ఆంధ్రప్రదేశ్ కేంద్రీయ విశ్వవిద్యాలయం आंध्रप्रदेश केंद्रीय विश्वविद्यालय

CENTRAL UNIVERSITY OF ANDHRA PRADESH

(Established by an act of Parliament in 2019)

SCHOOL OF INTERDISCIPLINARY AND APPLIED SCIENCES

DEPARTMENT OF COMPUTER SCIENCE & ARTIFICIAL INTELLIGENCE

Undergraduate Programme Structure as per the
AICTE Credit Framework (NEP 2020)

Vidya Dadati Vinayam
(Education gives humility)

BTech Computer Science and Engineering (CSE)

"Computer science empowers students to create the world of tomorrow."
- Satya Nadella

Programme Structure
(With effect from AY 2025 - 26)

CONTENTS

SCHOOL OF INTERDISCIPLINARY AND APPLIED SCIENCES
DEPARTMENT OF COMPUTER SCIENCE & ARTIFICIAL INTELLIGENCE

B. Tech in Computer Science and Engineering (CSE)

Introduction to the Programme:

The **B. Tech in Computer Science and Engineering (CSE)** at Central University of Andhra Pradesh is a forward-looking undergraduate programme to be introduced from the academic year 2025–26, developed in alignment with the **National Education Policy (NEP) 2020** and as per **All-India Council for Technical Education (AICTE)** credit framework. The programme is designed to establish a solid foundation in fundamental computing concepts while integrating modern technological advancements and interdisciplinary approaches. It offers flexible entry and exit options, ensuring an inclusive and industry-relevant learning experience.

The curriculum covers essential areas such as programming, algorithms, data structures, operating systems, databases, and computer networks. It also introduces advanced and emerging domains like Artificial Intelligence, Machine Learning, Data Science, Blockchain, Cybersecurity, Cloud Computing, and the Internet of Things (IoT). In addition, the programme emphasizes professional ethics, communication, teamwork, innovation, and sustainability.

Through structured coursework, hands-on lab sessions, and exposure to a wide range of subjects, students develop both theoretical understanding and practical competence. Upon completion, graduates will possess the technical skills, analytical mindset, and problem-solving abilities needed to pursue careers in software development, research, IT services, or higher education. The programme aspires to produce technically proficient and socially responsible engineers equipped to meet the demands of a rapidly evolving technological world

Programme Educational Objectives (PEOs):

PEO-1	Develop the ability to formulate, analyze, and solve real-world computing problems using strong foundations in computer science, mathematics, and engineering principles.
PEO-2	Pursue higher education or engage in research activities in computer science and related interdisciplinary fields, contributing to academic and technological advancements.
PEO-3	Design, implement, test, and maintain reliable software systems using modern tools and technologies that address both industrial and societal needs
PEO-4	Exhibit professionalism through effective communication, teamwork, ethical conduct, leadership qualities, and entrepreneurial skills to work productively in diverse environments.
PEO-5	Embrace lifelong learning, technological adaptability, and collaborative research that contribute to innovation, sustainable development, and nation-building efforts

Programme Outcomes (POs):

PO-1: **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and computer science to solve complex engineering problems.

PO-2: **Problem Analysis:** Identify, formulate, research literature, and analyze complex computing problems using principles of mathematics and computer science.

PO-3: **Design/Development of Solutions:** Design solutions for complex engineering problems and systems that meet specified needs with appropriate consideration for public health, safety, culture, and environment.

PO-4: **Conduct Investigations of Complex Problems:** Use research-based knowledge and methods to analyze, interpret data, and derive valid conclusions.

PO-5: **Modern Tool Usage:** Create, select, and apply modern engineering and IT tools for modeling, simulation, and solving engineering problems.

PO-6: **The Engineer and Society:** Apply contextual knowledge to assess societal, legal, health, safety, and cultural issues relevant to engineering practice.

PO-7: **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the need for sustainable development.

PO-8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities in engineering practice.

PO-9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO-10: **Communication:** Communicate effectively on engineering activities with peers, the engineering community, and society at large through reports, documentation, and presentations.

PO-11: **Project Management and Finance:** Demonstrate knowledge of engineering and management principles and apply them to project work as a team member or leader.

PO-12: **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning.

Programme Specific Outcomes:

PSO-1: Ability to design, develop, and maintain software systems using programming languages, data structures, algorithms, and software engineering practices.

PSO-2: Ability to pursue higher studies in a multidisciplinary perspective leading to Masters and Research degrees.

PSO-3: Ability to apply the Computer Science and Engineering concepts in different fields of Engineering culminating in successful careers and entrepreneurs with a focus on societal problem solving**.**

SCHOOL OF INTERDISCIPLINARY AND APPLIED SCIENCES

DEPARTMENT OF COMPUTER SCIENCE & ARTIFICIAL INTELLIGENCE

Curriculum of B. Tech Computer Science & Engineering

Sl. No.	Course Code	Title of the Course	Credit Points	Credit Distribution		
				L*	T*	P*
Semester I						
1.	BTC101	Mathematics-I (Linear Algebra & Calculus)	3	3	0	0
2.	BTC102	Engineering Physics	3	3	0	0
3.	BTC103	Basic Electrical and Electronics Engineering	3	3	0	0
4.	BTC104	Problem Solving and Programming Using C	3	3	0	0
5.	BTC105	Communicative English	3	2	0	1
6.	BTC106	Engineering Physics Lab	2	0	0	2
7.	BTC107	Basic Electrical and Electronics Engineering Lab	2	0	0	2
8.	BTC108	Problem Solving and Programming Lab	2	0	0	2
9.	BTC109	Sports and Yoga (Audit Course)	0	2*	0	0
Total			**21**	**14**	**0**	**7**
Semester II						
1.	BTC201	Mathematics-II (Differential Equation and Vector Calculus)	3	3	0	0
2.	BTC202	Computer Aided Engineering Drawing	3	1	0	2
3.	BTC203	Digital Logic Design	3	3	0	0
4.	BTC204	Python Programming	4	3	0	1
5.	BTC205	Design Thinking	2	2	0	0
6.	BTC206	Universal Human Values	2	2	0	0
7.	BTC207	Digital Logic Design Lab	2	0	0	2
8.	BTC208	IT Workshop	1	0	0	1
9.	BTC209	NSS (Audit Course)	0	0	0	2*
Total			**20**	**14**	**0**	**6**

***L**: Lecture; **T**: Tutorial; **P**: Practical

Note:

1. The Programme template and the title of the courses are tentative, any changes as required may be made.

Credit Distribution

Semester	Total Credits	Cumulative Credit at the end of the Semester
I	21	21
II	20	41
III	21	62
IV	21	83
V	23	106
VI	20	126
VII	21	147
VIII	13	160

Total Credits :160

Assessment Pattern for Theory Courses: 40% of internal [formative evaluation – two best out of three tests (for a maximum of 15 marks each = 30 marks) and seminar/ assignments/class presentations /quizzes (10 marks)] and 60% (summative evaluation – end of the semester examination)

End Semester Examination

Maximum Marks: 60 Time: 3 Hours

Assessment Pattern for Theory with laboratory Courses: 60% of internal [formative evaluation – two best out of three tests (for a maximum of 15 marks each = 30 marks), practical lab (20 marks) and seminar/ assignments/class presentations /quizzes (10 marks)] and 40% (summative evaluation – end of the semester examination)

End Semester Examination

Maximum Marks: 40 Time: 2 Hours

Dissertation / Project Report

Dissertation Evaluation - 60 Marks Seminar and Viva-Voce- 40 Marks

Important Information to Students

1. Programme: B. Tech Computer Science and Engineering
2. Eligibility: 10+2 level of education (Intermediate/ PUC/ CBSE/ ICSE/ HSC or an equivalent examination) with at least 60% marks (55% for SC/ST candidates) in aggregate in three subjects: Physics, Mathematics, and any one subject from Chemistry/Computer Science/Electronics/Information-Technology/Biology/Informatics Practices/Biotechnology/Technical Vocational subject/Agriculture/Engineering Graphics/ Business Studies/Entrepreneurship

3. The minimum duration for completion of any UG Programme is eight semesters (four academic years) and the maximum duration is sixteen semesters (8 academic years) or as per amendments made by the regulatory bodies from time to time.

