Shree Warana Vibhag Shikshan Mandal's

WARANA UNIVERSITY,
WARANANAGAR

(A State Public University established under Section 3 (6) of MPUA, 2016)

।। विद्या सर्वस्य भूषणम् ।।

Warana University

Established:2025

Structure & Syllabus For

First Year Bachelor of Technology (F.Y. B. Tech)

Of

Computer Science and Business Systems (CSBS)

Semester- I and II

Sponsored By

Tata Consultancy Services (TCS)

(As Per National Education Policy – 2020)

With Effect from Academic Year 2025-26 Onwards

Shree Warana Vibhag Shikshan Mandal's

TATYASAHEB KORE INSTITUTE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS), WARANANAGAR, KOLHAPUR

TKIET
Estd. 1983

Lead Institute of

WARANA UNIVERSITY, WARANANAGAR
(A State Public University)

First Year Bachelor of Technology (F.Y. B. Tech) Semester-I & II

Computer Science & Business Systems

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Structure and Syllabus as per NEP Policy 2020

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Preface

The Bachelor of Technology in Computer Science and Business Systems (CSBS) program, sponsored by Tata Consultancy Services (TCS), has been designed to address the growing need for professionals who possess not only strong foundations in Computer Science but also an understanding of business domains, management principles, and communication skills. This unique interdisciplinary program aims to bridge the gap between technology and business by nurturing graduates who are industry-ready, adaptable, and capable of driving innovation in the digital economy.

The curriculum emphasizes core computing subjects, data science, artificial intelligence, and emerging technologies, while also integrating courses on economics, management, finance, and business communication. This blend enables students to develop both technical expertise and business acumen, equipping them to analyse real-world challenges, design technology-enabled solutions, and contribute effectively to organizational growth.

Aligned with the vision of TCS and academic institutions, the program aspires to produce graduates who demonstrate professional ethics, entrepreneurial mindset, leadership qualities, and lifelong learning orientation. With its holistic approach, the CSBS program prepares students to become globally competent professionals, capable of shaping the future of technology-driven businesses and contributing to sustainable development.

Program Outcomes

1. **Engineering Knowledge** Graduates will possess a strong foundation in engineering fundamentals and apply this knowledge to identify, analyze, and solve complex engineering problems. They will be able to understand and apply principles of mathematics, science, and engineering to a variety of real-world situations.
2. **Problem Analysis and Solution Design** Graduates will be able to critically analyze engineering problems and design effective solutions. Using their skills in problem-solving and analytical thinking, they will develop innovative solutions while considering factors such as feasibility, sustainability, and societal impact.
3. **Design and Development of Solutions** Graduates will be able to design and develop solutions for complex engineering problems by selecting and applying appropriate engineering design principles, tools, and techniques. They will also consider ethical, cultural, and environmental aspects in their designs, contributing to sustainable solutions.
4. **Investigation and Research** Students will be equipped with the skills to conduct in-depth investigations and research into engineering problems, using appropriate research methodologies, experiments, and data analysis. This ability will help them to evaluate solutions, optimize designs, and innovate within their field.
5. **Modern Tool Usage** Graduates will be proficient in using modern engineering tools, technologies, and software relevant to their specialization. They will understand the limitations and appropriate application of these tools in solving engineering problems and designing systems, products, and processes.
6. **The Engineer and Society** Graduates will be aware of the impact of engineering solutions on society, the environment, and public safety. They will be equipped to practice engineering in a socially responsible manner, adhering to professional ethics, and contributing positively to the welfare of society.
7. **Environment and Sustainability** Graduates will understand the importance of sustainability and the need to consider environmental impact when designing solutions. They will be capable of creating engineering solutions that promote environmental sustainability, using renewable resources, and minimizing waste and pollution.
8. **Ethics and Professionalism** Graduates will demonstrate professional ethics in their engineering practices, showing integrity, accountability, and social responsibility. They will follow industry standards, uphold ethical decision-making, and work in a manner that reflects the values of the engineering profession.
9. **Teamwork and Communication** Graduates will have strong interpersonal skills, working effectively in multidisciplinary teams. They will communicate ideas and solutions clearly, both in written and oral forms, and be able to collaborate with peers, colleagues, and stakeholders in a professional manner.
10. **Life-Long Learning** Graduates will have a mindset of continuous improvement and lifelong learning. They will be capable of adapting to new technological advancements, seeking out opportunities for professional development, and staying current with industry trends throughout their careers.
11. **Leadership and Innovation** Graduates will demonstrate leadership qualities, take initiative in projects, and contribute to innovative solutions within their field. They will foster creativity, encourage new ideas, and embrace challenges with an entrepreneurial mindset

Program Specific Outcomes

PSO 1 – Computing Competence
Apply core concepts of computer science, programming, and emerging technologies to design and develop efficient software and system solutions.

PSO 2 – Business Integration
Integrate management, economics, and analytics knowledge with computing skills to analyze business problems and support effective decision-making.

PSO 3 – Professional & Ethical Practice
Demonstrate innovation, teamwork, communication, entrepreneurship, and ethical responsibility in developing technology-enabled business solutions.

Duration

- The B.Tech in Computer Science and Business Systems (CSBS) is a full-time undergraduate program of 4 years.
- The program is divided into 8 semesters, each consisting of coursework, laboratory sessions, projects, and industry-oriented activities.
- In addition to classroom learning, students undergo industry interaction, internships, and project-based training, facilitated by TCS and the institute..

Eligibility

1. Educational Qualification:

The candidate shall have passed the Higher Secondary Certificate (HSC) examination or its equivalent examination with:

- Physics and Mathematics as compulsory subjects, and
- Any one of the following subjects: Chemistry / Biotechnology / Biology / Technical or Vocational Subject / Computer Science / Information Technology / Informatics Practices / Agriculture / Engineering Graphics / Business Studies.

The candidate shall have obtained:

- At least 45% marks (minimum 134 marks) in the above subjects taken together for Open Category candidates.
- At least 40% marks (minimum 119 marks) for candidates belonging to Reserved Categories, EWS, and Persons with Disability (PwD).

2. Entrance Examination Requirement:

The candidate shall have obtained a non-zero score in MHT-CET OR JEE (Main).

3. Alternative Qualification (Diploma Route):

The candidate shall have passed a Diploma in Engineering and Technology and obtained:

- At least 45% marks for Open Category candidates.
- At least 40% marks for Reserved Categories, EWS, and Persons with Disability (PwD).

Medium of Instruction

- The medium of instruction, examinations, assignments, and project reports is English.
- All technical and business communication, including interactions with industry mentors (TCS-supported programs), will be carried out in English to ensure global employability.
- Students are also encouraged to strengthen business communication skills and professional English throughout the program.

