Flow charts; Algorithms, Pseudo code. **Introduction to C Programming:** Data types, Key words; Variables and Constants; Format-Specifiers, basic input and output statements; Operators: Arithmetic, relational, logical operators; Assignment, increment, decrement, conditional operators; Bitwise and special operators, operator precedence and associativity, type conversion.
UNIT-II (10 Hrs)	**Control Structures:** **Decision Making statements:** Simple if, if-else; nested if, else-if ladder; Switch-Case **Looping Statements:** While loop; Do-while loop; For loop; Comparison of while, do-while and for; Nested loops; Break and continue.

UNIT-III **(10 Hrs)**	**Arrays:** Introduction to Arrays, one dimensional Arrays; two dimensional Arrays; Applications of 1D-Arrays: Bubble Sort; Insertion Sort; Selection Sort; Linear Search and Binary Search; Applications of 2D-Arrays: Matrix Addition; Matrix Multiplication and Transpose; **Strings:** Introduction to Strings; string handling functions; Implementation of string copy and string concatenation without using string library functions.
UNIT-IV **(10 Hrs)**	**Structures and Unions:** Structures, Accessing elements of a structure, Array of structures; pointer to structure; Unions, Compare structures and unions; Bit fields; **Pointers:** Pointers, dereferencing and address operators, Pointer arithmetic; Accessing array elements using pointers;
UNIT-V **(10 Hrs)**	**Functions:** Functions, Declaration, Definition, call; Actual and formal parameters, return values; Call by value, call by reference; passing and returning pointers through functions; Passing arrays to functions; Dynamic memory allocation, malloc(), calloc(), realloc(), free(), storage classes; Command line arguments. **File Handling:** Files, file streams, file types; File modes of operation; Functions for reading from a files; Functions to write data to a file; Random file access functions; Macros

Textbooks:

1.	"The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1988
2.	Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1.	Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2.	Programming in C, RemaTheraja, Oxford, 2016, 2nd edition
3.	C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

e-Resources

1.	https://wwww.w3schools.com/c/c intro.php
2.	https://wwww.geeksforgeeks.org/ c-programming-language/
3.	https://wwww.hackerrank.com/domains/c

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23IT1101	**ES**	--	--	**2**	**1**	**30**	**70**	**3 Hrs.**

IT WORKSHOP

(Common to all Programmes of Engineering)

Course Objectives:

1	To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2	To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3	To teach basic command line interface commands on Linux.
4	To teach the usage of Internet for productivity and self-paced life-long learning
5	To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

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

S.No	Outcome	Knowledge Level
1	**Identify** various hardware components of a personal computer and perform assembly and disassembly.	K3
2	**Install** Windows and Linux Operating Systems and configure basic network, internet and security settings.	K3
3	**Demonstrate** skill in usage and basic security configurations of browsers.	K3
4	**Create** documents and presentations, use spreadsheet applications for data storage and analysis.	K4
5	**Use** Chat GPT to Create stories, translate languages, and prompt engineering features.	K3

SYLLABUS

1	**PC Hardware & Software Installation** **Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2	**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
3	**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
4	**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

5	**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva
6	**Internet & World Wide Web** **Task 1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
7	**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
8	**Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
9	**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.
10	**LaTeX and WORD** **Task 1:** Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
11	**Task 2:** Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.
12	**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
13	**Task 4:** Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.
14	**EXCEL** **Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources. **Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.
15	**Task 2:** Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

16	**LOOKUP/VLOOKUP** **Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting, VLOOKUP, HLOOKUP, Match & Index LOOKUP functions.
17	**POWER POINT** **Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.
18	**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
19	**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.
20	**AI TOOLS – ChatGPT** **Task 1: Prompt Engineering:** Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. • **Ex:** Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
21	**Task 2: Creative Writing:** Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas. • **Ex:** Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
22	**Task 3: Language Translation:** Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. • **Ex:** Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:	
1	Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2	The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4	PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5	LaTeX Companion, Leslie Lamport, PHI/Pearson.
6	IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7	IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3 rd edition

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS1105	BS	--	--	2	1	30	70	3 Hrs.

CHEMISTRY LAB

(Common to AIDS, AIML, CSBS, CSG & CIC)

Course Objectives:

1	To impart a scientific approach and to familiarize the applications of chemistry in the field of technology.
2	To familiarize the students with different application-oriented topics like new generation engineering materials, storage devices, different instrumental methods etc. To develop analytical thinking abilities and skills for sustainable development.

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

S.No	Outcome	Knowledge Level
1	**Apply** the application of theoretical knowledge to perform experiments and techniques used in chemistry laboratory for volumetric analysis; redox titrations with different indicators and an ability to use instrumental techniques for chemical analysis	K3
2	**Develop** problem solving ability to justify choice of chemicals and materials and to acquire the skill for the preparation of engineering materials like polymers	K3
3	**Measure** chemical parameters to solve problems in chemical sciences both individually and in teams by **analyzing** and **interpreting** data from a range of sources	K4
4	**Develop** the latest technologies in the field of nanotechnology, energy storage systems and sustainable development	K3

SYLLABUS

1	Determination of hardness of a ground water sample
2	Estimation of Dissolved Oxygen by Winkler's method
3	Determination of Strength of an acid in Pb-Acid battery
4	Estimation of Ferrous Iron by Dichrometry
5	Conductometric titration of strong acid vs. strong base
6	Potentiometry - determination of redox potentials and emfs
7	Determination of pH for water and soil samples
8	Preparation of a polymer (Bakelite)
9	Preparation of nanomaterials by precipitation method
10	Preparation of printed circuit board (PCB)
11	Determination of cell constant and conductance of solutions
12	Verify Lambert-Beer's law

Reference Books:	
1	"Vogel's Quantitative Chemical Analysis 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar
2	Engineering Chemistry Manual -Developed by Faculty of Chemistry, SRKR Engineering College (Within College Circulation)
3	Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited.
4	Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23ME1102	ES	--	--	3	1.5	30	70	3 Hrs.