4. A student should have minimum 75% attendance in classes, seminars, practical/ lab in each course of study without which he/she will not be allowed for the Semester -end examination.

5. All theory courses in the programme shall have Continuous Internal Assessment (CIA) component of 40 marks and a Semester-end component for 60 marks. The minimum pass marks for a course is 50%.

6. In case of courses with lab component Continuous Internal Assessment (CIA) component shall be of 60 marks and Semester-End Component for 40 marks. The minimum pass marks for a course is 50%.

7. The student is given **three** Continuous Internal Assessment (CIA) tests per semester in each course from which the best **two** performances are considered for the purpose of calculating the marks in CIA. A record of the continuous assessment is maintained by the academic unit. The three internal tests are conducted for 15 Marks each, out of the best two tests' scores are considered for 30 marks and for Academic Participation (10 marks) The remaining 10 marks are awarded based on participation and performance in:
   - Assignments
   - Class presentations
   - Seminars
   - Quizzes

8. A student should pass separately in both CIA and the Semester-end Examination (SEE), i.e., a student should secure 20 (50% of 40) out of 40 marks for theory in CIA and 30 (50% of 60) out of 60 marks for theory in the SEE.
9. Semester-end examination shall consist of Objective type questions, descriptive type questions, short answer questions and case studies or any others.

10. A student failing to secure the minimum pass marks in the CIA is not allowed to take the Semester-end examination of that course. She/he has to redo the course by attending

special classes for that course and get the pass percentage in the internal tests to become eligible to take the semester-end examination.

11. Students failing a course due to lack of attendance should redo the course.

12. Re-evaluation is applicable only for theory papers and shall not be entertained for other components such as practical/ thesis/ dissertation/ internship etc.

SEMESTER-WISE DETAILED SYLLABI

SEMESTER-I

Course Code : **BTC101** Course Type : **Basic Science** No. of Credits : **3** No. of Hours **: 45**	Course Title **Mathematics-I (Linear Algebra & Calculus)**

Course Objectives:

1.To understand the basic foundation knowledge on linear algebra and calculus essential for solving engineering problems.

2.To develop analytical skills through the application of differentiation, integration, and matrix operations.

3.To apply the concepts of Engineering Mathematics in solving the real-world applications.

Course Outcomes:

After completion of the course, students will be able to

CO1: Apply fundamental concepts of calculus, determine the Rank of a matrix using echelon and normal forms and understand its implications for solving linear systems.

CO2: Understand and manipulate vector spaces by exploring subspaces, linear independence, basis, dimension, and linear transformations

CO3: Analyse multivariable functions, Jacobians, optimization techniques such as Lagrange multipliers, vector spaces and perform linear transformations using basis and dimension concepts.

CO4: Solve systems of linear equations using matrix methods, and interpret matrix properties such as rank, eigenvalues, and diagonalizability

CO5: Evaluate definite and multiple integrals for solving problems related to area, volume, and special functions.

CO /PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	2	-	-	-	-	-	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-
CO3	3	3	2	3	2	-	-	-	-	-	-	-
CO4	3	3	-	3	3	-	-	-	-	-	-	-
CO5	3	2	2	3	-	-	-	-	-	-	-	-

Course Outline:

UNIT-I **[08 hours]**

Single Variable Calculus: Limits, continuity, rules of differentiation, Taylor's series, and its consequences, Indeterminate forms, L' Hospital's rule, mean value theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem

UNIT-II **[08 hours]**

Multivariable Calculus: Functions of several variables, partial derivatives, chain rules, total derivatives, Taylor and Maclaurin series in two variables, Jacobian, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT-III **[10 hours]**

Integral Calculus: Length of the curves, surface area of revolution, volume of solids of revolution, Leibnitz rule, improper integrals, beta and gamma functions. *Double and Triple Integrals:* evaluation of double, triple, surface, and volume integrals.

UNIT-IV **[08 hours]**

Linear Algebra: Vector spaces, subspaces, linear independence and dependence of vectors, linear span, basis and dimension of vector spaces, linear transformation, and its properties

UNIT-V **[11 hours]**

Matrix Theory: Rank of a Matrix using Echelon method, consistency of the system of linear equations in terms of matrix notions, eigenvalues and eigenvectors of a matrix, Caley-Hamilton theorem, similar matrices, diagonalizability, special matrices (symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, and unitary matrices) and their properties.

Text/Reference Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10th ed., 2023.
2. J. Stewart, D.K. Clegg and S. Watson, "Calculus", Cengage Learning India, 9th ed., 2023.
3. G. Strang, "Linear Algebra and its Applications", Brooks/Cole, 4th ed., 2006.
4. G.B. Thomas, M. D. Weir, and J.R. Hass, "Calculus", Pearson Education, 15th ed., 2024.
5. N. Piskunov, "Differential Calculus and Integral Calculus–I, II", CBS Publishers & Distributors, 1st ed., 1996.

Course Code : **BTC102** Course Type : **Basic Science** No. of Credits : **3** No. of Hours **: 45**	Course Title **Engineering Physics**

Course Objectives:

1. To understand the principles, working, and applications of lasers and fiber optics.

2. To comprehend the foundational concepts of quantum mechanics and their implications in physical systems.

3. To explore the physical properties of nuclear structure, radioactivity, and elementary particle physics materials, including electrical, magnetic, and superconducting behaviour.

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand the basic working and uses of lasers and optical fibers, electrical, magnetic, super conducting properties of materials.

CO2: Explain the key ideas and experiments that led to quantum mechanics.

CO3: Solve simple quantum problems using Schrödinger's equation.

CO4: Describe the structure of the nucleus, radioactivity, and nuclear reactions.

CO5: Identify basic particles and understand fundamental forces in nature.

CO /PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-

Course Outline:

UNIT-I **[09 hours]**

Lasers: Introduction to lasers, Characteristics of lasers, Spontaneous and stimulated emissions, Einstein's coefficients, Population inversion and lasing action, He-Ne laser, Semiconductor laser, Applications of lasers. Fiber Optics: Fermat's principle, Principle and construction of optical fibers, Acceptance cone, Numerical aperture, Types of fibers, Principle of fiber optic communication and Fiber optic sensors

UNIT-II **[09 hours]**

Inadequacy of classical mechanics, Black body radiation, Planck's law and Planck's equation. Photoelectric effect and its features, Einstein's explanation, Wave-particle duality of radiation, de Broglie concept of matter waves, Electron diffraction-Davission and Germer experiment, Heisenberg's uncertainty principle.
Schrödinger's time-independent wave equation; wave function-physical significance in terms of probability density, Eigenvalues and Eigen functions, Application of Schrodinger wave equation for a Particle confined in one-dimensional infinite square well potential.

UNIT-III **[09 hours]**

Nuclear properties and nuclear forces, nuclear models (qualitative): Liquid drop model, Shell model, nuclear reactions, Radioactivity – types of radiation, decay equation and half-life, applications of radioactivity. Fundamental forces in nature, Basics of particle physics, Classification of elementary particles-standard model of particle physics, Quark model.

UNIT-IV **[09 hours]**

Physics of Materials:
Dielectric materials – Polar and non-polar materials, electric polarization - Clausius-Mossotti Relation
Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity, Quantum free electron theory (qualitative)
Magnetic materials Diamagnetic, paramagnetic and ferromagnetic-properties and applications.
Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory (qualitative)
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UNIT- V **[09 hours]**

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Fabrication: Bottom-up approach Sol-gel Process and Chemical vapour deposition; Top-down approach –Ball milling and Lithography. Characterization techniques-SEM, EDAX. Physical, Chemical and Optical properties of Nano materials, Applications.

