GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B.TECH – COMPUTER SCIENCE AND ENGINEERING(Data Science)

COURSE STRUCTURE AND SYLLABI UNDER RG 23 REGULATIONS

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

Vision & Mission

VISION

- To emerge as a premier department of Computer Science and Engineering in the domain of Data Science striving to produce competent young data scientists to serve the society with professional commitment and ethical values.

MISSION

- **M1**: Transforming learners into technically proficient engineers through innovative teaching learning methodologies enabling them to fulfil industrial requirements.
- **M2**: Inculcating discipline, ethical and professional values among the aspirants to become socially responsible engineers.
- **M3**: Exploring the potential of learners through integrity and professionalism to serve the needs of the society.
- **M4**: Engaging students in acquisition of core capabilities through learner-centric activities to offer sustainable solutions to real-time problems .

B. Tech CSE (DS) - PROGRAM EDUCATIONAL OBJECTIVES (PEO's)	
A graduate of Computer Science and Engineering (Data Science) will be able to:	
PEO 1	Contribute to the economic growth of the Country through a purposeful and productive interaction with their peers .
PEO 2	Successfully pursue higher studies in engineering or management courses .
PEO 3	Emerge as visionary leaders and entrepreneurs possessing leadership qualities and team building skills..
PEO 4	Exhibit core technical competencies to analyse and design viable solutions for problems with social responsibility and ethical standards..
B. Tech CSE (DS) - PROGRAM EDUCATIONAL OBJECTIVES (PSO's)	
A graduate of Computer Science and Engineering (Data Science) will be able to:	
PSO1	Apply the principles of Data Science, Data Management, Data Security and Visualization for Data Analysis and prediction.
PSO2	Utilize the knowledge of analytics, statistics and Machine Learning concepts to solve real time problems related to Data Analysis.

Program Outcomes

On successful completion of the Program, the graduates of B.Tech(CSE) Program will be able to:

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, andsynthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, andneed for sustainable development
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and giveand receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engagein independent and life-long learning in the broadest context oftechnological change.

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Unit of USHODAYA EDUCATIONAL SOCIETY
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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

B.TECH. – COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE – R23

(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools,etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematicalskills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

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B.Tech – I Year I Semester

S.No.	Category	Course Code	Title	L/D	T	P	Credits
1	BS&H	23A0009T	Communicative English	2	0	0	2
2	BS&H	23A0004T	Chemistry	3	0	0	3
3	BS&H	23A0001T	Linear Algebra & Calculus	3	0	0	3
4	Engineering Science	23A0101T	Basic Civil & Mechanical Engineering	3	0	0	3
5	Engineering Science	23A0501T	Introduction to Programming	3	0	0	3
6	BS&H	23A0010P	Communicative English Lab	0	0	2	1
7	BS&H	23A0007P	Chemistry Lab	0	0	2	1
8	Engineering Science	23A0302P	Engineering Workshop	0	0	3	1.5
9	Engineering Science	23A0502P	Computer Programming Lab	0	0	3	1.5
10	BS&H	23AYG01P	Health and wellness, Yoga and Sports	-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

B.Tech – I Year II Semester

S.No.	Category	Course Code	Title	L/D	T	P	Credits
1	BS&H	23A0003T	Engineering Physics	3	0	0	3
2	BS & H	23A0002T	Differential Equations & Vector Calculus	3	0	0	3
3	Engineering Science	23A0201T	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	23A0301T	Engineering Graphics	1	0	4	3
5	Engineering Science	23A0503P	IT Workshop	0	0	2	1
6	Professional Core	23A0504T	Data Structures	3	0	0	3
7	BS&H	23A0006P	Engineering Physics Lab	0	0	2	1
8	Engineering Science	23A0202P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	Professional Core	23A0505P	Data Structures Lab	0	0	3	1.5
10	BS&H	23ANS01P	NSS/NCC/Scouts & Guides/ Community Service	-	-	1	0.5
Total				**13**	**00**	**15**	**20.5**