ENGINEERING WORKSHOP

(Common for AIDS, AIML, CE, CSBS, CSG, CIC & ME)

Course Objectives:

1.	To familiarize students with Wood working, Fitting & Sheet metal operations.
2.	To acquire basic knowledge on tools and equipment used in Foundry, Arc welding, plumbing, etc.

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

S.No	Outcome	Knowledge Level
1.	**Observe** safety precautions, select suitable tools and **practice** on preparing various components in Wood working & Fitting Trades.	K3
2.	**Analyze** the dimensions to be marked and prepare the sheet metal components.	K4
3.	**Examine** the tools and equipment used in Foundry & Arc welding methods.	K3
4.	**Choose** various tools and accessories to prepare pipe joints, change of two-wheeler tyre etc.	K3

SYLLABUS

1.	Demonstration and explanation of **Safety practices and precautions** to be observed in workshop.
2.	**Wood Working:** Familiarity with different types of woods and tools used in wood carpentry and make following joints. a) Corner halving Joint b) Dovetail halving joint c) Mortise & Tenon Joint
3.	**Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises. a) Triangular fit b) Rectangular fit c) Semi-circular fit
4.	**Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a) Straight pipe b) Square tray c) Frustum of cone
5.	**Foundry Trade:** Demonstration on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
6.	**Welding Shop**: Demonstration on Arc Welding method and Preparation of Lap joint and Butt joint.
7.	**Plumbing:** Demonstration and practice of Plumbing tools, Preparation of pipe joints with coupling for same diameter and with reducer for different diameters.
8	Demonstration on Bicycle tire puncture and change of two-wheeler tyre.

Text Books:	
1.	Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015
2.	A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017
Reference Books:	
1.	Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2.	Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3.	Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS1102	ES	--	--	3	1.5	30	70	3 Hrs.

COMPUTER PROGRAMMING LAB

(**Common to AIDS, AIML, CSBS, CSG, CSE, CSIT, CIC & IT**)

Course Objectives:

1	To be familiar with the programming concepts of C Language.
2	To provide hands on experience with coding and debugging.
3	To foster logical thinking and problem-solving skills using programming.

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

S.No	Outcome	Knowledge Level
1	**Develop** C Programs with utilize memory efficiently using various programming constructs.	K3
2	**Select** appropriate control structure to **Solve** real world problems.	K4
3	**Solve** various complex problems using Modular Programming skills.	K4
4	**Develop**, Debug and Execute programs that demonstrate the applications of arrays, functions, basic concepts of pointers in C.	K4

SYLLABUS

1	**WEEK 1**
	Objective: Getting familiar with the programming environment on the computer and writing the first program.
	Suggested Experiments/Activities:
	Tutorial 1: Problem-solving using Computers.
	Lab1: Familiarization with programming environment
	   i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
	   ii) Exposure to Turbo C, gcc
	   iii) Writing simple programs using printf(), scanf()

2	**WEEK 2**
	Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
	Suggested Experiments /Activities:
	Tutorial 2: Problem-solving using Algorithms and Flow charts.
	Lab 1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs
	   i) Sum and average of 3 numbers
	   ii) Conversion of Fahrenheit to Celsius and vice versa
	   iii) Simple interest calculation

3	**WEEK 3**
	Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
	Suggested Experiments/Activities:
	Tutorial 3: Variable types and type conversions:
	Lab 3: Simple computational problems using arithmetic expressions.
	   i) Finding the square root of a given number
	   ii) Finding compound interest
	   iii) Area of a triangle using heron's formulae
	   iv) Distance travelled by an object

4	**WEEK 4**
	Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
	Suggested Experiments/Activities:
	Tutorial 4: Operators and the precedence and as associativity:
	Lab4: Simple computational problems using the operator' precedence and associativity
	   i) Evaluate the following expressions.
	        a. A+B*C+(D*E) + F*G
	        b. A/B*C-B+A*D/3
	        c. A+++B---A
	        d. J= (i++) + (++i)
	   ii) Find the maximum of three numbers using conditional operator
	   iii) Take marks of 5 subjects in integers, and find the total, average in float

5	**WEEK 5**
	Objective: Explore the full scope of different variants of "if construct" namely if-else, null else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
	Suggested Experiments/Activities:
	Tutorial 5: Branching and logical expressions:
	Lab 5: Problems involving if-then-else structures.
	   i) Write a C program to find the max and min of four numbers using if-else.
	   ii) Write a C program to generate electricity bill.
	   iii) Find the roots of the quadratic equation.
	   iv) Write a C program to simulate a calculator using switch case.
	   v) Write a C program to find the given year is a leap year or not.

6	**WEEK 6**
	Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
	Suggested Experiments/Activities:
	Tutorial 6: Loops, while and for loops
	Lab 6: Iterative problems e.g., the sum of series
	    i) Find the factorial of given number using any loop.
	    ii) Find the given number is a prime or not.
	    iii) Compute sine and cos series
	    iv) Checking a number palindrome
	    v) Construct a pyramid of numbers.