Text/Reference Books:

1. W. T. Silfvast, "Laser Fundamentals," 2nd ed. New York, NY, USA: Cambridge University Press, 2004.
2. D. Halliday, R. Resnick, and J. Walker, "Fundamentals of Physics", 6th ed. New York, NY, USA: John Wiley & Sons, 2001.
3. A. Beiser, "Concepts of Modern Physics". New Delhi, India: Tata McGraw-Hill, 2010.
4. R. Shankar, "Fundamentals of Physics II" New Haven, CT, USA, and London, UK: Yale University Press, 2016.
5. C. Kittel, "Introduction to Solid State Physics", 8th ed. Hoboken, NJ, USA: John Wiley & Sons, 2005.
6. Richard Booker and Eary Boyseen, "Nanotechnology" John Wiley & sons, 2005
7. Bharat Bhushan. Encyclopedia of Nanotechnology" Springer Volume-1
8. Amretashis Sengupta and Chandan Kumar Sarkar, "Introduction to Nano: basics to nanoscience and nanotechnology"

Course Code : **BTC103** Course Type : **Basic Science** No. of Credits : **3** No. of Hours **: 45**	Course Title **Basic Electrical and Electronics Engineering**

Course Objectives:

1. To learn the basic concepts of fundamental laws and theorems of electrical circuits, electronic devices.
2. To acquire the skills for design, develop the operating principles of electrical machines.
3. To familiarize with sensors, transducers, and measurement instruments.

Course Outcomes:

After completion of the course, students will be able to

CO1: Analyze basic DC and AC electrical circuits using laws and theorems.
CO2: Understand the working and characteristics of electrical machines like transformers, DC and AC motors.
CO3: Explain the behaviour and application of diodes, transistors, and power electronic devices.
CO4: Identify different types of sensors and transducers used in electrical measurements.
CO5: Use electrical measuring instruments such as DMM and CRO for basic testing and analysis.

CO/PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	2	3	2	1	-	-	-	-	-	-	-
CO3	3	2	2	2	2	-	-	-	-	-	-	-
CO4	2	2	2	2	1	-	-	-	-	-	-	-
CO5	3	2	2	2	2	-	-	-	-	-	-	-

Course Outline:

UNIT-I **[9 hours]**

DC and AC Circuits: Kirchhoff's Voltage and Current Laws, Superposition Theorem, Star-Delta Transformations. Complex representation of Impedance, Phasor diagrams, Power & Power Factor, Solution of 1-Phase Series & Parallel Circuits.

UNIT-II **[9 hours]**

Single Phase Transformers: Principle of Operation, EMF Equation, Phasor Diagram, Equivalent Circuit, Determination of Parameters, Regulation & Efficiency-DC Machines: Principle of Operation, Classification, EMF and Torque Equations, Characteristics, Speed Control Methods.

UNIT-III **[10 hours]**

AC Machines: 3-Phase Induction Motor – Operation, Torque-Speed Characteristics & Applications; Alternator – Principle, EMF Equation. Electronic devices & Circuits: P-type and N-Type semiconductors, P-N junction diode and its I-V characteristics, Half-wave, and Full-wave rectifiers.

UNIT-IV **[8 hours]**

Bipolar Junction Transistor – Operation and configurations (CE, CC, CB), Static Characteristics. SCR, MOSFET, IGBT – Basic operation-Sensors & Transducers: Thermocouple, Thermistor, RTD, Hall Effect, Piezoelectric (qualitative).

UNIT-V **[9 hours]**

Measuring Instruments: Moving Coil & Moving Iron Ammeters and Voltmeters, Wattmeter (qualitative). Electronics Measurements: Digital Multimeter – Principle of Operation, Cathode Ray Oscilloscope (CRO) – basic use.

Text/Reference Books:

1. E. Hughes, “Electrical & Electronic Technology”, Pearson Education, 13th ed., 2021.
2. V. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, 2nd ed., 2015.
3. V. K. Mehta, “Principles of Electrical & Electronics Engineering,” S. Chand Publications, New Delhi, 3rd ed., 2010.
4. V. N. Mittle and A. Mittal, “Basic Electrical Engineering,” Tata McGraw Hill, 2nd ed., 2005.
5. J. Millman and C. Halkias, “Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill Education,” 2nd ed., 2010.
6. U. Bakshi and A. Bakshi, “Basic Electrical Engineering,” Technical Publications, 2019.
7. A. E. Fitzgerald, C. Kingsley, and S. D. Umans, “Electric Machinery,” McGraw-Hill Education, 7th ed., 2014.
8. S. J. Chapman, “Electric Machinery,” McGraw Hill International Edition, 4th ed., 2017.
9. P. S. Bimbhra, “Electrical Machinery: Theory, Performance & Applications,” Khanna Publishers, 8th ed., 2021.

Course Code : **BTC104** Course Type : **Engineering Core** No. of Credits : **3** No. of Hours **: 45**	Course Title **Problem Solving and Programming Using C**

Course Objectives:

1.To understand the basic concepts of structure, operation of computers and programming languages.

2.To acquire skills for developing algorithms, problem-solving techniques.

3.To enable students to handle advanced features in C such as dynamic memory allocation, structures, and file operations.

Course Outcomes:

After completion of the course, students will be able to

CO1: Explain the components of a computer system and classify different programming languages.

CO2: Design algorithms and flowcharts to solve computational problems systematically.

CO3: Develop C programs using variables, expressions, control structures, and loops.

CO4: Implement modular programming techniques using functions, arrays, and parameter passing.

CO5: Apply advanced C concepts like dynamic memory allocation, structures, and file I/O in practical applications.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	2
CO2	2	3	2	1	–	–	–	–	–	–	–	2
CO3	3	3	3	2	2	–	–	–	–	–	–	2
CO4	3	3	3	2	3	–	–	–	1	–	–	2
CO5	3	2	2	2	3	–	–	–	–	–	–	2

Course Outline:

UNIT-I **[10 hours]**

Fundamentals of Computers - Components of a computer, Problems, Flowcharts, Memory, Variables, Values, Instructions, Programs, programming languages, concept of high-level, assembly and low-level programming languages,

Problem solving techniques – Algorithmic approach, characteristics of algorithm, Flowcharts, Problem solving strategies: Top-down approach, Bottom-up approach, Number systems and data representation.

UNIT II **[10 hours]**

Introduction to C- C character set- Identifiers and Keywords- Data types- Constants- Variables Declarations- Expressions- Statements- Symbolic Constants- Operators- Library Functions Data input and output: Single character input and output- Entering input data- Writing output data- gets and puts functions – Control Statements- Branching: if-else-looping: while- do..while for; Nested control Structures- switch statements- Break statements- Continue Statements, Comma operator- goto statements.

UNIT III **[9 hours]**

Modular Programming- Functions and Procedures - Examples- Parameters passing methods - Arrays- Defining an array- Processing an array- Multi dimensional arrays- Pointers- Variables definitions and initializations- Pointer operators- Pointer expressions and arithmetic- Pointers and one-dimensional arrays - String operations.

UNIT IV **[8 hours]**

Functions- Defining function- Accessing a function- Function prototypes- Passing arguments to a function- Passing arrays to a function- Passing Pointers to function- Recursion – Dynamic memory allocation - malloc, calloc, realloc.