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3	BS&H	23A0001T	Linear Algebra & Calculus	3	0	0	3
4	Engineering Science	23A0101T	Basic Civil & Mechanical Engineering	3	0	0	3
5	Engineering Science	23A0501T	Introduction to Programming	3	0	0	3
6	BS&H	23A0010P	Communicative English Lab	0	0	2	1
7	BS&H	23A0007P	Chemistry Lab	0	0	2	1
8	Engineering Science	23A0302P	Engineering Workshop	0	0	3	1.5
9	Engineering Science	23A0502P	Computer Programming Lab	0	0	3	1.5
10	BS&H	23AYG01P	Health and wellness, Yoga and Sports	-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

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S.No.	Category	Course Code	Title	L/D	T	P	Credits
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6	Professional Core	23A0504T	Data Structures	3	0	0	3
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8	Engineering Science	23A0202P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	Professional Core	23A0505P	Data Structures Lab	0	0	3	1.5
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Total				**13**	**00**	**15**	**20.5**

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COMMUNICATIVE ENGLISH
(Common to CSE, AI&ML, DS, CS, CE)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0009T	2:0:0	2	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well structured reports
- Broaden the knowledge base of **grammatical structures** and **vocabulary** and encourage their
- appropriate use in speech and writing

Course Outcomes (CO):

On completion of this course, the students are able to:

CO1: The learner will be able to speak and write grammatically accurate sentences through applications of principles of English grammar
CO2: The learner will enhance vocabulary skills to build strong language skills.
CO3: The learner acquires the ability to understand the academic text from multiple dimensions employing ethical and logical reasoning based on accurate comprehension
CO4: The learner gains evaluation potential by employing standard reading & listening strategies to grasp the core essence and spirit of the text
CO5: The learner will gain mastery on speaking & writing skills through the application of relevant guidelines, through consistent practice of functional English expression

Syllabus		Total Hours:48
Unit- I	**HUMAN VALUES: Gift of Magi (Short Story)**	**8**

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: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

Unit- II	**The Brook by Alfred Tennyson (Poem)**	**7**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks**.**
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	BIOGRAPHY: Elon Musk	6
Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing, Note-making, paraphrasing **Grammar:** Verbs - tenses; subject-verb agreement; Compound words, **Vocabulary:** Compound words, Collocations		
Unit- IV	**INSPIRATION: The Toys of Peace -Saki**	**6**
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data **Writing**: Letter Writing: Official Letters, Resumes **Grammar :** Reporting verbs, Direct & Indirect speech, Active & Passive Voice **Vocabulary:** Words often confused, Jargons		
Unit- V	**MOTIVATION: The Power of Intrapersonal Communication(An Essay)**	**5**
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts **Reading:** Reading for 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) **Vocabulary:** Technical Jargons		

Textbooks:

1. " Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & 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.

Web 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

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CHEMISTRY
(Common to CSE, AI&ML, CS, ECE, EEE, DS)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0004T	3:0:0	3	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- To familiarize chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods.

Course Outcomes (CO):

CO1: Describe Planck's quantum theory, dual nature of matter, Schrodinger equation, molecular orbital Theory and molecular orbital energy level diagram of different molecules
CO2: Explain Crystal field theory, splitting in octahedral and tetrahedral geometry and the magnetic behavior, Oxidation state, coordination and color of complexes.
CO3: Explain the principle of Band diagrams of conductors, superconductor, semiconductors and insulator and nonmaterial
CO4: Discuss the principles of electrochemistry in potentiometry, conductometry, battery and electrochemical sensors
CO5: Explain polymerization and the preparation, properties, and applications of thermoplastics &thermosetting, elastomers, & conducting polymers
CO6: Discuss the different applications of analytical instruments

Syllabus		Total Hours:48
Unit- I	**Structure and Bonding Models**	**9**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero-nuclear diatomic molecules – energy level diagrams of O2, CO, and NO. π- molecular orbitals of butadiene and benzene, calculation of bond order.

Unit- II	**Modern Engineering materials**	**10**

Semiconductors – Introduction, basic concept, application
Superconductors: Introduction, Basic concept and Applications.
Super capacitors: Introduction, Basic concept, Classification and Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphine nano particles

Unit- III	**Electrochemistry and Applications**	**10**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

Unit- IV	**Polymer Chemistry**	**10**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications.
Biodegradable polymers - **poly dioxanone,** Polyglycolic Acid (PGA), Polylactic Acid (PLA).