7	**WEEK 7:**
	Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.
	 Suggested Experiments/Activities:
	Tutorial 7: 1 D Arrays: searching.
	Lab 7:1D Array manipulation, linear search
	    i) Find the min and max of a 1-D integer array.
	    ii) Perform linear search on1D array.
	    iii) The reverse of a 1D integer array
	    iv)Find 2's complement of the given binary number.
	    v) Eliminate duplicate elements in an array

8	**WEEK 8:**
	Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
	Suggested Experiments/Activities: Tutorial 8: 2 D arrays, sorting and Strings.
	Lab 8: Matrix problems, String operations, Bubble sort
	    i) Addition of two matrices
	    ii) Multiplication two matrices
	    iii) Sort array elements using bubble sort
	    iv) Concatenate two strings without built-in functions
	    v) Reverse a string using built-in and without built-in string functions

9	**WEEK 9:**
	
	Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C
	
	Suggested Experiments/Activities:
	
	Tutorial 9: Pointers, structures and dynamic memory allocation
	
	Lab 9: Pointers and structures, memory dereferences.
	
	   i) Write a C program to find the sum of a 1D array using malloc()
	   ii) Write a C program to find the total, average of n students using structures
	   iii) Enter n students data using calloc() and display failed students list
	   iv) Read student name and marks from the command line and display the student details along with the total.
	   v) Write a C program to implement realloc()

10	**WEEK 10:**
	
	Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
	
	Suggested Experiments/Activities:
	
	Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
	
	Lab10 : Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
	
	   i) Create and display a singly linked list using self-referential structure.
	   ii) Demonstrate the differences between structures and unions using a C program.
	   iii) Write a C program to shift/rotate using bitfields.
	   iv) Write a C program to copy one structure variable to another structure of the same type.

11	**WEEK 11:**
	
	Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
	
	Suggested Experiments/Activities:
	
	Tutorial 11: Functions, call by value, scope and extent,
	
	Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.
	
	   i) Write a C function to calculate NCR value.
	   ii) Write a C function to find the length of a string.
	   iii) Write a C function to transpose of a matrix.
	   iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

12	**WEEK 12:** **Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions. **Suggested Experiments/Activities:** **Tutorial 12:** Recursion, the structure of recursive calls **Lab 12:** Recursive functions i) Write a recursive function to generate Fibonacci series. ii) Write a recursive function to find the lcm of two numbers. iii) Write a recursive function to find the factorial of a number. iv) Write a C Program to implement Ackermann function using recursion. v) Write a recursive function to find the sum of series.
13	**WEEK 13:** **Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers **Suggested Experiments/Activities:** **Tutorial 13:** Call by reference, dangling pointers **Lab 13:** Simple functions using Call by reference, Dangling pointers. i) Write a C program to swap two numbers using call by reference. ii) Demonstrate Dangling pointer problem using a C program. iii) Write a C program to copy one string into another using pointer. iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.
14	**WEEK14:** **Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files. **Suggested Experiments/Activities:** **Tutorial 14:** File handling **Lab 14:** File operations i) Write a C program to write and read text into a file. ii) Write a C program to write and read text into a binary file using fread() and fwrite() iii) Copy the contents of one file to another file. iv) Write a C program to merge two files into the third file using command-line arguments. v) Find no. of lines, words and characters in a file vi) Write a C program to print last n characters of a given file.

Textbooks:

1	Ajay Mittal, Programming in C: A practical approach, Pearson.
2	Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2	C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS1104	HS	--	--	1	0.5	100	--	3 Hrs.

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to AIDS, AIML, CE, CSBS, CSG, CIC & ME)

Course Objectives:

To make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality

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

S.No	Outcome	Knowledge Level
1.	**Understand** the importance of yoga and sports for Physical fitness and sound health.	K2
2.	**Demonstrate** health-related fitness components.	K3
3.	**Compare** and contrast various activities that help enhance their health.	K3
4.	**Assess** current personal fitness levels.	K3
5.	**Develop** Positive Personality	K3

SYLLABUS

UNIT-I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community

ii) Preparation of health profile

iii) Preparation of chart for balance diet for all age groups

UNIT-II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT-III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i)   Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball,

	Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
ii)	Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1.	Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2.	T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3.	Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4.	Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5.	The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

Evaluation Guidelines:

1.	Evaluated for a total of 100 marks.
2.	A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
3.	A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
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SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23		I / IV - B.Tech. II - Semester							
ARTIFICIAL INTELLIGENCE & DATA SCIENCE									
SCHEME OF INSTRUCTION & EXAMINATION **(With effect from 2023-24 admitted Batch onwards)**									
Course Code	**Course Name**	**Category**	**L**	**T**	**P**	**Cr**	**C.I.E.**	**S.E.E.**	**Total Marks**
B23BS1201	Differential Equations & Vector Calculus	BS	3	0	0	3	30	70	100
B23BS1202	Engineering Physics	BS	3	0	0	3	30	70	100
B23EE1201	Basic Electrical and Electronics Engineering	ES	3	0	0	3	30	70	100
B23ME1201	Engineering Graphics	ES	2	0	2	3	30	70	100
B23CS1203	Data Structures	PC	3	0	0	3	30	70	100
B23BS1204	Engineering Physics Lab	BS	0	0	2	1	30	70	100
B23EE1202	Electrical and Electronics Engineering Workshop	ES	0	0	3	1.5	30	70	100
B23CS1204	Data Structures Lab	PC	0	0	3	1.5	30	70	100
B23HS1201	Communicative English Lab	HS	0	0	2	1	30	70	100
B23HS1203	NSS/NCC/Scouts & Guides/Community Service	HS	-	-	1	0.5	100	0	100
			14	**0**	**13**	**20.5**	**370**	**630**	**1000**

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23BS1201	BS	3	--	--	3	30	70	3 Hrs.