UNIT V **[8 hours]**

Structures – Declaration – Structures and Functions – Arrays of Structures – Pointers to structures – Typedef - Unions – Bit-fields - Files – Input / Output using files – fread, fwrite, fprintf, fscanf – Formatted input – File access - argc, argv

Text / Reference Books

1. B. S. Gottfried, Schaum's, "Outline of Programming with C," New York, NY, USA: McGraw-Hill, 3rd ed., 2017.
2. R. Thareja, "Computer Fundamentals and Programming in C," Oxford University Press, 3rd ed., 2023.
3. B. W. Kernighan and D. M. Ritchie, "The C Programming Language," Pearson Education, 2nd ed., 1988.
4. V. Rajaraman, "Computer Basics and C Programming," PHI Learning Pvt. Limited, 2006.
5. E. Balagurusamy, "Computer Concepts and Programming in C," McGraw Hill Education, 2nd ed., 2017.
6. J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C," Pearson Education, 8th ed., 2015.
7. Y. Kanetkar, "Let Us C," BPB Publications, 21st ed., 2023.
8. H. M. Deitel and P. J. Deitel, "C: How to Program," Pearson Education, 8th ed., 2015.
9. S. Anami, N. Angadi, and S. Manvi, "Computer Concepts and Programming," PHI Learning Pvt. Ltd., 2nd ed., 2010.
10. R. S. Salaria, "Problem Solving and Programming in C," Khanna Publishing House 5th ed., 2016.

Course Code : **BTC105** Course Type : Humanities No. of Credits : **3** No. of Hours **: 45**	Course Title **Communicative English**

Course Objectives:

1.To learn basic concepts of speaking, writing English clearly in technical and academic settings.
2.To acquire skills on build confidence in public speaking, teamwork, and professional discussions.
3.To guide students on how to write emails, reports, resumes, and business messages.

Learning Outcomes:

After completion of the course, students will be able to

CO1: Gain Knowledge on Speak and write English clearly and correctly.
CO2: Analyze and prepare good reports, emails, résumés, and presentations.
CO3: Design for learning under uncertainty building suitable teamwork and leadership.
CO4: Acquire skills for effective Speaking, writing well in job interviews and startup pitches
CO5: Develop effective language learning systems.

CO/PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	–	–	–	–	–	–	–	2	3	–	2
CO2	2	–	3	–	2	–	–	–	2	3	2	2
CO3	–	–	–	–	–	2	–	2	**3**	3	2	2
CO4	2	-	-	-	-	-	-	-	-	3	-	-
CO5	2	-	-	-	-	-	-	-	-	3	-	2

Course Outline:

UNIT-I: Communicative Competencies **[09 hours]**

Functional grammar for technical communication
Vocabulary development with domain focus (technical jargon, academic register)
Sentence construction, coherence and cohesion
Listening comprehension (TED Talks, AI/CS podcasts)
Speaking practice: self-introduction, articulation, fluency, pronunciation

UNIT-II: Professional and Collaborative Communication **[09 hours]**

Public speaking: structuring and delivering technical presentations
Group discussion and collaborative communication
Cross-cultural and interdisciplinary communication
Communication ethics in AI: bias, transparency, responsibility
Interview skills and real-world scenarios

UNIT-III: Writing for Academic, Professional, and Entrepreneurial Purposes **[09 hours]**

Email etiquette and official communication
Writing instructions and process descriptions (algorithms, procedures)
Academic writing: paragraphing, referencing, summarising
Report writing: lab/project reports, incident reports
Resume and Statement of Purpose writing
Crafting clear and compelling elevator pitches for tech products or AI solutions
Writing concise startup concept notes, executive summaries, and business emails.

UNIT-IV: Writing for Academic, Professional, and Entrepreneurial Purposes [09 hours]

Introduction to Technical and Digital Writing, Differences between technical and general writing Principles of Clear and Concise Writing, Organizing information logically, Writing effective proposals Social Media and Digital Content Adapting technical content for social media Microblogging, posts, and threads- Document Design and Structure, Avoiding jargon and ambiguity, Digital Writing Tools and Software Word processors, collaboration tools Introduction to Markdown, HTML basics.

UNIT-V: Writing for Academic, Professional, and Entrepreneurial Purposes [09 hours]

Corporate communication vs. marketing communication, Visual and verbal corporate identity, Communication strategies for different audiences, Traditional media, Digital media and social platforms, Press releases and press conferences, Social media management, Crisis management principles Preparing and responding to crises, Delivering persuasive oral pitches to potential investors, partners, or incubators.

Text/Reference Books:

1. Meenakshi Raman & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Oxford University Press.
2. K. R. Lakshminarayanan. *English for Technical Communication*, Cambridge University Press

Course Code : **BTC 106** Course Type : **Basic Science Lab** No. of Credits : **2** No. of Hours **: 60**	Course Title **Engineering Physics Lab**

Course Objectives:

1. To provide foundational understanding of laser physics, fiber optics, quantum mechanics, nuclear and particle physics, and materials science.

2.To enable students to apply physical principles to engineering problems and modern technological applications.

3.To develop attitude for independent and continues learning of latest concepts of Engineering Physics.

Course Outcomes:

After completion of the course, students will be able to

CO1: Explain the principles and applications of lasers and optical fibers in modern technology.

CO2: Apply the concepts of quantum mechanics to understand the behaviour of microscopic particles.

CO3: Describe nuclear properties, models, and basic ideas of particle physics and fundamental forces.

CO4: Analyze the properties of dielectric, magnetic, conducting, and superconducting materials.

CO5: Utilize the understanding of modern physics in the design and functioning of electronic and photonic devices.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	0	0	0	1	0	0	1
CO2	3	3	3	2	2	0	0	0	1	0	0	1
CO3	3	2	2	2	1	1	0	0	1	0	0	1
CO4	3	2	3	2	2	0	0	0	1	0	0	1
CO5	2	2	2	3	3	0	0	0	1	0	0	1

List of Experiments:

1. Study of Laser: Determination of Wavelength using Diffraction Grating / single slit / Double slit
2. Measurement of Numerical Aperture of an Optical Fiber
3. Determination of Planck's Constant using LED
4. Verification of Photoelectric Effect and Stopping Potential
5. Study of He-Ne Laser Beam Profile and Beam Divergence
6. Determination of Wavelength of Light using Newton's Rings
7. Determination of Energy Band Gap of a Semiconductor
8. Diffraction of Electron Beam (Davisson-Germer Experiment Simulation)
9. Determination of e/m by Thomson's Method
10. Measurement of Magnetic Susceptibility of a Material
11. B-H Curve Tracing using CRO (Magnetic Hysteresis Loop)
12. Determination of Dielectric Constant of a Material (liquid or solid)
13. Study of Hall Effect in Semiconductors
14. Superconductivity Demonstration (Meissner Effect, where available)
15. Verification of Heisenberg's Uncertainty Principle (using laser diffraction)
16. Four probe method: electrical resistance and resistivity

Text/Reference Books:

1. W. T. Silfvast, "Laser Fundamentals," New York, NY, USA: Cambridge University Press, 2nd ed., 2004.
2. D. Halliday, R. Resnick, and J. Walker, "Fundamentals of Physics,", New York, NY, USA: John Wiley & Sons, 12th ed., 2021.
3. A. Beiser, S. Mahajan, and S. Rai Choudhury, "Concepts of Modern Physics," McGraw Hill Education, 8th ed., 2024.

4. R. Shankar, “Fundamentals of Physics II: Electromagnetism, Optics, and Quantum Mechanics,” New Haven, CT, USA, and London, UK: Yale University Press, Expanded ed., 2020.
5. C. Kittel, “Introduction to Solid State Physics,” Hoboken, NJ, USA: John Wiley & Sons, 8th ed., 2005

Course Code : **BTC107** Course Type : **Engineering Core Lab** No. of Credits : **2** No. of Hours **: 60**	Course Title **Basic Electrical and Electronics Engineering Lab**

Course Objectives:

1. Understand the basic principles of electrical and electronic circuits through practical experiments.

2. Analyze and interpret the behaviour of transformers, DC machines, and AC machines under different operating conditions.