Unit- V	**Instrumental Methods and applications**	**9**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification, **Gas chromatography,** HPLC: Principle,
Instrumentation and applications

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

Reference Books:

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

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LINEAR ALGEBRA &CALCULUS
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0001T	3:0:0	3	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

Course Outcomes (CO):

On completion of this course, the students are able to:

CO1: Solving systems of linear equations that is needed by engineers for practical applications.
CO2: Find the eigen values and eigen vectors to facilitate the calculation of matrix characteristics.
CO3: Utilize mean value theorems to real life problems.
CO4: Apply the technique of partial differentiation to find the Jacobian and the extreme values of functions of several variables.
CO5: Apply the techniques of multiple integrals to find the areas and volumes.

Syllabus		Total Hours:48
Unit- I	**Matrices**	**10**

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: Solving system of Homogeneous and Non-Homogeneous equations - Gauss elimination method, Iteration Methods: Gauss- Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in electrical circuits.

Unit- II	Eigen values, Eigenvectors and Orthogonal Transformation	8

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	Calculus	10

Mean Value Theorems: Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof) with their geometrical interpretation, Cauchy's mean value theorem (Without Proof), Taylor's and Maclaurin theorems with remainders (Without Proof), Problems and applications on the above theorems.

Unit- IV	Partial differentiation and Applications (Multi variable calculus)	10

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, 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.

Unit- V	Multiple Integrals (Multi variable Calculus)	10

Double integrals, triple integrals, change of order of integration (Cartesian Coordinate only), change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals)

Textbooks:

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

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, G$_3$lyn James, Pearson publishers, 2018, 5th Edition.

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BASIC CIVIL & MECHANICAL ENGINEERING
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0101T	3:0:0	3	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

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

Course Outcomes (CO):

On completion of this course, the students are able to:

CO1: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying

CO2: Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics

CO3: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.

CO4: Understand the different manufacturing processes

CO5: The basics of thermal engineering and its applications.

CO6: Describe the working of different mechanical power transmission systems and power Plants; learn basics of robotics.

Syllabus	Total Hours:48
Unit- I	**9**

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of CivilEngineering-StructuralEngineering-Geo-technicalEngineering-TransportationEngineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline- BuildingConstructionandPlanning-ConstructionMaterials-Cement-Aggregate-Bricks-Cementconcrete-Steel. Introduction to Prefabricated construction Techniques

Unit- II	**10**

Fluid Mechanics: Properties of fluids and types of fluids.

Surveying: Objectives of Surveying- Horizontal Measurements-Angular Measurements-Introduction to Bearings Leveling instruments used for leveling – Simple problems on leveling and bearings-Contour mapping

Unit- III	**9**

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.
3. BasicCivilEngineering,SatheeshGopi,PearsonPublications,2009,FirstEdition

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. Justoand Veeraraghavan, Nemchandand Brothers Publications 2019. 10th Edition.

E- Resources :

1. https://archive.nptel.ac.in/courses/105/106/105106201/

PART B		
Syllabus		
]Unit- I		**9**

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		**9**

Manufacturing Processes: Principles of Casting, Forming, and joining processes, Machining, Introduction CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles

Unit- III		**9**

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications. Introduction to **Robotics** - Joints & links, configurations, and applications of robotics.

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

Textbooks:

1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning 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. Thermal Engineering by Mahesh M Rathore Tata Mcgraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956

3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137

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INTRODUCTION TO PROGRAMMING
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0501T	3:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions and arrays.
- To encourage collaborative learning and team work in coding projects.

Course Outcomes (CO):

On completion of this course, the students are able to:

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.

CO2: Analyse a problem and develop an algorithm to solve it.

CO3: Implement various algorithms using the C programming language.

CO4: Understand more advanced features of C language.

CO5: Develop problem-solving skills and the ability to debug and optimize the code.

Syllabus		Total Hours:48
Unit- I	**Introduction to Programming and Problem Solving**	**10**

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool),pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms

Unit- II	**Control Structures**	**8**

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue..