Abbreviations

Acronym	Full Form
ISE	In-Semester Examination
ISE-I	In-Semester Examination-I
ISE-II	In-Semester Examination-II
ESE	End Semester Examination
ISA	In-Semester Assessment (Term Work)
L	Lecture
T	Tutorial
P	Practical
CH	Contact Hours
C	Credit
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Program Core Courses
HSSM	Humanities Social Science and Management
VSEC	Vocational and Skill Enhancement Course
CC	Co-curricular course
AEC	Ability Enhancement Course
IKS	Indian Knowledge System
MAC	Mandatory Audit Course

Examination & Evaluation Pattern

Evaluation tools used for the evaluation of a student for each course is as follows:

For Theory Courses	In-Semester Examination (ISE) And End Semester Examination (ESE)
For Lab / Tutorial Courses	In-Semester Assessment (ISA) And / Or Practical and Oral Examination (POE)

Refer course structure for specific evaluation tools used for each course.

In-Semester Examination (ISE)

The In-Semester Examination (ISE) will be conducted at the departmental level. There will be two tests in each semester for every theory course: ISE-I and ISE-II.

- Each test will be of 40 marks.
- The duration of each test will be 1 hour and 30 minutes.

The total ISE marks will be calculated as the average of ISE-I and ISE-II. These rules may be modified from time to time as per the guidelines of the concerned regulatory authorities.

- ISE-I will cover Unit I and Unit II.
- ISE-II will cover Unit III and Unit IV.

  - **Minimum Passing Criteria**

    Students must score a minimum of 40% marks in the ISE. If a student fails to secure the minimum required marks, he/she must appear for a Make-up Examination.

    The Make-up Examination will be conducted in the same semester for:

    - Students who fail to secure minimum passing marks.
    - Students who were absent due to valid reasons such as medical issues, natural calamities, or participation in NSS, NCC, or similar activities (subject to verification of absence and recommendation from the Head of Department).

- **Special Provision**

  If a failed student appears for three tests (including the Make-up test) and scores more than 16 marks when calculating the average of the best two out of the three tests, the student will be awarded the minimum passing marks of 16 only.

  For students absent with valid reasons:

  - If absent in one test, the average of the attempted test and the Make-up test will be considered.
  - If absent in two tests, the decision will be taken after reviewing the reasons and based on the recommendation of the Head of Department.

End Semester Examination (ESE):

The End Semester Examination (ESE) will be conducted for 60 marks and will be based on the entire syllabus. The duration of each examination will be 2 hours.

Weightage of Units

The weightage of units in the ESE question paper will be as follows:

a) Units that are not covered in ISE-I or ISE-II will carry 30% weightage each.

b) Units that are covered in ISE-I and ISE-II will carry 10% weightage each.

Backlog Examination

Students who fail in the End Semester Examination (ESE) of either the odd or even semester within an academic year will be allowed to appear for the Backlog Examination, which will be conducted along with the regular ESE of the respective semester.

- **Re-Examination of ESE**

  A Re-Examination (Make-up Examination) for all courses (UG and PG), including both theory and laboratory courses, will be conducted once a year before the commencement of the odd semester of the next academic year.

  - A one-grade penalty will be applied to students appearing for the Make-up/Re-Examination.
  - However, no grade penalty will be applied if a student secures a ‘P’ grade in the Make-up/Re-Examination.
  - Grace marks will not be awarded for the Make-up/Re-Examination.
  - Exception: Grace marks may be considered if the student is appearing for the ESE for the first time.

- **Eligibility Criteria for ESE**

  To be eligible for the End Semester Examination (ESE), a student must:

  - Secure at least 40% marks in ISE and ISA of the concerned course.
  - Fulfil the attendance requirements as per the norms of Warana University, Warananagar.

  If a student does not meet these requirements, he/she will not be eligible to appear for the ESE.

Nature of Question Paper:

Q. No.		Marks	BL	CO
1	**Attempt any Four**	**8**		
a	Unit -1			
b	Unit -2			
c	Unit -3			
d	Unit -4			
e	Unit -1/2/3/4			
f	Unit -1/2/3/4			
2	**Attempt All**	**16**		
a	Unit -1			
b	Unit -2			
c	Unit -3			
d	Unit -4			
3	**Attempt any Three**	**18**		
a	Unit -5			
b	Unit -5			
c	Unit -5			
d	Unit -5			
4	**Attempt any Three**	**18**		
a	Unit -6			
b	Unit -6			
c	Unit -6			
d	Unit -6			

In Semester Assessment (ISA):

ISA for laboratory courses will be conducted as a continuous assessment throughout the semester. The assessment will be based on the following:

1. Performance in laboratory work.
2. Submission of experiments in the form of a properly maintained journal or report.
3. Timely completion of assigned experiments.
4. Attendance in laboratory sessions.
5. Understanding of the experiments conducted, evaluated through methods such as quizzes, oral examinations, case studies, field work, surveys, open-book tests, model preparation, programming, projects, or any other criteria specified by the course teacher.

Practical Oral Examination (POE):

POE for laboratory courses will be conducted immediately after the end of the semester. The duration of the practical examination will be as specified in the curriculum structure. The POE will be conducted jointly by an Internal Examiner and an External Examiner.

The examination may be conducted in any one of the following ways:

1. **Oral Examination Only**

   Both the Internal and External Examiners will ask questions based on the practical content of the course to assess the student's practical knowledge.

2. **Practical Examination Only**

   Students will be required to perform a given experiment, complete a workshop task, prepare a drawing, or develop a computer program, as applicable. In this case, the student's performance will be evaluated by the External Examiner only.

3. **Practical and Oral Examination**

   Students will first perform a given practical task. This will be followed by an oral examination (viva voce) based on the practical content of the course. The student's performance will be evaluated jointly by both the Internal and External Examiners.

Grading System

The University follows a **10-Point Grading System** to evaluate student performance.

- **Conversion of Marks into Grades**
  In every semester, the marks you get in each subject (out of 100) are converted into **grade points** as per the table below. You need at least **40% marks** to pass a subject.

Marks Obtained (Out of 100)	Grade Point	Letter Grade	Meaning
Absent	0	AB	Absent
0 – 39	0	F	Fail
40 – 44	4	P	Pass
45 – 49	5	C	Average
50 – 59	6	B	Above Average
60 – 69	7	B+	Good
70 – 79	8	A	Very Good
80 – 89	9	A+	Excellent
90 – 100	10	O	Outstanding

Note:

1. If decimal marks are 0.5 or more, they will be rounded off to the next higher number. (Example: 59.5 will become 60)
2. For courses of 50 marks or 200 marks, marks will be converted proportionally to 100 marks before assigning grade points.