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Programmes of Engineering)

Pre-requisites: Calculus of functions of a single variable and geometry.

Course Objectives: Student will learn

1	First order ordinary differential equations and some simple geometrical and physical applications
2	Methods of solution of linear higher order ordinary differential equations.
3	Formation and solution of linear partial differential equations
4	Concepts of Gradient, divergence, curl.
5	Vector integral theorems.

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

S.No	Outcome	Knowledge Level
1	**Apply** the knowledge in simple applications such as Newton's law of cooling, orthogonal trajectories and simple electrical circuits	K3
2	**Solve** linear ordinary differential equations of second order and higher order and applications related to various engineering fields	K3
3	**Identify** the methods of solution for partial differential equations that model physical processes.	K3
4	**Interpret** the physical meaning of different operators such as gradient, curl and divergence.	K3
5	**Evaluate** the work done against a field, circulation and flux using vector calculus.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Differential equations of first order and first degree** Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Orthogonal Trajectories, Newton's Law of cooling – Law of natural growth and decay- Electrical circuits: RL & RC circuits.
UNIT-II (10Hrs)	**Linear differential equations of higher order (Constant Coefficients)** Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.
UNIT-III (10Hrs)	**Partial Differential Equations** Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's

	method. Homogeneous and Non-Homogeneous Linear Partial differential equations with constant coefficients.
UNIT-IV **(10Hrs)**	**Vector differentiation** Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient and applications, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.
UNIT-V **(10Hrs)**	**Vector integration** Line Integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Text Books:

1.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2.	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:

1.	Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2	Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3	Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4.	Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5	Higher Engineering Mathematics, B. V. Ramana, McGraw Hill Education, 2017

e-Resources :

1.	https://onlinecourses.nptel.ac.in/noc21_ma51/preview
2.	http://www.nitttrc.edu.in/nptel/courses/video/111107108/L29.html

Course Code	Category	L	T	P	C	C.I.E	S.E.E.	Exam
B23BS1202	BS	3	--	--	3	30	70	3 Hrs.

ENGINEERING PHYSICS

(Common for AIDS, AIML, CE, CSBS, CSG, CIC, ME)

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like Interference, Diffraction etc., enlightening the periodic arrangement of atoms in Crystalline Solids and concepts of Quantum mechanics, introduce novel concepts of Dielectric and Magnetic materials, Physics of Semiconductors.

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

S.No.	Outcome	Knowledge Level
1.	**Analyze** the intensity variation of light due to polarization, interference and diffraction.	K4
2.	**Familiarize** with the basics of crystals and their structures.	K3
3.	**Summarize** various types of polarization of dielectrics and classify the magnetic materials.	K3
4.	**Apply** the basic concepts of Quantum mechanics, free electron theory and fermi energy.	K3
5.	**Classify** the type of semiconductor using Hall effect.	K4

SYLLABUS

UNIT-I (10Hrs)	**Wave Optics** Interference: Introduction - Principle of superposition - Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index. Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit (Qualitative) & N-slits (Qualitative) - Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism - Half wave and Quarter wave plates.
UNIT-II (10 Hrs)	**Crystallography and X-ray diffraction** Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes. X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.
UNIT-III (10 Hrs)	**Dielectric and Magnetic Materials** Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability,

	Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mosotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss. Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, Anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.
UNIT-IV **(10 Hrs)**	**Quantum Mechanics and Free electron Theory** Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations - Particle in a one-dimensional infinite potential well. Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) Quantum free electron theory – Electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy.
UNIT-V **(10 Hrs)**	**Semiconductors** Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors - Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors - density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Textbooks:

1.	A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar & T V S Arun Murthy, S. Chand Publications, 11th Edition 2019.
2.	Engineering Physics, D. K. Bhattacharya & Poonam Tandon, Oxford Press 2015

Reference Books:

1.	Engineering Physics, B. K. Pandey & S. Chaturvedi, Cengage Learning 2021
2.	Engineering Physics, Shatendra Sharma, Jyotsna Sharma, Pearson Education 2018
3.	Engineering Physics, Sanjay D. Jain, D. Sahasrabudhe & Girish, University Press 2010
4.	Engineering Physics, M. R. Srinivasan, New Age International Publishers

e-Resources

1.	https://www.loc.gov/rr/scitech/selected-internet/physics.html

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23EE1201	ES	3	--	--	3	30	70	3 Hrs.

BASIC ELECTRICAL and ELECTRONICS ENGINEERING

(Common for AIDS, AIML, CE, CSBS, CSG, CIC, ME)

PART A: BASIC ELECTRICAL ENGINEERING

Course Objectives: Students will learn

1.	About the basic principles of Direct Current (DC) & Alternating Current (AC) Circuit analysis.
2.	About the fundamentals of Electric power generation and measuring instruments.
3.	About the Electrical Motors for Energy conversion and Electrical Safety.