3.Study the characteristics and operation of electronic components like diodes, BJTs, SCRs, and sensors, electrical and electronic instruments like Multimeter, CROs, and potentiometers, and gain hands-on experience to correlate theoretical concepts with real-world applications**.**

Course Outcomes:

After completion of the course, students will be able to

CO1: Verify fundamental electrical laws and transformer characteristics through experiments.

CO2: Conduct tests on DC motors and induction motors to evaluate their performance.

CO3: Analyze the V-I characteristics of diodes and transistors.

CO4: Acquire skills on CROs, Multimeter, and other instruments to measure and analyze electrical and electronic parameters.

CO5: Explore the working of common sensors and transducers in real-time applications.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	-	-	-	-	-	-	-
CO2	3	2	3	2	2	-	-	-	-	-	-	-
CO3	3	2	2	1	3	-	-	-	-	-	-	-
CO4	2	2	3	2	3	-	-	-	-	-	-	-
CO5	2	2	2	3	3	-	-	-	-	-	-	-

List of Experiments:

1. Open Circuit and Short Circuit Tests on Single-Phase Transformer
2. Load Test on Single-Phase Transformer
3. Speed Control of DC Shunt Motor
4. Torque-Speed Characteristics of 3-Phase Induction Motor (Demo/Simulation)
5. Measurement of Resistance using Wheatstone Bridge
6. Calibration of Voltmeter using Potentiometer
7. Measurement of Signal Parameters using Oscilloscope
8. V-I Characteristics of a P-N Junction Diode
9. Full-Wave Rectifier with and without Filter
10. Input and Output Characteristics of BJT (CE Configuration)
11. VI Characteristics of SCR / MOSFET
12. Study of Thermistor / RTD Characteristics

Text/Reference Books:

1. E. Hughes, “Electrical & Electronic Technology”, Pearson Education, 13th ed., 2021.
2. V. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, 2nd ed., 2015.
3. V. K. Mehta, “Principles of Electrical & Electronics Engineering,” S. Chand Publications, New Delhi, 3rd ed., 2010.
4. V. N. Mittle and A. Mittal, “Basic Electrical Engineering,” Tata McGraw Hill, 2nd ed., 2005.
5. J. Millman and C. Halkias, “Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill Education,” 2nd ed., 2010.
6. U. Bakshi and A. Bakshi, “Basic Electrical Engineering,” Technical Publications, 2019.
7. A. E. Fitzgerald, C. Kingsley, and S. D. Umans, “Electric Machinery,” McGraw-Hill Education, 7th ed., 2014.
8. S. J. Chapman, “Electric Machinery,” McGraw Hill International Edition, 4th ed., 2017.
9. P. S. Bimbhra, “Electrical Machinery: Theory, Performance & Applications,” Khanna Publishers, 8th ed., 2021.

Course Code : **BTC108** Course Type : **Engineering Core Lab** No. of Credits : **2** No. of Hours **: 60**	Course Title **Problem Solving and Programming using C Lab**

Course Objectives:

1.Develop programming skills through a foundational course in C programming.
2.Introduce basic decision-making and logical thinking via hands-on exercises.
3.Inculcate algorithmic and programmatic thinking through practical coding tasks.

Course Outcomes:

After completion of the course, students will be able to

CO1: Demonstrate fundamental programming skills using the C language.
CO2: Apply conditional and looping constructs to solve computational problems.
CO3: Implement recursive and iterative solutions in programming tasks.
CO4: Participate effectively in coding exercises and competitions using structured logic.
CO5: Design and develop logical solutions for real-life computational problems using C.

CO / PO Mapping:

Course Outcomes (CO)	PO	PO	PO	PO	PO5	PO6	PO7	PO8	PO9	PO10	PO	PO12
CO1	3	2	2	–	–	–	–	–	–	–	–	2
CO2	3	3	2	–	–	–	–	–	–	–	–	2
CO3	3	3	2	–	–	–	–	–	–	–	–	2
CO4	2	3	2	–	–	–	–	–	1	–	–	3
CO5	3	3	3	2	2	–	–	–	1	–	–	3

List of Experiments:

1. Develop a C program to test whether a number is prime using a loop construct.
2. Develop C programs to demonstrate the use of relational, arithmetic, logical, bitwise operators, and ternary operator.
3. Create a C program to compute factorial of a number using a loop and use break and continue where needed.
4. Write a C program to generate Fibonacci numbers using a loop.
5. Write a C program to print the following pattern:
   *****
   ******
   ****
   ****
   ****
6. Develop C programs for array insertion and display of array elements.
7. Write a C program to search for an element in a one-dimensional array.
8. Implement basic sorting on an array using bubble sort or selection sort.
9. Write a C program to delete an element from an array.
10. Develop a C program to display and concatenate two strings without using string library functions.
11. Write a C program to check whether a string is a palindrome.
12. Write C programs for string comparison and copying without using built-in functions.
13. Demonstrate simple pointer operations: accessing variable values using pointers.
14. Use pointers to perform addition of two numbers and pointer-based array traversal.
15. Develop a C program to dynamically allocate memory using malloc and initialize array values.
16. Write functions in C that accept arrays as arguments and return the sum of elements.

17. Write functions that take pointers as arguments and return pointer values.
18. Develop recursive functions to calculate factorial and Fibonacci numbers.
19. Write a C program to define a structure for a student containing the following fields: registration number, name, program name, and marks in three subjects. Read the details from the user and display them using structure variables.
20. Demonstrate the use of global and static variables within functions.

Text / Reference Books:

1. B. S. Gottfried, Schaum's, "Outline of Programming with C," New York, NY, USA: McGraw-Hill, 3rd ed., 2017.
2. R. Thareja, "Computer Fundamentals and Programming in C," Oxford University Press, 3rd ed., 2023.
3. B. W. Kernighan and D. M. Ritchie, "The C Programming Language," Pearson Education, 2nd ed., 1988.
4. V. Rajaraman, "Computer Basics and C Programming," PHI Learning Pvt. Limited, 2006.
5. E. Balagurusamy, "Computer Concepts and Programming in C," McGraw Hill Education, 2nd ed., 2017.
6. J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C," Pearson Education, 8th ed., 2015.
7. Y. Kanetkar, "Let Us C," BPB Publications, 21st ed., 2023.
8. H. M. Deitel and P. J. Deitel, "C: How to Program," Pearson Education, 8th ed., 2015.
9. S. Anami, N. Angadi, and S. Manvi, "Computer Concepts and Programming," PHI Learning Pvt. Ltd., 2nd ed., 2010.
10. R. S. Salaria, "Problem Solving and Programming in C," Khanna Publishing House 5th ed., 2016.

Course Code : **BTC109** Course Type : **Sports and Yoga** No. of Credits : **0** No. of Hours **: 30**	Course Title **Sports and Yoga (Audit Course)**

Course Objectives:

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.

2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.

3. To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health**.**

Course Outcomes:

After completion of the course, students will be able to

CO1: Demonstrate the Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.

CO2: To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance

CO3: To understand and implement the basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

CO4: To develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.

CO5: To improve personal fitness through participation in sports and yogic activities.

Course Contents:

Exercise 1. Introduction to Physical Education: Meaning & definition of Physical Education, Aims & Objectives of Physical Education, Changing trends in Physical Education.

Exercise II. Olympic Movement: Ancient & Modern Olympics (Summer & Winter), Olympic Symbols, Ideals, Objectives & Values, Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.).

Exercise III. **Physical Fitness, Wellness & Lifestyle:** Meaning & Importance of Physical Fitness & Wellness, Components of Physical fitness, Components of Health-related fitness, Components of wellness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle.

Exercise IV. Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga: Define Anatomy, Physiology & Its Importance, Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.).