- **Calculation of Semester Grade Point Average (SGPA)**
  SGPA is calculated at the end of each semester**.** It shows your average performance in one semester.

$$SGPA = \frac{\sum(Credit \times Grade\ Point)\ for\ each\ course\ of\ a\ Semester}{\sum(Credits)\ for\ a\ Semester}$$

- **Calculation of Cumulative Grade Point Average (CGPA)**
  CGPA is calculated after completing multiple semesters. CGPA reflects the overall academic performance of the student in the program.

$$CGPA = \frac{\sum\begin{pmatrix} Total\ Credits\ of\ a\ Semester \times \\ SGPA\ of\ Respective\ Sememster \end{pmatrix}\ of\ all\ semesters}{\sum(Course\ Credits)\ of\ all\ Semesters}$$

Note: The SGPA & CGPA shall be rounded off to 2 decimal points.

First Year B. Tech Computer Science &Business Systems

Curriculum Structure and Evaluation Scheme of Semester-I

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
2501UCBSBSC102	BSC	Introductory Topics in Statistics, Probability and Calculus	3	1	--	4	4	ESE	60	24	40
								ISE	40	16	
2501UCBSBSC105	BSC	Physics for Computing Science	3*	--	--	2	3	ESE	60	24	40
								ISE	40	16	
2501UCBSBSC105T	BSC	Physics for Computing Science Lab	--	--	2	1	2	ISA	25	10	10
2501UCBSESC101	ESC	Discrete Mathematics	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
2501UCBSESC103	ESC	Fundamentals of Computer Science	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
2501UCBSESC103P	ESC	Fundamentals of Computer Science Lab	--	--	2	1	2	ISA	25	10	30
								POE	50	20	
2501UCBSESC104	ESC	Principles of Electrical Engineering	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
2501UCBSESC104P	ESC	Principles of Electrical Engineering Lab	--	--	2	1	2	ISA	25	10	30
								POE	50	20	
2501UCBSHSM106	HSSM	Business Communication & Value Science – I	2	--	--	2	2	ESE	60	24	40
								ISE	40	16	
2501UCBSHSM106T	HSSM	Business Communication & Value Science – I Lab	--	--	2	1	2	ISA	25	10	10
Total			**17**	**01**	**08**	**21**	**26**	**--**	**800**	**320**	**320**

First Year B. Tech Computer Science &Business Systems

Curriculum Structure and Evaluation Scheme of Semester-II

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
2501UCBSBSC201	BSC	Linear Algebra	3	1	--	4	4	ESE	60	24	40
								ISE	40	16	
2501UCBSBSC202	BSC	Statistical Methods	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
2501UCBSBSC202T	BSC	Statistical Methods Lab	--	--	2	1	2	ISA	25	10	10
2501UCBSESC204	ESC	Principles of Electronics Engineering	2	--	--	2	2	ESE	60	24	40
								ISE	40	16	
2501UCBSESC204P	ESC	Principles of Electronics Engineering Lab	--	--	2	1	2	ISA	25	10	30
								POE	50	20	
2501UCBSPCC203	PCC	Data Structures And Algorithms	3	--	--	3	3	ESE	60	24	40
								ISE	40	16	
2501UCBSPCC203P	PCC	Data Structures and Algorithms Lab	--	--	2	1	2	ISA	25	10	30
								POE	50	20	
2501UCBSCC205	CC	Fundamentals of Economics	2	--	--	2	2	ESE	60	24	40
								ISE	40	16	
2501UCBSHSSM206	HSSM	Business Communication & Value Science – II	2	--	--	2	2	ESE	50	20	30
								ISE	25	10	
2501UCBSHSSM206T	HSSM	Business Communication &Value Science II-Lab	--	--	2	1	2	ISA	25	10	10
2501UCBSVSEC207T	VSEC	Web Designing	--	--	2	1	2	ISA	25	10	10
Total			**15**	**1**	**10**	**21**	**26**	**--**	**800**	**320**	**320**

Course Code: 2501UCBSBSC102 Couse Name: Introductory Topics in Statistics, Probability and Calculus

Teaching Scheme			**Credits: 04**	**Evaluation Scheme**	
Lectures	**:**	**3 Hrs/Week**		**ISE**	**:** 40 Marks
Tutorials	**:**	**1**		**ESE**	**:** 60 Marks

Course Description:

This course covers key statistical concepts, including data types, probability distributions, and sampling techniques. It focuses on measures of central tendency, dispersion, and the analysis of random variables. Students will apply these methods to solve real-world problems

Prerequisites	Knowledge of basic mathematics and algebra

Course Objective: The objectives of this course are

1	To understand key concepts and techniques in statistics.
2	To develop skills in data analysis and interpretation.
3	To apply statistical methods to solve real-world problems.
4	To provide an overview of partial derivatives and double and triple integral and its applications.

Course Outcomes:

COs	At the end of successful completion of the course, the students will be able to	**Bloom's Taxonomy**
CO1	Calculate partial derivative & find extreme values of function of two variables.	Apply
CO2	Calculate double and triple integral apply to find area and Mass.	Apply
CO3	Identify data types and interpret graphical representations and calculate mean, median, standard deviation.	Understand
CO4	Analyze random variables and their probability distributions.	Understand
CO5	To Apply probability distributions like binomial and normal.	Apply
CO6	Utilize sampling techniques and evaluate standard error.	Understand

	Section – I	
Unit-1	**Differential Calculus:** Introduction, Definition: -Differentiation, Rules for Differentiation, Definition: - Partial Differentiation, Partial Differentiation of first order and higher order, Partial Differentiation of some standard function and composite function, Maxima and Minima of function of two variables	**07 Hours**
Unit-2	**Integral Calculus:** Introduction, Basic Concept of definite and Indefinite integral, Rules for integration, Double integral, Triple integral, Application of double integral: - Area and Mass.	**06 Hours**
Unit-3	**Introduction to statistics:** Random Variable and types of Random Variable. Two - dimensional random Definition, Data, various types of data, Graphical Representation of data. Measures of central tendency: Mean, Median, Mode and simple properties Measures of Dispersion: Variance, Standard Deviation, Coefficient of Variation. Bivariate data, Marginal and Conditional frequency distribution.	**06 Hours**
	Section – II	

Unit-4	**Probability & Random variable:** Definition of probability, sample space, random variable, Probability mass function, probability density function, mathematical expectation and its properties.	**05 Hours**
Unit-5	Probability Distributions: Discrete Probability Distribution: -Binomial Distribution & Poisson Distribution, Continuous Probability Distribution: -Geometric Distribution & Normal Distribution	**06 Hours**
Unit-6	Sampling Techniques: Random sampling. Random Sampling from Finite and Infinite populations. Standard Error. Simple random sampling with and without replacement. Chi-square Distribution test, t – Distribution test, F- Distribution test	**06 Hours**