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

S.No	Outcome	Knowledge Level
1.	**Apply** the circuit laws for the analysis of simple DC and AC Circuits.	K3
2.	**Illustrate** the working of major power generating plants and measuring instruments.	K3
3.	**Apply** the basic principles of energy conversion to understand the working of various electric motors and **illustrate** electric safety measures.	K3

SYLLABUS

UNIT-I (9Hrs)	**Direct Current (DC) & Alternating Current (AC) Circuits:** **DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law, Kirchoff's laws (KCL & KVL), series-parallel resistive circuits, Simple numerical problems with Voltage Sources. **AC Circuits:** A.C. Fundamentals, Sinusoidal voltages and currents, time period, frequency, amplitude, phase, phase difference, average value, RMS value of sinusoidal waveforms, Phasor representation of Voltages and currents, Concept of Impedance, Impedance of Series R-L, R-C and RLC circuits, Average power, Concept of power factor - **Simple Numerical problems.**
UNIT-II (9 Hrs)	**Electricity Generation and Measuring instruments** Construction and principle of 3 – phase Alternator, Transformer principle, Major sources of electricity generation: schematics of conventional power plants (Thermal and Hydro), Non-conventional sources (solar and wind). Measuring Instruments: Types, Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Single-phase Energy meter-Power rating of different household appliances and Electricity bill.
UNIT-III (9 Hrs)	**Electrical Energy Consumption and Safety Measures:** Major Electrical Loads, DC motor - Construction and Working principle, Torque equation, AC motor - Working principle of 3-phase Induction motor, slip - Other electrical

machines: Stepper motor, BLDC Motor.

Electrical Safety: Electric Shock, Safety Precautions to avoid shock, Earthing and its types Domestic protective device: Fuse, Miniature circuit breaker(MCB) and Earth leakage circuit breaker (ELCB).

Textbooks:

1.	Principles of Electrical and Electronics Engineering, V.K. Mehtha, S. Chand Technical Publishers, 2020
2.	Basic Electrical Engineering, Ritu SahDev, Khanna Publishers,2018, First Edition

Reference Books:

1.	Non-conventional Energy sources by G.D Rai, Khanna Publishers, 2009, Third Edition
2.	Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,Fourth Edition
3.	Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

e-Resources

1.	https://nptel.ac.in/courses/108105053
2.	https://nptel.ac.in/courses/108108076

PART – B: BASIC ELECTRONICS ENGINEERING

Course Objectives: Students will learn

1.	About the fundamentals of semiconductor devices and their applications.
2.	About the fundamentals of basic electronic circuits and instrumentation.
3.	About the fundamentals of Digital systems.

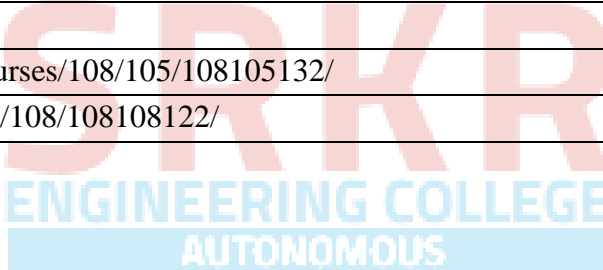**Course Outcomes:** At the end of the course students will be able to

S.No	Outcome	Knowledge Level
1.	**Illustrate** construction and working of Diodes & BJT.	K3
2.	**Apply** the knowledge of semiconductor devices to understand the working of rectifiers, voltage regulators and electronic instruments.	K3
3.	**Implement** simple digital logic circuits.	K3

SYLLABUS	
UNIT-I (9Hrs)	**Semiconductor Devices** Introduction – Types of semiconductor devices – Operation and Characteristics of PN Junction Diode, Zener Effect, Zener Diode and its Characteristics. Bipolar Junction Transistor -Principle of operation and CB, CE, CC Configurations— Elementary Treatment of Small Signal CE Amplifier.
UNIT-II (9 Hrs)	**Basic Electronic Circuits and Instrumentation** Rectifiers and power supplies: Block diagram description of a dc power supply, working and analysis of a Half wave and full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator.

	Electronic Instrumentation: Block diagram of an electronic instrumentation system, Digital Voltmeter (DVM), Cathode Ray Oscilloscope (CRO)
UNIT-III **(9 Hrs)**	**Digital Logic Fundamentals** Overview of Number Systems – Binary, Hexa-decimal and BCD numbers. Boolean Algebra - Basic Theorems - Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Clocked S-R and J-K Flip-flops, **Simple examples of two bit Registers and Counters.**

Textbooks:

1.	R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2.	Sanjeev Gupta & Santhosh Gupta, Electronic Devices & Circuit, Dhanpat Rai Publications,2010

Reference Books:

1.	Principles of Electrical and Electronics Engineering, V.K. Mehtha, S.Chand Technical Publishers, 2020
2.	R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3.	R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

e-Resources

1.	https://archive.nptel.ac.in/courses/108/105/108105132/
2.	http://nptel.ac.in/courses/108/108/108108122/

Course Code	Category	L	T	P	C	C.I.E	S.E.E	Exam
B23ME1201	**ES**	**2**	**--**	**2**	**3**	**30**	**70**	**3 Hrs**

ENGINEERING GRAPHICS

(Common for AIDS, AIML, CSBS, CSG, CSE, CSIT, CIC, IT)

Course Objectives:

1.	To bring awareness that Engineering drawing is the language of engineers
2.	To impart basic knowledge and skills required to prepare Engineering drawings.
3.	To develop the Engineering imagination essential for successful design.