Exercise V. Yoga & Lifestyle: Asanas as preventive measures, Hypertension- Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana. Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Ardh Matsyendrasana, Back Pain, Diabetes, Asthema Gomukhasana.

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education − NCERT (11th and 12th Classes).

SEMESTER-II

Course Code : **BTC201** Course Type : **Basic Science** No. of Credits : **3** No. of Hours **: 45**	Course Title **Mathematics-II (Differential Equations and Vector Calculus)**

Course Objectives:

1: To learn methods for solving first-order and higher-order ordinary differential equations and apply them to real-life problems.
2: To understand the formation and solution of partial differential equations using standard techniques.
3: To study and apply vector differential operators like gradient, divergence, and curl, and their physical interpretations, integral theorems such as Green's, Stokes', and Divergence theorems to solve engineering problems.

Course Outcomes:

After completion of the course, students will be able to

CO1: Solve first-order and higher-order differential equations and apply them to real-world problems.
CO2: Apply first-order differential equations to model real-world phenomena like cooling, growth, decay, and electrical circuits (RC/RL).
CO3: Analyze and solve simultaneous linear differential equations and apply them to physical systems such as LCR circuits and simple harmonic motion.
CO4: Formulate and solve partial differential equations using standard methods and compute line, surface, and volume integrals and interpret physical applications like work done, circulation, and flux
CO5: Understand and apply concepts of vector differentiation and integration, including gradient, divergence, curl, and related theorems (Green's, Stokes', Divergence)

CO/PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	2	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	1	-	-	-	-	-	1
CO4	3	2	2	2	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	1	-	-	-	-	-	1

Course Outline:

UNIT-I **[10 hours]**

First-Order Differential Equations and Applications: Linear differential equations, Bernoulli's equations, Exact differential equations, Equations reducible to exact form, Applications – Newton's law of cooling, Law of natural growth and decay, RC and RL circuits.

UNIT-II **[11 hours]**

Higher-Order Linear Differential Equations and Applications: Linear differential equations with constant coefficients – Homogeneous and non-homogeneous forms, Complementary function, Particular integral, General solution, Wronskian, Method of variation of parameters, Simultaneous linear differential equations, **Applications** – LCR circuits, Simple harmonic motion.

UNIT-III **[8 hours]**

Partial Differential Equations**:** Formation of partial differential equations by eliminating arbitrary constants and functions, First-order linear PDEs using Lagrange's method, Homogeneous linear PDEs with constant coefficients.

UNIT-IV **[8 hours]**

Vector Calculus: Vector Differentiation – Scalar and vector point functions, Gradient, Directional derivative, Divergence, Curl, Vector identities.

UNIT-V **[8 hours]**

Vector Integration – Line integral, Work done and circulation, Surface integral and flux, Volume integral, Theorems (without proofs) – Green's theorem, Stokes' theorem, Divergence theorem and simple applications.

Text Books/ Reference Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.
3. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
4. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
5. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
6. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
7. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

Course Code : **BTC202** Course Type : **Engineering Core** No. of Credits : **3** No. of Hours **: 15T+60L**	Course Title **Computer Aided Engineering Drawing**

Course Objectives:

1. To introduce the fundamental principles of Engineering Drawing, enabling students to understand and create orthographic projections of various geometrical elements using both manual drafting techniques and computer-aided tools.
2. To develop the ability to visualize and construct lateral surface developments of 3D objects, preparing students to apply these skills in solving practical design and manufacturing problems.
3. To strengthen spatial visualization and drawing skills by training students to create accurate isometric drawings and convert them into corresponding orthographic views.

Course Outcomes:

After completion of the course, students will be able to

CO1: Produce orthographic projections of points and lines using both manual drafting methods and computer aided design tools.

CO2: Create orthographic projections of planes and solids with accuracy using traditional and CAD techniques.

CO3: Generate lateral surface developments of various solids for practical, real-world applications.

CO4. Create isometric drawings and convert isometric views into precise orthographic projections.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			3					1		1
CO2	3	2	2		3					1		1
CO3	2	2	3		2					1		1
CO4	2	2	3		3					2		1

Course Outline:

UNIT-I **[10 hours]**

Introduction:

Significance of Engineering drawing, Free hand sketching of engineering drawing, Scales.
Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, square, rectangle, polygons, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, chamfer, fillet and curves. **(Software part**)

Orthographic Projections of Points, Lines:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants. Orthographic projections of lines (Placed in all four quadrants)

UNIT-II **[15 hours]**

Orthographic projections of planes: Triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only).

UNIT-III **[20 hours]**

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cones&Tetrahedraon.

UNIT-IV **[15 hours]**

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations.

UNIT-V **[15 hours]**

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale. Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids

Text Books/ Reference Books:

1. N. D. Bhatt, V. M. Panchal, and P. R. Ingle, “Engineering Drawing,” Charotar Publishing House, 55th ed., 2025.
2. L. P. Singh and H. Singh, “Engineering Drawing Principles and Applications,” Cambridge University Press Education, 2021.
3. B. Agrawal and C. M. Agrawal, “Engineering Graphics,” TMH Publication, 2012.
4. K. L. Narayana and P. Kannaiah, "Engineering Drawing," Scitech Publications (India) Pvt. Ltd., 2020.
5. CAD Software Theory and User Manuals (specific reference details needed). 2025.
6. K. Venugopal, *Engineering Drawing and Graphics + AutoCAD*, 4th ed., New Age International Publication Ltd., 2004.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.youtube.com/watch?v=zbqrNg4C98U

Course Code : **BTC203** Course Type : **Engineering Core** No. of Credits : **3** No. of Hours **: 45**	Course Title **Digital Logic Design**

Course Objectives:

1: To understand the basic concepts of number systems, binary arithmetic, and digital code representations, principles of Boolean algebra and logic simplification techniques.

2: To develop the ability to design and analyze combinational logic circuits.

3: To apply the concepts of sequential logic and design of flip-flops, registers, and counters, programmable logic devices, and HDL fundamentals.

Course Outcomes:

After completion of the course, students will be able to

CO1: Gain Knowledge on conversions between number systems and apply binary arithmetic and codes.

CO2: Simplify and manipulate Boolean expressions using algebraic and graphical methods.

CO3: Design and implement combinational circuits using standard logic modules.

CO4: Analyze and design basic sequential circuits such as flip-flops, counters, and shift registers.

CO5: Explain the architecture of memory and programmable logic devices, and describe simple HDL models.

CO / PO Mapping:

Course Outcomes (CO)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	2	-	-	-	-	-	-	-
CO4	3	2	3	2	2	-	-	-	-	-	-	-
CO5	2	2	2	-	3	-	-	-	-	-	-	-

Course Outline:

UNIT-I **[09 hours]**

Number Systems, Codes, and Logic Fundamentals: Binary Numbers, Number-Base Conversions, Octal and Hexadecimal Numbers, Signed Binary Numbers – 1's and 2's Complement, Binary Codes – BCD, Gray Code, Excess-3, Binary Storage and Registers, Basic Definitions of Boolean Algebra, Basic Theorems and Properties, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Introduction to Hardware Description Languages (HDLs) and their syntax.

UNIT-II **[10 hours]**

Boolean Expression Simplification and Minimization**:** Simplification of Boolean expressions – Algebraic methods and Canonical Forms, Gate-level Minimization, K-Map method – Three-variable map, Four-variable map, Five-variable map, Product of Sums simplification, Don't-care conditions, NAND and NOR implementation, Quine-McCluskey algorithm, Determination, and selection of Prime Implicants, Essential and Non-essential Prime Implicants.

UNIT-III **[09 hours]**

Combinational Logic Circuits: Combinational Logic, Implementing Combinational Logic, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Parallel Adders and Look-ahead Adders, Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Parity Generators and Checkers.