Mapping of POs & COs:

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

References	
Text Books :	
1	Introduction of Probability Models– S. M. Ross - Academic Press, N.Y
2	Fundamentals of Statistics - I & II - A. Goon, M. Gupta and B. Dasgupta - World Press
3	Higher Engineering Mathematics - B. S. Grewal - Khanna Publication, Delhi
Reference Books :	
1	A first course in Probability– S. M. Ross - Prentice Hall.
2	Probability and Statistics for Engineers– 4th edition – I. R. Miller, J.E. Freund and R – PHI
3	Introductions to the Theory of Statistics- A. M. Mood, F.A. Graybill ,D.C. Boes - McGraw Hill Edu
4	Advanced Engineering Mathematics – 7th edition - Peter V. O'Neil- Pearson
5	Applied Mathematics – 1st & 2nd edition - P. N. Wartikar and J. N. Wartikar- Vidyarthi Prakashan.
6	Advanced Engineering Mathematics – 2nd edition - M. D. Greenberg- Tata McGraw.

Course Code: 2501UCBSESC103 Course Name: Fundamentals of Computer Science

Teaching Scheme			**Credits: 03**	**Evaluation Scheme**	
Lectures	**:**	**3 Hrs/Week**		**ISE**	**: 40 Marks**
Tutorials	**:**			**ESE**	**: 60 Marks**

Course Description: This course introduces essential programming concepts, including data types, operators, control flow, functions, pointers, and arrays. It covers file handling, structures, and Unix system interfaces, equipping students with practical skills for effective software development.

Prerequisites	Fundamentals of Computer

Course Objective: The objectives of this course are

1	To understand fundamental programming concepts and structures.
2	To develop skills in writing and managing functions and data structures.
3	To apply programming techniques to solve real-world problems and work with system interfaces.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Identify and use fundamental programming concepts and data types.	Understand
CO2	Apply control flow statements like loops and conditionals in programs.	Apply
CO3	Understand the use and management of functions, including recursion and scope.	Understand
CO4	Utilize pointers and arrays for efficient data handling and memory management.	Understand
CO5	Apply file I/O operations and interact with Unix system interfaces.	Apply

Section – I

Unit-1	**General problem-Solving concepts and Imperative languages:** Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops. Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C).Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation	**07 Hours**
Unit-2	**Control Flow with discussion on structured and unstructured programming:** Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming	**06 Hours**
Unit-3	**Functions and Program Structure with discussion on standard library**: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules,	**06 Hours**

	Block structure, Initialization, Recursion, Pre-processor, Standard Library Functions and return types	
Section – II		
Unit-4	**Pointers and Arrays:** Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initializations of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated	**05 Hours**
Unit-5	**Structures:** **Basic Structures :** Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields **Input and Output:** Standard I/O, Formatted Output – printf, Formatted Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions	**06 Hours**
Unit-6	**Unix system Interface:** File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, make file utility	**06 Hours**

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-
CO5	2	-	2	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	B. W. Kernighan and D. M. Ritchi, “The C Programming Language”, Second Edition, PHI.
2	B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series.
Reference Books:	
1	Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill.
2	YashavantKanetkar, “Let Us C”, BPB Publications.

Course Code: 2501UCBSESC104 Course Name: Principles of Electrical Engineering

Teaching Scheme			**Credits: 03**	**Evaluation Scheme**		
Lectures	**:**	**3 Hrs/Week**		**ISE**	**:**	**40 Marks**
Tutorials	**:**	**--**		**ESE**	**:**	**60 Marks**

Course Description:

This course covers fundamental concepts in electrical engineering, including DC and AC circuits, electrostatics, capacitors, and batteries. It explores the principles of electro mechanics, sensors, and measurement systems. Students will gain practical knowledge of electrical networks, power analysis, and wiring systems

Prerequisites :	Basic knowledge of mathematics and physics

Course Objective: The objectives of this course are

1	To understand fundamental electrical concepts and circuit analysis techniques.
2	To apply principles of electrostatics, capacitors, and batteries in practical scenarios.
3	To analyze AC circuits and electromechanical systems, including sensors and measurement techniques.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Apply knowledge of basic concepts of work, power, energy for energy conversion and calculate current in electrical network using Kirchhoff's laws.	Apply
CO2	Calculate response of electrical circuit using network theorems	Calculate
CO3	Define basic terms of single phase and three phase ac circuits and supply systems.	Describe
CO4	Describe construction, principle of operation, specifications and applications of capacitors and batteries	Describe
CO5	Apply fundamental concepts of magnetic and electro-mechanics for operation of single-phase transformer, illumination and describe types of wiring and earthling system.	Apply

Section – I

Unit-1	**Introduction:** Concept of EMF, Potential difference, voltage, current, resistance, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis (Numerical Treatment: KCL, KVL-Two Loops)	**04 Hours**
Unit-2	**DC Circuits:** Ohm Law, Difference between AC and DC Circuit, Thevenin's theorem, Norton's Theorem, Simplifications of networks using series-parallel, Star/Delta transformation. (Numerical Treatment: Simplifications of networks using series-parallel, Star/Delta transformation))	**04 Hours**
Unit-3	**AC Circuits:** Faradays law, AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, concept of impedance, admittance, active, reactive, apparent power, definition of power factor, Three-phase balanced AC circuits (Y-Δ and Δ-Y): (Numerical Treatment: RL, RC, RLC Series)	**05 Hours**

Section – II

Unit-4	**Electrostatics:** Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitors in series and parallel, energy stored in capacitors, Principle of batteries, types, construction and working, application. (Numerical Treatment: capacitors in series and parallel)	**05 Hours**
Unit-5	**Electro-Mechanics:** Self and mutual inductance, Ampere's law, Comparison between magnetic and electric circuits and B-H Curve, Single phase transformer, principle of operation, EMF equation, KVA rating, losses in transformer, efficiency and regulation. (Numerical Treatment: Single phase transformer)	**04 Hours**
Unit-6	**Measurements and Sensors:** Measuring devices/sensors: Piezoelectric and thermo-couple related to electrical signals, Basic concept of indicating and integrating instruments, Electrical Wiring Different types of lamps like Fluorescent Lamp, Compact Fluorescent Lamp, Sodium Vapor Lamp, Mercury Vapor Lamp., Necessity of earthing, Types of earthing.	**05 Hours**

Mapping of POs & COs:

PO COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		-		-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	2	-	1	1	2	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	2	2	2	-	-	-	-	-	-	-

References	
Text Books :	
1	Electric Machinery,(Sixth Edition) A.E. Fitzgerald, KingselyJr Charles, D. Umans Stephen, Tata McGraw Hill.
2	A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and Company Ltd. Delhi.
3	Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4	Theory and problems of Basic Electrical Engineering, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.
Reference Books :	
1	Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011
2	Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3	Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book
4	Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