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

S.No	Outcomes	Knowledge Level
1.	Utilize the fundamentals of drawing to **Sketch** polygons and engineering curves.	K3
2.	**Apply** principles of Orthographic projections to **Draw** the projections of points and lines.	K3
3.	Utilize the fundamentals of Orthographic projections to **Draw** the projections of planes.	K3
4.	Utilize the fundamental principles of Orthographic projections to **Sketch** projections of three-dimensional objects.	K3
5.	**Apply** principles of drawing to **Construct** sectional views and pictorial views of simple solids.	K3

SYLLABUS

UNIT-I (10Hrs)	**Geometrical Constructions and Engineering Curves:** **Introduction** to Engineering Drawing, Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. **Engineering Curves:** Parabola, Ellipse and Hyperbola by general method (Eccentricity method only), Cycloidal curves, Involutes, tangent & normal for these curves.
UNIT-II (10Hrs)	**Orthographic Projections:** Introduction to orthographic projection, Projections of a point situated in any one of the four quadrants. **Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to the other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight line inclined to both reference planes.
UNIT-III (10Hrs)	**Projections of planes**: Regular planes perpendicular to one reference plane and parallel to other, planes perpendicular to one reference plane and inclined to the other reference plane; planes inclined to both the reference planes.

UNIT-IV **(10Hrs)**	**Projections of Solids:** Types of solids- Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.
UNIT-V **(10Hrs)**	**Sections of Solids:** Sections and Sectional views of Right and Regular Solids – Prism, Cylinder, Pyramid and Cone – and True shape of section. **Isometric Projection:** Introduction to Isometric projection and Isometric projection of simple Right and Regular Solids – Prism, Cylinder, Pyramid and Cone. **Computer graphics**: Creating 2D&3D drawings of objects and Transformations using Auto CAD (Not for end examination).

Text Books:	
1.	Engineering Drawing by N.D Bhatt, Charotar Publications.
2.	Engineering Drawing– K Venugopal, V. Prabhu Raja, New Age

Reference Books:	
1.	Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
2.	Engineering Graphics for Degree by K.C. John, PHI Publishers.
3.	Engineering Graphics by PI Varghese, McGrawHill Publishers.
4.	Engineering Drawing by Agarwal &Agarwal, Tata McGraw Hill Publishers

e-Resources:	
1.	https://nptel.ac.in/courses/112103019/
2.	https://nptel.ac.in/courses/112104172/1

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS1203	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA STRUCTURES

(Common to AIDS, AIML, CSBS, CSG, CSE, CSIT, CIC & IT)

Course Objectives:

1.	Introduce the fundamental concept of data structures and abstract data types
2.	Emphasize the importance of data structures in developing and implementing efficient algorithms
3.	Describe how arrays, records, linked structures, stacks, queues, trees, and hashing are represented in memory and used by algorithms

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

S.No	Outcome	Knowledge Level
1.	**Explain** the role of linear data structures in organizing and accessing data efficiently in algorithms.	K3
2.	**Design**, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	K4
3.	**Develop** programs using stacks to handle recursive algorithms	K3
4	**Apply** queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.	K3
5	**Develop** novel solutions to small scale programming challenges involving data structures such as Trees and **Recognize** scenarios where hashing is advantageous, and design hash-based solutions	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Linear Data Structures:** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. **Searching Techniques:** Linear & Binary Search, **Sorting Techniques:** Bubble sort, Selection sort, Insertion Sort
UNIT-II (10 Hrs)	**Linked Lists: Singly linked lists:** representation **and operations**, doubly linked lists and circular linked lists, comparing arrays and linked lists, **Applications of linked lists:** Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List.
UNIT-III (10 Hrs)	**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, **Applications of stacks:** Infix to Postfix Conversion, Evaluating Postfix Expressions, Backtracking, Reversing list.

UNIT-IV (8 Hrs)	**Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in Circular Queues, Priority Queues, Multiple Queues. breadth-first search, scheduling. **Deques:** Introduction to deques (double-ended queues), Operations on deques and their applications- Palindrome checking, Applied as both stack and queue.
UNIT-V (12 Hrs)	**Trees:** Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal **Hashing:** Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching.

Text Books:	
1.	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2.	Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.
Reference Books:	
1.	Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sander
2.	C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3.	Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4.	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5.	Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick
e-Resources:	
1.	https://nptel.ac.in/courses/106102064

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS1204	BS	--	--	2	1	30	70	3 Hrs.

ENGINEERING PHYSICS LAB

(Common for AIDS, AIML, CE, CSBS, CSG, CIC, ME)

Course Objectives:

1	To impart hands on experience to the students entering engineering/technology education about handling equipment/instruments and use them in experimentation.
2	To make the students understand the theoretical aspects of various phenomena experimentally.

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

S.No	Outcome	Knowledge Level
1	Get hands on experience in setting up experiments and using the instruments/equipment individually and conduct experiments.	K3
2	Get introduced to using new/advanced technologies and understand their significance.	K3

LIST OF EXPERIMENTS

1	Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2	Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3	Verification of laws of series and parallel combination of resistances by Carey Foster's bridge method.
4	Determination of dielectric constant using charging and discharging method.
5	Study the variation of B versus H by magnetizing the magnetic materials (B-H curve).
6	Determination of wavelength of Laser light using diffraction grating.
7	Estimation of Planck's constant using photoelectric effect.
8	Determination of the resistivity of semiconductor by four probe method.
9	Determination of energy gap of a semiconductor using p-n junction diode.
10	Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11	Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12	Determination of temperature coefficient of a thermistor.
13	Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14	Determination of magnetic susceptibility by Kundt's tube method.
15	Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16	Sonometer: Verification of laws of stretched string.
17	Determination of Young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever method).
18	Determination of frequency of electrically maintained tuning fork by Melde's experiment.