Unit- III	**Arrays and Strings**	**10**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings

Unit- IV	**Pointers & User Defined Data types**	**10**

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

Unit- V	**Functions & File Handling**	**10**

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, command line arguments, Preprocessor directives, Basics of File Handling

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 SGottfried, McGraw-HillEducation,1996

Reference Books:

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

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COMMUNICATIVE ENGLISH LAB
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0010P	0:0:2	1	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning students will get trained in the basic communication skills and also make them ready to face job interviews

Course Outcomes (CO):

CO1: Analyze the English speech sounds, stress, intonation for better Listening practice
CO2: Apply communication skills through various language learning activities
CO3: Application of writing skills through design and preparation of professional Resume & email writing
CO4: Create effective resonate and prepare themselves to face interviews in future

Syllabus | **Total Hours:48**

List of Experiments

1. VOWELS & CONSONANTS
2. NEUTRILIZATION/ ACCENT RULES
3. COMMUNICATION SKILLS & JAM
4. ROLE PLAY OR CONVERSATIONAL PRACTICE
5. EMAIL WRIRING
6. RESUME WRITING, COVER LETTER, SOP
7. GRPOUP DISCUSSION-METHODS & PRACTICE
8. DEBATE - METHOD & PRACTICE
9. PPT PRESENTATION / PSTER PRESENTATION
10. INTERVIEW SKILLS

Suggested Software: Walden InfoTech / Young India Films

Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press.

Online Learning Resources/Virtual Labs:

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

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

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CHEMISTRY LAB
(Common to CSE, AI&ML, CS, ECE, EEE, DS)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0007P	0:0:2	1	CIE: 30 SEE:70	3 Hours	BS&H

Course Objectives:

- Verify the fundamental concepts with experiments

Course Outcomes (CO):

CO1: Determine the cell constant and conductance of solutions and the strength of an acid by conductometry
CO2: Synthesize of advanced polymer materials
CO3: Measure the strength of an acid present in secondary battery and Ferrous ion using volumetric analysis
CO4: Determine the potentials and EMFs of solutions by Potentiometry
CO5: Identify some organic and inorganic compounds by instrumental methods
CO6: Synthesize of nano materials by simple methods

Syllabus | **Total Hours:48**

List of Experiments

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Simultaneous estimation of Mn and Cr ions by spectrophotometry in water samples.
10. Wavelength measurement of sample through UV-Visible Spectroscopy
11. Identification of functional groups in organic compounds by IR Spectroscopy.
12. Preparation of nano materials by precipitation method
13. Estimation of Ferrous Iron by Dichrometry
14. Determination of Hardness of a groundwater sample
15. pH metric titration of strong acid vs strong base

(**Any 10 experiments from the above**

Textbooks:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Jain & Jain. Engineering Chemistry: Dhanapath rai Publications., 2015.
3. S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised edition, 2008.

Reference Books:

1. "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

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ENGINEERING WORKSHOP
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0302P	0:0:3	1.5	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes (CO):

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, and foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

Syllabus | **Total Hours:48**

List of Experiments

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a. Half –Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b)Conical funnel c)Elbow pipe d)Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c)Semi-circular fit
   d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b)Two-way switch c) Go down lighting
   d)Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters

Textbooks:

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.

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COMPUTER PROGRAMMING LAB
(Common to CSE, AI&ML, DS, CS, CE)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0502P	0:0:3	1.5	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

Course Outcomes (CO):

CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

Syllabus

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()

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

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

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:

Tutorial4: 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

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.

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.

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.

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

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 dereference.

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()

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.

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 dereference.

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()

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.

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

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.

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 othercharacters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences 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, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Web Resources:

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HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to all branches)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23AYG01P	0:0:1	0.5	CIE: 30 SEE:70	3 Hours	MC

Course Objectives:

- The main objective of introducing this course is 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 (CO):

On completion of this course, the students are able to:

CO-1: Understand the importance of yoga and sports for Physical fitness and sound health.

CO-2: Demonstrate an understanding of health-related fitness components.

CO-3: Compare and contrast various activities that help enhance their health.

CO-4: Compare and contrast various activities that help enhance their health.

CO-5: Develop Positive Personality

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 cardio respiratory 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

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

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.