Course Code: 2501UCBSBSC105 Course Name: Physics for Computing Science

Teaching Scheme		**Credits: 02**	**Evaluation Scheme**	
Lectures	**: 3* Hrs/Week**		**ISE**	**: 40 Marks**
Tutorials	**: --**		**ESE**	**: 60 Marks**

Course Description:

This course explores advanced topics in physics, including oscillations, interference, diffraction, and polarization. It covers lasers, fiber optics, crystallography, semiconductor physics, quantum mechanics, electromagnetism, and thermodynamics. Students will gain an understanding of both theoretical concepts and practical applications in these areas

Prerequisites	Basic understanding of physics and mathematics

Course Objective: The objectives of this course are

1	To understand the principles of quantum mechanics.
2	To discuss various advanced engineering materials and their properties
3	To understand the periodic motion, oscillation and its characteristics.
4	To discuss various properties of material for engineering applications.
5	To familiarize with the phenomenon of light and their engineering applications.
6	To explain various characteristics of LASER and types of Optical Fiber with applications.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Summarize the knowledge of basic quantum mechanics to understand Dualism and their phenomenon.	Understand
CO2	Demonstrate the different crystal structure understanding crystal physics.	Understand
CO3	Apply the theory and phenomenon oscillations to produce various motion by using oscillators	Apply
CO4	Define the fundamental concepts of Electromagnetism, Thermodynamics and Band theory for engineering applications.	Remember
CO5	Illustrate the different phenomena of light.	Understand
CO6	Explain the concepts with applications of LASER and Fiber Optics	Understand

Section – I

Unit-1	**Quantum Mechanics:** Introduction, Plank's quantum theory, Matter waves, de Broglie wavelength, Heisenberg uncertainty principle, time-independent and time-dependent Schrodinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box.	**03 Hours**
Unit-2	**Crystallography:** Basic terms, Types of crystal systems, Bravais Lattices, Miller Indice d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures, X-ray diffraction	**07 Hours**
Unit-3	**Oscillation**: Periodic motion, simple harmonic motion, characteristics of simple harmonic motion, the vibration of the simple spring-mass system, Resonance - definition,	**04 Hours**

	damped harmonic oscillator, heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.	
Section – II		
Unit-4	**Electromagnetism, Thermodynamics and Semiconductor Physics:** Electromagnetism: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium. Thermodynamics: Zeroth law of thermodynamics, First law of thermodynamics, Application of First law, Second law of thermodynamics, concept of Engine, Entropy, Change in entropy in reversible and irreversible processes. Semiconductor**:** Conductor, Semiconductor and Insulator, Origin of Band theory, Basic Concept of the Band theory.	**05 Hours**
Unit-5	**Interference, Diffraction and Polarization of Light**: Interference: Theory of Interference fringes, types of interference, Fresnel's prism, Newton's rings, Diffraction: Types of diffraction, the difference between interference and diffraction, Fraunhofer diffraction at single slit plane diffraction grating, Temporal and spatial coherence. Polarization: Concepts of production of a polarized beam of light from two SHM acting at a right angle, plane, elliptical and circularly polarized light, Brewster's law, Double Refraction.	**04 Hours**
Unit-6	**LASER and Fiber Optics:** **LASER** Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, Different types of lasers, Ruby Laser, CO2 and Neodymium YAG (Neodymium doped Yirtium Aluminum Garnet); Properties of LASER beams (Monochromaticity, Coherence, Directionality and brightness, LASER speckles), and Applications of LASER in Engineering. **Fiber Optics** Fiber optics, Principle, Advantages, and application, types of optical fibers.	**04 Hours**

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Concepts Of Physics (Fifth edition)ABeiser McGraw Hill International.
2	Fundamentals Optics (Fifth edition) AjoyGhatak, Tata McGraw Hill Sears &Zemansky University Physics, Addison –Wesley Fundamentals of Optics ,(Third Edition)Jenkins &White, McGraw-Hill
Reference Books :	
1	R. K. Gaur & Gupta S. L, Engineering Physics –DhanapatRai Publication
2	B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi
3	Subramanyam&BrijLal, A Text Book of Optics –S. Chand & Company (P.) Ltd.
4	M. N. Avadhanulu& P. G. Kshirsagar - A Text Book of Engineering Physics -S. Chand Publication.
5	B. K. Pandey and S. Chaturvedi- Engineering Physics, Cengage Learning

Course Code: 2501UCBSHSM106 Course Name: Business Communication and Values –I

Teaching Scheme		**Credits: 02**	**Evaluation Scheme**	
Lectures	**: 2 Hrs/Week**		**ISE**	**: 40 Marks**
Tutorials	**: --**		**ESE**	**: 60 Marks**

Course Description: This course help students develop life skills for a balanced life, encourage self-improvement, and introduce key concepts like values and business communication. Enhancing their English grammar and communication skills will boost their performance in assessments and professional interactions.

Prerequisites:	Basic English HSC level

Course Objective: The objectives of this course are

1. To develop communication skills and overcome barriers.
2. To enhance verbal aptitude and grammar.
3. To improve listening, speaking, and business correspondence.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Recognize the importance of life skills and values in personal and professional growth.	Understand
CO2	Identify personal strengths and areas for improvement to foster self-development.	Understand
CO3	Apply life skills effectively in various real-world situations.	Apply
CO4	Understand and implement key communication practices across different types of interactions.	Understand

	Section – I	
Unit-1	**Communication and Values:** Introduction to Values: Understanding their importance and necessity. Communication Fundamentals: Exploring the significance, process, and levels of communication. Methods of Communication: Distinguishing between verbal and non-verbal forms. Communication Barriers: Identifying obstacles and discovering solutions.	03 Hours
Unit-2	**Communication in Business Context:** Overview of Business Communication: Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions	02 Hours
Unit-3	**Verbal Aptitude:** Grammar: parts of speech-using articles, conjunctions and prepositions; using appropriate tenses, degree, voice Vocabulary: Affixation, synonyms and antonyms, idioms, confusables-homophones and homonyms. Syntax: types of sentences, spotting errors in sentences with justification	03 Hours
	Section – II	
Unit-4	**Enhancing Listening, Speaking, and Thinking Skills** Effective listening: Law of nature- Importance of listening skills, Difference between listening and hearing, process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers Effective speaking: Importance, various oral business contexts/situations, preparing effective public speeches, expressing oneself clearly •Thinking as a learning skill.	**03 Hours**

Unit-5	**Formal Business Correspondence-1** Principles, structure (elements) Layout (complete block, modified block, semi-block)	**02 Hours**
Unit-6	**Formal Business Correspondence-2** Types of letters (leave application, enquiry and replies, claim and adjustment	**02 Hours**