UNIT-IV **[9 hours]**

Sequential Circuits and Memory Devices: Latches and Flip-Flops – SR, JK, D, T, Excitation Tables, Shift Registers, Design of Counters – Ripple Counters, Synchronous Counters, Memory Units, Integrated Circuits – MOS, CMOS, RTL, DTL, TTL, ECL

UNIT-V **[8 hours]**

Programmable Logic Devices – PLA, PAL, Designing Combinational Logic Circuits with PLDs, Random Access Memory (RAM), Read-Only Memory (ROM), Content Addressable Memory (CAM).

Text Books/ Reference Books:

1. M. M. Mano, “Digital Logic and Computer Design,” Pearson Education India, 2023.
2. T. L. Floyd, “Digital Fundamentals,” Pearson Education India, 11th ed., 2023.
3. J. F. Wakerly, “Digital Design: Principles and Practices,” Pearson Education India, 5th ed., 2018.
4. C. R. Kime and M. M. Mano, “Logic and Computer Design Fundamentals,” Pearson Education India, 5th ed., 2015.
5. N. S. Widmer and R. J. Tocci, “Digital Systems: Principles and Applications,” Pearson Education India, 10th ed., 2017.
6. C. H. Roth Jr., L. L. Kinney, and E. B. John, “Fundamentals of Logic Design,” Cengage Learning, 8th ed., 2020.

Course Code : **BTC204** Course Type : **Engineering Core** No. of Credits : **4** No. of Hours **: 45 + 30 Lab**	Course Title **Python Programming**

Course Objectives:

1: To understand the basic concepts on python data types, python programming.

2: To acquire skills for developing python programming and algorithms for data handling.

3: To learn the python concepts, principles, functions and develop an application.

Course Outcomes:

After completion of the course, students will be able to

CO1: To analyze the basic concepts and working principles of Python Programming.

CO2: To develop algorithmic solutions to simple computational problems.

CO3: To understand the structure of solving problems using programming.

CO4: To acquire skills the concepts of compound data using Python lists, tuples, dictionaries.

CO5: To explore the various multimedia features using python.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	–	–	–	–	–	–	–	2
CO2	3	3	2	–	–	–	–	–	–	–	–	3
CO3	3	2	2	–	–	–	–	–	–	–	–	3
CO4	3	3	2	–	–	–	–	–	–	–	–	3
CO5	3	2	3	2	2	–	–	–	–	–	–	3

Course Outline:

UNIT-I **[10 hours]**

Introduction: History - Features - Working with Python - Installing Python - basic syntax - Data types - variables - Manipulating Numbers - Text Manipulations - Python Built-in Functions.

UNIT-II **[15 hours]**

components of python programming: Python objects and other languages - Operator Basics Numbers - String - List - Tuples - Dictionaries - Files - Object Storage - Type Conversion - Type Comparison – Statements, Assignments - Control Statements.

UNIT-III **[15 hours]**

functions and modules: Functions Definition and Execution - Arguments - Return Values - Advanced Function Calling - Modules - Importing modules - Packages - Creating a module.

UNIT-IV **[20 hours]**

Object oriented and exception handling: Classes and Objects - creating a class - class methods -class inheritance. Exceptions Handling-Build in Exceptions- Files, File operations, reading a file content, writing a file, change position, controlling file I/O, Manipulating file paths.

UNIT-V **[15 hours]**

Applications: Working with PDF and Word Documents - Working with CSV Files and JSON Data - Sending Email and Text Messages - Manipulating Images - Using Python for Multimedia.

Text Books/ Reference Books:

1. A. B. Downey, “Think Python: How to Think Like a Computer Scientist,” Shroff O'Reilly Publishers, 3rd ed., 2019.
2. G. Van Rossum and F. L. Drake Jr., “The Python Language Reference Manual,” Network Theory Ltd., 2023.

3. M. C. Brown, “The Complete Reference – Python,” Tata McGraw Hill Indian Edition, 2018.

4. E. Matthes, “Python Crash Course: A Hands-On, Project-Based Introduction to Programming,” 2nd ed., No Starch Press, 2019.

5. T. A. Budd, “Exploring Python,” Tata McGraw Hill Education, 2nd ed., 2016.

6. R. Sedgewick, K. Wayne, and R. Dondero, “Introduction to Programming in Python: An Interdisciplinary Approach,” Pearson India Education Services Pvt. Ltd., 2nd ed., 2023.

Course Code : **BTC205** Course Type : **Humanities** No. of Credits : **2** No. of Hours **: 30**	Course Title **Design Thinking**

Course Objectives:

1: To understand the basic concepts on engineering as a tool for social and economic development.

2: To acquire skills for developing introduce the design thinking process through real-world contexts.

3: To foster creativity and innovation through ideation and prototyping, testing and feedback loops.

Course Outcomes:

After completion of the course, students will be able to

CO1: Explain the importance of engineering in society.

CO2: Apply the design thinking process to real-world problems.

CO3: Define clear problem statements based on user needs.

CO4: Use creativity tools to generate multiple ideas.

CO5: Create and improve prototypes based on feedback.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	-	-	-	2	-	-
CO2	3	2	2	-	-	2	-	-	-	-	-	-
CO3	3	2	3	1	2	-	-	-	-	-	-	-
CO4	3	2	3	-	2	-	-	-	-	-	-	-
CO5	3	2	3	2	2	-	-	-	1	-	-	-

Course Outline:

UNIT-I **[06 hours]**

Introduction to Engineering**:** "Engineering" as a vehicle for social and economic development; the impact of science/engineering on our day-to-day lives; the process of engineering a product; various career options.

UNIT-II **[06 hours]**

Introduction and identifying the need: Understanding the unique needs of the user - empathize - define - ideate - prototype - test. Problem Formulation: Framing a problem statement neutrally using adequate checks. Case studies.

UNIT-III **[06 hours]**

Case Studies - Develop an appreciation for the design process and its application in specific settings (Guest lectures, Videos, Field visits, Interplay lectures of design-based movies).

UNIT-IV **[06 hours]**

Concept Generation: Generate multiple concepts using various creativity tools and thinking styles, Prototyping: Select from ideas and make quick prototypes (mock-ups) using available material.

UNIT-V **[06 hours]**

Evaluation: Iterative process of ideation, prototyping and testing-Take the mock-ups to users for feedback and iterate the process till users feel delighted.

Text Books/ Reference Books:

1. Pressman, "Design Thinking: A Guide to Creative Problem Solving for Everyone," Routledge Taylor and Francis Group, 1st ed., 2019.

2. T. Brown, “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation,” Harper Business, 2009.
3. G. E. Dieter and L. C. Schmidt, “Engineering Design,” McGraw-Hill Education, 5th ed., 2019
4. K. Ulrich, S. Eppinger, and M. Yang, “Product Design and Development,” McGraw-Hill Education, 7th ed., 2020.

Course Code : **BTC206** Course Type : **Humanities** No. of Credits : **2** No. of Hours **: 30**	Course Title **Universal Human Values**

Course Objectives:

1. To help students understand the need and importance of value-based living.
2. To facilitate self-exploration and develop a holistic perspective of life and profession.

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand the concepts of right understanding, human relationships, and physical needs.
CO2: Analyze the harmony within themselves and with the body for healthy and ethical living.
CO3: Apply values to develop harmony in family, society, and nature.
CO4: Evaluate the importance of universal human values and sustainable living.
CO5: Demonstrate responsible and ethical behaviour in personal and professional contexts.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	0	3	2	2	1	0	0	0
CO2	2	3	0	0	0	3	1	2	0	0	0	0
CO3	1	3	0	0	0	3	3	2	2	0	0	0
CO4	1	3	0	0	0	3	3	1	2	0	0	0
CO5	3	2	3	1	2	3	3	3	3	2	2	2

Course Outline:

UNIT-I **[06 hours]**

Introduction to Value Education and Human Aspirations: Understanding Value Education, Self-exploration as the Process for Value Education, Right Understanding - Relationship - Physical Facility (Holistic Development and the Role of Education), Continuous Happiness and Prosperity as Basic Human Aspirations.