	Reference Books:
1	Physics Laboratory Manual by Physics Department, SRKREC, Bhimavaram
2	Advanced Practical Physics vol 1 & 2 SP Singh & MS Chauhan, Pragati Prakasan, Meerut
3	A Text book of Practical Physics – S Balasubramanian & M N Srinivasan, S. Chand Publishers, 2017

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23EE1202	ES	--	--	3	1.5	30	70	3 Hrs.

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common for AIDS, AIML, CE, CSBS, CSG, CIC, ME)

PART – A: ELECTRICAL ENGINEERING WORKSHOP

Course Objectives: Student will learn

1	To verify Kirchhoff 's laws.
2	About the voltage build - up in a DC generator and transformation ratio of a 1-Φ transformer.
3	To measure various electrical quantities using different types of meters.
4	About electrical power generation using solar photovoltaic (PV) system.
5	About safety measures used in electrical systems.

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

S.No	Outcome	Knowledge Level
1	**Demonstrate** Kirchhoff 's laws and solar power generation with changing irradiance.	K3
2	**Examine** the functioning of safety equipment in electrical systems.	K4
3	**Use** electrical instruments for measuring electrical quantities.	K3
4	**Analyze** the Magnetization Characteristics to find the critical field resistance of DC Shunt generator and **examine** the transformation ratio of 1-Φ transformer.	K4

List of Experiments

1	Verification of KCL & KVL.
2	Magnetization characteristics of a DC Shunt Generator.
3	Measurement of Power and Power factor in single phase circuit.
4	Measurement of Earth Resistance using Megger.
5	Measurement of Electrical Energy consumed by Domestic Electrical Appliances.
6	Overload and Short circuit protection using Fuse / Miniature Circuit Breaker (MCB).
7	Measurement of Solar Power Output.
8	Transformation ratio test on a 1-Φ transformer.

Reference Books:

1	Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S. Chand Publications. Revised Edition 2017.
2	Chetan Singh Solanki - Solar photovoltaic technology and systems, Manual for Technicians, Trainers and Engineers-PHI Learning - 2013 – second edition.
3	Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

PART –B: ELECTRONICS ENGINEERING WORKSHOP

Course Objectives: Student will learn

1	About the characteristics and functioning of PN junction diode, Zener diode and transistor.
2	About full wave rectifiers with and without filter.

3	To verify the truth tables of various logic gates.
4	To verify the truth tables of various flip-flops.
5	About the use of Cathode Ray Oscilloscope (CRO).

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

S.No	Outcome	Knowledge Level
1	**Analyze the** v-i Characteristics of PN junction Diode and Zener diode.	K4
2	**Demonstrate** the Input – Output characteristics of transistor and its working as a switch.	K3
3	**Use** CRO to measure amplitude and frequency of given signal and display the output of full wave rectifier with and without filter.	K3
4	**Illustrate** the working of the logic gates and flipflops by verifying their truth tables.	K3

List of Experiments	
1	v-i characteristics of a PN Junction diode
2	v-i characteristics of a Zener Diode and its application as voltage Regulator.
3	Implementation of full wave rectifier with and without filter.
4	Input & Output characteristics of Bipolar Junction Transistor (BJT) in Common Emitter (CE) configuration.
5	Verification of logic gates using Integrated Circuits (ICs).
6	Verification of S-R and J-K flip flops using Integrated Circuits (ICs).
7	Transistor as a Switch.
8	Measurement of amplitude and frequency using CRO.

Reference Books:

1	Principles of Electronics Engineering, V.K Mehta, Rohit Mehta, S. Chand Publications. Revised Edition 2017
2	Digital Logic and Computer Design, Morris Mano, Pearson India, 2016.
3	R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS1204	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

DATA STRUCTURES LAB

(Common to AIDS, AIML, CSBS, CSG, CSE, CSIT, CIC & IT)

Course Objectives:

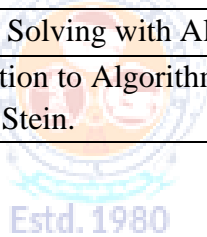|	
1.	Demonstrate the importance of data structures in developing and implementing efficient algorithms
2.	Describe how arrays, records, linked structures, stacks, queues, trees, and hashing are represented in memory and used by algorithms

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

S.No	Outcome	Knowledge Level
1	**Develop** the ability to **Design** linear data structures such as arrays and liked lists.	K4
2	**Develop** the ability to **Design** stacks to handle problems	K4
3	**Develop** the ability to **Design** Queue to handle problems	K4
4.	**Develop** the ability to **Design** Trees and their applications	K4
5.	**Develop** the ability to **Design** hash-based problems	K4

LIST OF EXPERIMENTS

1.	**Exercise-1: Array Manipulation** a) Write a program to reverse an array. b) C Programs to implement the Searching Techniques – Linear & Binary Search c) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort
2.	**Exercise-2: Linked List Implementation** a) Implement a singly linked list and perform insertion and deletion operations. b) Develop a program to reverse a linked list iteratively and recursively. c) Solve problems involving linked list traversal and manipulation.
3.	**Exercise-3:Linked List Applications** a) Create a program to detect and remove duplicates from a linked list. b) Implement a linked list to represent polynomials and perform addition.
4.	**Exercise -4: Double Linked List Implementation** a) Implement a doubly linked list and perform various operations to understand its properties and applications. b) Implement a circular linked list and perform insertion, deletion, and traversal.
5.	**Exercise -5: Stack Operations** a) Implement a stack using arrays and linked lists. b) Write a program to evaluate a postfix expression using a stack. c) Implement a program to check for balanced parentheses using a stack.
6.	**Exercise -6: Queue Operations** a) Implement a queue using arrays and linked lists.