Mapping of POs & COs:

PO COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-		-	-	-	2	2	3	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
CO4	-	-	-	-	-	-	-	1	-	2	-	-
CO5	-	-	-	-	-	-	-	1	2	2	-	-

References	
Text Books :	
1	Communication Skills– 3rd edition - Meenakshi Raman and Sangeeta Sharma – Oxford University Press (OUP)
2	Communication Skills – 2nd edition - Sanjay Kumar and Pushpa Lata- Oxford University Press (OUP)
Reference Books :	
1	Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011

Course Code: 2501UCBSESC103P Course Name: Fundamentals of Computer Science Lab

Teaching Scheme	**Credits: 01**	**Evaluation Scheme**
Lectures : --		**ISA : 25 Marks**
Practical : 2 Hrs/Week		**POE : 50 Marks**

Course Objective: The objectives of this course are	
1	To Develop proficiency in fundamental C programming constructs and techniques.
2	To Implement robust input validation and error handling in C programs.
3	To Enhance problem-solving skills through practical programming challenges.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able**	**Bloom's Taxonomy**
CO1	To Apply various C programming constructs to write and debug programs that effectively solve specified problems.	Apply
CO2	To Analyze and manipulate data through string and file handling, demonstrating an understanding of data processing techniques..	Analyze
CO3	To Create modular and error-resistant C programs using user-defined libraries, showcasing their ability to design and implement complex solutions.	Create

List of Experiments:	
01	Write a C program to display a specified pattern using nested loops.
02	Create a C program that prints its own source code as output.
03	Develop a C program that demonstrates the use of arrays with both simple and recursive functions.
04	Implement a C program to count the number of lines, words, and characters in a given text file.
05	Write a C program that utilizes structures and pointers to manage and manipulate complex data.
06	Create a multi-file C program that employs user-defined libraries to enhance code organization.
07	Develop a C program that accepts single alphabetical characters, sorting them and terminating on a non-alphabetical input.
08	Write a C program that checks another C program for common syntax errors, including unbalanced parentheses and quotes.
09	Implement a C program that performs prime factorization of an integer from command-line input, outputting results to both the console and a text file.
10	Create a C program that functions as a basic calculator, using functions to perform arithmetic operations based on user input.

Mapping of POs & COs:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-

Course Code: 2501UCBSESC104P Course Name: Principles of Electrical Engineering Lab

Teaching Scheme	**Credits: 01**	**Evaluation Scheme**
Lectures : --		**ISA : 25 Marks**
Practical : 2 Hrs/Wee		**POE : 50 Marks**

Course Objective: The objectives of this course are	
1	To impart the use of electrical Elements, sources, measuring devices and transducers relatedto electrical circuits experimentally.
2	To verify the network theorems for the electric circuit using hardware.
3	To enable experimental measurement of electrical quantities in DC and AC systems

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	**Understand** the principles of electrical circuits and measurement techniques.	Understand
CO2	**Apply** theoretical concepts to validate DC circuit theorems through experiments.	Apply
CO3	**Analyze** circuit performance and behavior in RL, RC, and AC circuits using practical measurements.	**Analyze**

List of Experiments:	
01	Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical.
02	Determination of resistance temperature coefficient.
03	Verification of Superposition Theorem.
04	Verification of Norton Theorem
05	Verification of Maximum Power Transfer Theorem.
06	Simulation of R-L-C series circuits for XL>XC , XL< XC.
07	Simulation of Time response of R-C circuit.
08	Verification of relation in between voltage and current in three phasebalanced.
09	Demonstration of measurement of electrical quantities in DCand AC systems.
10	Measure the time constant of an RC circuit and analyze its impact on charging and discharging rates.

Mapping of POs & COs:

PO COS	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	-	-	-	-

Course Code: 2501UCBSBSC105T Course Name: Physics for Computing Science Lab

Teaching Scheme		**Credits: 01**	**Evaluation Scheme**	
Lectures	: --		**ISA**	: 25 Marks
Practical	: 2 Hrs/Week		**POE**	: ----

Course Objective: The objectives of this course are	
1	To introduce fundamental concepts of oscillations, wave phenomena, and quantum mechanics.
2	To provide an understanding of semiconductor physics, electromagnetism, and thermodynamics with engineering applications.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	**Understand** basic principles of oscillations, interference, and diffraction, and their applications.	Understand
CO2	**Apply** concepts of lasers, fiber optics, and crystallography in practical and engineering contexts.	Apply
CO3	**Analyze** quantum mechanics, electromagnetism, and thermodynamics to solve real-world physics problems.	**Analyze**

List of Experiments:	
01	Determine gravitational acceleration by measuring the oscillation period of a Kater's pendulum.
02	Calculate the torsional constant by analyzing the oscillation period of a torsional pendulum.
03	Verify the inverse square law by measuring light intensity at different distances.
04	Measure the divergence angle of a laser beam
05	Analyze diffraction patterns to determine the wavelength of light using a grating.
06	Assess the resolving power of a diffraction grating with spectral lines.
07	Determine crystal structure and Miller indices using X-ray diffraction.
08	Measure Hall voltage to find the Hall coefficient of a semiconductor.
09	Calculate Planck's constant using the photoelectric effect.
10	Evaluate laser and optical fiber performance by measuring key parameters.

Mapping of POs & COs:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-

Course Code: 2501UCBSHSM106T Course Name: Business Communication and Value Science -I Lab

Teaching Scheme		**Credits: 01**	**Evaluation Scheme**	
Lectures	**: --**		**ISA**	**: 25 Marks**
Practical	**: 2 Hrs/Week**		**POE**	**: ----**

Course Objective: The objectives of this course are	
1	To Enhance students' understanding of English sounds for improved pronunciation.
2	To Develop students' listening and speaking skills through practical exercises.
3	To Strengthen grammatical competence to enable effective communication

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Analyze English sounds and grammar to improve professional communication.	Analyze
CO2	Apply effective listening techniques in everyday interactions.	Apply
CO3	Construct and deliver impactful public speeches.	Construct

List of Experiments:	
01	**Ice Breaking**: Introduce yourself and others using adjectives and phrases for effective communication.
02	**Life Skills Presentation**: Present on a favorite sports captain, focusing on the skills and values they demonstrate.
03	**Phonetics Practice**: Explore consonants, vowels, and diphthongs in English, practicing pronunciation with audio-visual aids.
04	**Verbal Aptitude - Vocabulary**: Engage in vocabulary-building games and practice using idioms and homonyms.
05	**Verbal Aptitude - Grammar**: Practice grammar skills, including tense usage, articles, and error spotting in sentences.
06	**Listening Comprehension**: Develop effective listening strategies through guided audio and video exercises.
07	**Speaking Practice - Public Speaking**: Analyze effective speeches and practice extemporaneous and prepared speaking.
08	**Speaking Practice - Prepared Speeches**: Deliver prepared speeches for assessment and improvement feedback.
09	**Experiencing Life Skills**: Participate in community service with an NGO and share your experience through roleplay.
10	**Understanding Life Skills**: Analyze "The Pursuit of Happyness" to identify and relate to essential life skills and values.