UNIT-II **[06 hours]**

Harmony in Human Being, Family and Society: Understanding Human Being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Harmony in the Family - the Basic Unit of Human Interaction, Trust - the Foundational Value in Relationships, Respect - Right Evaluation .

UNIT-III **[06 hours]**

Understanding Harmony in Society, Vision for the Universal Human Order, Harmony in Nature and Implications of Holistic Understanding**:** Understanding Harmony in Nature, Interconnectedness - Self-regulation - Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, Holistic Perception of Harmony in Existence -Describing - Defining – Classifying.

UNIT-IV **[06 hours]**

Writing Introduction and Conclusion, Natural Acceptance of Human Values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics

UNIT-V **[06 hours]**

Holistic Technologies - Production Systems - Management Models (Case Studies), Strategies for Transition toward a Value-based Life and Profession.

Text Books/ Reference Books:

1. P. Kapoor, “Professional Ethics and Human Values,” Khanna Book Publishing Company, New Delhi, 2022.
2. R. R. Gaur, R. Asthana, and G. P. Bagaria, “The Textbook - A Foundation Course in Human Values and Professional Ethics,” Excel Books, New Delhi, 2nd revised ed., 2019.
3. R. R. Gaur, R. Asthana, and G. P. Bagaria, “The Teacher’s Manual - Teachers Manual for A Foundation Course in Human Values and Professional Ethics,” 2nd revised ed., Excel Books, New Delhi, 2019.
4. A. Leonard, “The Story of Stuff,” 2011.
5. A. N. Tripathi, “Human Values,” New Age International Publishers, New Delhi, 2019.
6. M. K. Gandhi, “The Story of My Experiments with Truth,” FP Classic, 2009.
7. A. Nagaraj, “VanVidya: Ek Parichaya,” “Jeevan Vidya Prakashan,” Amarkantak, 1999.

Course Code : **BTC207** Course Type : **Engineering Core Lab** No. of Credits : **2** No. of Hours **: 60**	Course Title **Digital Logic Design Lab**

Course Objectives:

1: Understand the different types of adder circuits, logic gates, and Boolean algebra.

2: Learn to performs the opposite function, signal and routing.

3: Design, Develop & analyze combinational logic circuits, operation of flip-flops and sequential circuits, test digital circuits using simulation tools.

Course Outcomes:

After completion of the course, students will be able to

CO1: Implement number system conversions and basic logic circuits.

CO2: Simplify Boolean expressions and design optimized logic circuits.

CO3: Design and simulate combinational logic components like adders, encoders, decoders, and multiplexers.

CO4: Analyze and construct sequential logic systems including counters and shift registers.

CO5: Use digital circuit simulation software to test and verify logic designs.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	0	0	0	1	0	0	0
CO2	3	2	3	3	2	0	0	0	1	0	0	0
CO3	3	2	3	3	2	0	0	0	2	0	0	1
CO4	3	3	3	2	2	0	0	0	2	0	0	1
CO5	2	2	3	3	3	0	0	0	1	1	0	1

List of Experiments: (Through Virtual Labs)

1. To understand and implement different types of adder circuits used in digital systems.
2. A demultiplexer (DEMUX) performs the opposite function, taking a single input signal and routing it to one of many output lines.
3. To understand and implement BCD to 7-segment decoder circuits used in digital display systems.
4. To understand and implement an Arithmetic Logic Unit (ALU) - a fundamental component that performs arithmetic and logical operations in digital systems.
5. To understand and implement digital comparator circuits used in digital systems for magnitude comparison operations.
6. To understand and implement different types of latches and flip-flops used in sequential digital circuits.
7. To understand and implement different types of register circuits used in digital systems.
8. To understand and implement different types of counter circuits used in digital systems.
9. To understand and implement different types of multiplier circuits used in digital systems.
10. To understand and implement finite state machines (FSMs) and their state diagrams in digital systems.

Text Books/ Reference Books:

1. M. M. Mano, “Digital Logic and Computer Design,” Pearson Education India, 2023.
2. T. L. Floyd, “Digital Fundamentals,” Pearson Education India, 11th ed., 2023.
3. J. F. Wakerly, “Digital Design: Principles and Practices,” Pearson Education India, 5th ed., 2018.
4. C. R. Kime and M. M. Mano, “Logic and Computer Design Fundamentals,” Pearson Education India, 5th ed., 2015.

5. N. S. Widmer and R. J. Tocci, “Digital Systems: Principles and Applications,” Pearson Education India, 10th ed., 2017.
6. C. H. Roth Jr., L. L. Kinney, and E. B. John, “Fundamentals of Logic Design,” Cengage Learning, 8th ed., 2020.

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Course Code : **BTC208** Course Type: **Engineering Core Lab** No. of Credits: **1** No. of Hours**: 30**	Course Title **IT Workshop**

Course Objectives:

1: To Study the components of computer, Operating systems, software's, document design tools.

2: To provide skills in design of documentations, and Productivity tools including Word, Excel, PowerPoint and Publisher.

3: To gain knowledge on modules tasks includes training on PC Hardware, Internet & World Wide Web

Course Outcomes:

After completion of the course, students will be able to

CO1: Identify and use basic Hardware troubleshooting

CO2: Gain knowledge on Understand Hardware components and inter dependencies

CO3: Apply skills to Safeguard computer systems from viruses/worms.

CO4: Implement Document/ Presentation preparation.

CO5: Evaluate the Perform of calculations using spreadsheets.

CO / PO Mapping:

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	0	1	1	0	0	2	0	0	0
CO2	2	3	3	2	2	1	0	0	2	0	0	0
CO3	2	2	3	2	2	1	0	0	1	0	0	1
CO4	2	2	3	2	3	1	1	0	1	0	0	1
CO5	2	1	2	1	2	3	1	1	2	2	1	1

List of Task Exercises:

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.

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.

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.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Task 5: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 6: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 7: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 8: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP.

Task 9: Internet & World Wide Web, Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting.

Task 10: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

Task 11: 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. (Student should submit a project report to the instructor).

Text Books/ Reference Books:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
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 Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.

Course Code : **BTC209** Course Type: **NSS** No. of Credits: **0** No. of Hours**: 30**	Course Title **National Service Scheme (NSS)**

Course objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem –solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Course outcomes: At the end of the course, the student will be able to:

CO1: Understand the importance of his / her responsibilities towards society.
CO2: Analyse the environmental and societal problems/issues and will be able to design solutions for the same
CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development
CO4: Implement government or self-driven projects effectively in the field.
CO5: Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

CO / PO Mapping:

Course Outcomes (CO)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	0	0	0	3	2	1	1	0	0	0
CO2	2	3	3	2	0	1	2	0	3	2	1	2
CO3	0	0	2	2	0	2	1	2	2	1	2	2
CO4	1	1	1	1	1	1	1	0	1	0	0	1
CO5	2	0	2	0	0	2	2	1	3	3	2	2

Course Outline:

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management– Public, Private and Govt organization.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4. Water conservation techniques – Role of different stakeholders– Implementation.
5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
6. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.
7. Developing Sustainable Water management system for rural areas and implementation approaches.
8. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swatch Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.
9. Spreading public awareness under rural outreach programs. (minimum 5 programs).
10. Social connect and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

NOTE:

1. Student/s in individual or in a group Should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department.
2. At the end of every semester, activity report should be submitted to the department.

Suggested Learning Resources:

Books :

1. **NSS Course Manual,** Published by NSS Cell Govt Of India, Ministry of youth affairs & sports, New Delhi.
2. Government of India, NSS cell, Activities reports and its manual.
3. Government of Andhra Pradesh, NSS cell, activities reports and its manual.