	b) Develop a program to simulate a simple printer queue system. c) Solve problems involving circular queues. d) Implement a double-ended queue (dequeue) with essential operations.
7.	**Exercise -7: Stack and Queue Applications** a) Use a stack to evaluate an infix expression and convert it to postfix. b) Create a program to determine whether a given string is a palindrome or not. c) Implement a stack or queue to perform comparison and check for symmetry.
8.	**Exercise -8: Binary Search Tree** a) Implementing a BST using Linked List. b) Traversing of BST.
9.	**Exercise -9 Hashing** a) Implement a hash table with collision resolution techniques. b) Write a program to implement a simple cache using hashing.

Text Books:	
1.	Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.
2.	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
Reference Books:	
1.	Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sander.
2.	C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
3.	Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum.
4.	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS1201	HS	--	--	2	1	30	70	3 Hrs.

COMMUNICATIVE ENGLISH LAB

(For CE, ECE, EEE & ME)

Course Objectives: Students will

1	Attain the opportunity to encounter a range of self-instructional, learner-friendly methods for language acquisition.
2	Become accustomed to using Computer Assisted Language Learning (CALL), which equips them with the necessary tools to prepare for computer-based competitive exams such as GRE, TOEFL, GMAT, and more.
3	Enhance their pronunciation by focusing on stress, intonation, and rhythm.
4	Build their confidence in both the formal and informal contexts.
5	Receive training in LSRW (Listening, Speaking, Reading, and Writing) skills, equipping them to meet industry requirements.

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

S.No	Outcome	Knowledge Level
1	**Develop** English language proficiency with emphasis on LSRW skills.	K3
2	**Develop** communication skills through various language learning activities.	K3
3	**Analyze** the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.	K4
4	**Analyze** and apply professionalism in participating in debates and group discussions actively.	K4
5	**Deduce** the employability related strategies to become industry-ready.	K4

SYLLABUS

1	Vowels &Consonants
2	Neutralization/Accent Rules
3	Communication Skills & JAM
4	Role Player Conversational Practice
5	E-mail Writing
6	Resume Writing, Cover letter, SOP
7	Group Discussions-methods & practice
8	Debates-Methods &Practice
9	PPT Presentations/ Poster Presentation
10	Interviews Skills

Text Book / Source of Material:

1	Walden Infotech

2	Young India Films
3	Globarena Software

Reference Books	
1	RamanMeenakshi,Sangeeta-Sharma.*TechnicalCommunication*.OxfordPress.2018.
2	TaylorGrant:*EnglishConversationPractice*,TataMcGrawHillEducationIndia,2016
3	Hewing's, Martin. Cambridge *Academic English*(B2).CUP,2012.
4	J.Sethi & P.V.Dhamija. *A Course in Phonetics and Spoken English*, (2ndEd), Kindle, 2013
5	Richards, Jack C., Jonathan Hull, and Susan Proctor. Interchange Level 3 Student's Book with Self-study DVD-ROM. Vol. 3. Cambridge University Press, 2012.

Web Resources*:*

1	speechace.com
2	https://www.cambridgeone.org(Interchange-3)

Spoken English:

1	www.esl-lab.com
2	www.englishmedialab.com
3	www.englishinteractive.net
4	https://www.britishcouncil.in/english/online
5	http://www.letstalkpodcast.com/
6	https://www.youtube.com/c/mmmEnglish_Emma/featured
7	https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8	https://www.youtube.com/c/engvidAdam/featured
9	https://www.youtube.com/c/EnglishClass101/featured
10	https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11	https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice Accent:

1	https://www.youtube.com/user/letstalkaccent/videos
2	https://www.youtube.com/c/EngLanguageClub/featured
3	https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4	https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS1203	HS	--	--	1	0.5	100	--	3 Hrs.

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to AIDS, AIML, CE, CSBS, CSD, CIC, ME)

Course Objectives:

To impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

S.No	Outcome	Knowledge Level
1.	**Understand** the importance of discipline, character and service motto.	K2
2.	**Solve** some societal issues by applying acquired knowledge, facts, and techniques.	K3
3.	**Explore** human relationships by analyzing social problems.	K4
4.	**Determine** to extend their help for the fellow beings and downtrodden people.	K3
5.	**Develop** leadership skills and civic responsibilities.	K3

SYLLABUS

UNIT-I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.
Activities:
   i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
   ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
   iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
   iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT-II Nature & Care

Activities:
   i) Best out of waste competition.
   ii) Poster and signs making competition to spread environmental awareness.
   iii) Recycling and environmental pollution article writing competition.
   iv) Organising Zero-waste day.
   v) Digital Environmental awareness activity via various social media platforms.
   vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
   vii) Write a summary on any book related to environmental issues.

UNIT-III Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authoritiesexperts-etc.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1.	Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2.	Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3.	Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4.	Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5.	Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

Evaluation Guidelines:

1.	Evaluated for a total of 100 marks.
2.	A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
3.	A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.