Mapping of POs & COs:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-			-	-	-	2	2	3	-	1
CO3	-	-	-	-	-	-	-	2	2	2	-	-

Course Code: 2501UCBSBSC201 Course Name: Linear Algebra

Teaching Scheme	Credits: 04	Evaluation Scheme
Lectures : 3 Hrs/Week		**ISE : 40 Marks**
Tutorials : 1		**ESE : 60 Marks**

Course Description:

This course covers fundamental topics in linear algebra, including systems of linear equations, vector spaces, and linear transformations. It delves into eigenvalues and eigenvectors, quadratic forms, and their applications in machine learning and image processing. Additionally, the course explores inner product spaces and orthogonalization techniques

Prerequisites	Basic knowledge of algebra and introductory linear algebra concepts

Course Objective: The objectives of this course are

1	To understand and apply fundamental concepts of linear algebra
2	To analyze and compute properties of linear transformations
3	To utilize advanced techniques such as quadratic forms singular value decomposition (SVD), and principal component analysis (PCA) in practical applications

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain systems of linear equations and perform matrix decomposition techniques.	Understand
CO2	Understand and apply concepts related to vector spaces and their properties.	Understand
CO3	Analyze and implement linear transformations and related theorems effectively.	**Analyze**
CO4	Understand eigen values and eigenvectors and apply diagonalization methods.	Understand
CO5	Utilize quadratic forms, SVD, and PCA for applications in image processing and machine learning.	**Utilize**
	Section – I	
Unit-1	**System of Linear Equations:** Rank of a Matrix, System of Linear Equations, Gauss Elimination, LU Decomposition method	**06 Hours**
Unit-2	**Vector Space:** Vectors , n-Vectors , linear combination, Linear Dependence & Independence of vectors, Vector space, Subspace, Spanning Set, Basis & Dimension	**06 Hours**
Unit-3	**Linear Transformations:** Linear Transformations, Matrix of Linear transformation, Range and Kernel, Non-singular linear transformation, Rank-Nullity Theorem, Orthogonal transformation	**06 Hours**
	Section – II	
Unit-4	**EigenValues and EigenVectors:** EigenValues and EigenVectors, Cayley-Hamilton theorem and its	**06 Hours**

	Applications, Diagonalization,Inverse and power of matrix by modal matrix.	
Unit-5	**Quadratic Forms and Applications:** Quadratic forms, Symmetric Matrices, Reduction of Quadratic forms to canonical form, Definite & Semi- definite forms, Linear and Orthogonal transformation, Singular value decomposition (SVD) and Principal Component Analysis(PCA), Applications to Image Processing and Machine Learning	**06 Hours**
Unit-6	**Inner Product Space:**Inner Product Space, Norm of a Vector, Orthogonality, Orthogonal Projection, Gram-Schmidt ortho normalization, QR decomposition	**06 Hours**

Mapping of POs & COs:

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

References	
Text Books:	
1	Elementary Linear Algebra – Larson, Edwards, Falvo and - Houghton Mifflin
2	Introduction to linear algebra – Gilbert Strang and – Wellesley
3	Linear Algebra – Kenneth Hoffman, Ray Kunze and – Pearson
Reference Books:	
1	Linear Algebra – Seymour and – McGraw Hill.
2	Linear Algebra and its Applications – David C Lay and – Pearson
3	Linear Algebra – Kenneth M Hoffman and – Prentice Hall

Course Code: 2501UCBSBSC202 Course Name: Statistical Methods

Teaching Scheme	**Credits: 03**	**Evaluation Scheme**
Lectures : 3 Hrs/Week		**ISE : 40 Marks**
Tutorials : --		**ESE : 60 Marks**

Course Description:

In this course, students will learn Regression, Statistical Inference, and Time Series Analysis to model relationships, make predictions, and analyze time-based data. These skills will help them apply statistical techniques for data-driven decision-making

Prerequisites	Basic statistics and Probability.

Course Objective: The objectives of this course are

1	To Explain the role of regression and data analysis in business decision-making.
2	To Impart knowledge on data collection, analysis, and presentation for informed decisions.
3	To Apply estimation, testing, and modeling techniques to analyze real-time data and relationships.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain systems of linear equations and perform matrix decomposition techniques.	Understand
CO2	Understand and apply concepts related to vector spaces and their properties.	Understand
CO3	Analyze and implement linear transformations and related theorems ffectively.	Analyze
CO4	Understand eigenvalues and eigenvectors and apply diagonalization methods.	Understand
CO5	Utilize quadratic forms, SVD, and PCA for applications in image processing and machine learning.	Utilize

Section – I		
Unit-1	**Linear Statistical Models:** Correlation and Scatter diagram, Linear regression and Least squares method, Multiple regressions& multiple correlations, Rank correlation	**06 Hours**
Unit-2	**Statistical Inference – I (Estimation):** Point estimation, Criteria for good estimates (un-biasedness, consistency and sufficiency), Methodsof estimation including maximum likelihood estimation.	**07 Hours**
Unit-3	**Statistical Inference – II (Test of Significance):** Test of hypothesis, Sampling distribution of mean and standard error, Large sample tests: Test for an assumed mean and equality of two population means, Small sample tests: t-test for an assumed mean and equality of means of two populations, Paired t-test, Neyman Pearson lemma.	**08 Hours**
Section – II		
Unit-4	**Analysis of Variance:** Test for single variance by using Chi – square distribution, Test for two variance by using F- distribution, Analysis of variance (one way, two ways with as well as without interaction)	**08 Hours**

Unit-5	**Non-parametric Inference:** Comparison with parametric inference, Use of order statistics, Sign test, Wilcoxon signed rank test,Mann Whitney test, Run test, Kolmogorov-Smirnov test, Spearman's and Kendall's test, Toleranceregion.	**07 Hours**
Unit-6	**Basics of Time Series Analysis & Forecasting:** Stationary ARIMA Models: Identification, Estimation and Forecasting	**04 Hours**

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-

References	
Text Books:	
1	Probability and Statistics for Engineers – 4th edition - LI.R. Miller, J.E.Freund and R.Johnson
2	Fundamentals of Statistics – Vol. I & II - Goon, M. Gupta and - World Press
3	The Analysis of Time Series: An Introduction – Chris Chatfield
Reference Books:	
1	Introduction to Linear Regression Analysis – D.C. Montgomery & E.Peck A.M. Mood,F.A.
2	Introduction to the Theory of Statistics – Graybill & D.C. Boes
3	Applied Regression Analysis – N. Draper & H. Smith
4	Hands-on Programming with R – Garrett Grolemund
5	R for Everyone: Advanced Analytics and Graphics – Jared P. Lander

Course Code: 2501UCBSPCC203 Course Name: Data Structures and Algorithms

Teaching Scheme		**Credits: 03**	**Evaluation Scheme**	
Lectures	**: 3 Hrs/Week**		**ISE**	**: 40 Marks**
Tutorials	**: --**		**ESE**	**: 60 Marks**

Course Description:

This course provides a comprehensive overview of statistical methods and inference techniques. It covers linear statistical models, estimation, hypothesis testing, analysis of variance, and non-parametric inference methods. The course also introduces basics of time series analysis and forecasting, focusing on ARIMA models.

Prerequisites	Basic understanding of programming concepts

Course Objective: The objectives of this course are

1	To understand fundamental concepts of algorithms and data structures.
2	To develop skills in implementing and analyzing linear and non-linear data structures.
3	To apply various algorithms for searching, sorting, and managing data efficiently.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and explain fundamental concepts of algorithms and data structures.	Understand
CO2	Apply linear and non-linear data structures to solve various problems.	Apply
CO3	Analyze and evaluate the efficiency of searching and sorting algorithms.	Analyze
CO4	Implement file organization methods and access schemes for efficient data management.	Apply
CO5	Analyze and apply graph algorithms for effective search and traversal.	Analyze
	Section – I	
Unit-1	**Basic Terminologies and Introduction to Algorithm & DataOrganization:** Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction	**05 Hours**
Unit-2	**Linear Data Structure:** Array, Stack, Queue, Linked list and its types, Various Representations, Operations &Applications of Linear Data Structures	**07 Hours**
Unit-3	**Non-linear Data Structure:** Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, SplayTree), Applications of Non-Linear Data Structures.	**08 Hours**
	Section – II	
Unit-4	**Searching and Sorting on Various Data Structures**: Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heapsort, Introduction to Hashing	**05 Hours**

Unit-5	**Files:** Organization (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessingschemes	**07 Hours**
Unit-6	**Graphs:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexityanalysis	**08 Hours**

Mapping of POs & COs:

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

References	
Text Books :	
1	E. Horowitz, S. Sahni, S. A-Freed (2008). Fundamentals of Data Structures. Universities Press.
2	A. V. Aho, J. E. Hopcroft, J. D. Ullman (1982). Data Structures and Algorithms. Pearson
Reference Books :	
1	Donald E. Knuth (1997). The Art of Computer Programming: Volume 1: Fundamental Algorithms. Addison-Wesley
2	Thomas, H. Cormen, Charles E. Leiserson, R L. Rivest, Clifford Stein (2009). Introductionto Algorithms. PHI Learning Pvt. Ltd.
3	Pat Morin (2013). Open Data Structures: An Introduction (Open Paths to Enriched Learning). UBC Press.

Course Code: 2501UCBSESC204 Course Name: Principles of Electronics Engineering

Teaching Scheme		**Credits: 02**	**Evaluation Scheme**		
Lectures	**: 2 Hrs/Week**		**ISE**	**:**	**40 Marks**
Tutorials	**: --**		**ESE**	**:**	**60 Marks**

Course Description:	
This course offers an introduction to semiconductor devices and their applications. It covers the formation and characteristics of P-N junctions, diodes, and transistors, including both bipolar junction and field-effect transistors. The course also introduces operational amplifiers and basic digital electronics concepts, including logic gates, multiplexers, and flip-flops	
Prerequisites	Basic understanding of electrical circuits and principles of electronics
Course Objective: The objectives of this course are	
1	To understand the fundamental principles and characteristics of semiconductor devices.
2	To develop skills in designing and analyzing various diode and transistor circuits.
3	To apply basic concepts of operational amplifiers and digital electronics in practical applications.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and explain the formation and behavior of semiconductor junctions.	Understand
CO2	Apply diode and transistor characteristics to design and analyze electronic circuits.	Apply
CO3	Evaluate and implement operational amplifier configurations for different applications.	Evaluate
CO4	Understand and implement field-effect transistor principles and configurations.	Understand
CO5	Apply basic digital electronics principles to design and analyze logic circuits.	Apply

Section – I		
Unit-1	**Introductory idea of semiconductors:** Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone. Formation of PNP / NPN junctions, energy band diagram	**06 Hours**
Unit-2	**Diodes and Diode Circuits:** V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junctioncapacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation	**06 Hours**
Unit-3	**Bipolar Junction Transistors:** Transistor mechanism and principle of transistors, CE, CB, CC configuration, transistorcharacteristics: cut-off active and saturation mode.	**06 Hours**

Section – II		
Unit-4	**Field Effect Transistors**: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles	**06 Hours**
Unit-5	**Operational amplifier basics:** Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Proportional, Integral, Derivative circuits.	**06 Hours**
Unit-6	**Basic ideas of Digital electronics:** Basic idea of switching circuit, Realization of Logic gates, multiplexers and demultiplexers, Flipflop, Registers and Counters	**06 Hours**

Mapping of POs & COs:

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

References	
Text Books :	
1	Electronic Devices and Circuits – 8th edition 2005 - R. Boylestad & L. Nashelsky and – PHI
2	Electronic Devices and Circuits – Allen Mottershed and – PHI
3	Fundamentals of Digital Circuits – Anand Kumar and – PHI
Reference Books :	
1	Electronic Devices and Circuits – 4th edition - David A. Bell and – PHI
2	Electronic Devices and Circuits – 2th edition - Willim I. Fletcher and - PHI/ Pearson

Course Code: 2501UCBSCC205 Course Name: Fundamentals of Economics

Teaching Scheme	**Credits: 02**	**Evaluation Scheme**
Lectures : 2 Hrs/Week		**ISE : 40 Marks**
Tutorials : --		**ESE : 60 Marks**

Course Description:

This course provides a comprehensive introduction to both microeconomics and macroeconomics. It covers fundamental principles such as demand and supply, consumer behavior, and production theory. Students will explore key macroeconomic concepts including national income, money supply, and business cycles. The course also examines welfare analysis, the theory of production, and stabilization policies

Prerequisites	Basic knowledge of introductory economics and mathematics.

Course Objective: The objectives of this course are

1	To understand core concepts of microeconomics and macroeconomics.
2	To analyze consumer behavior and market structures.
3	To apply economic theories to real-world scenarios and policy analysis.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain fundamental microeconomic principles and their applications.	Understand
CO2	Apply welfare analysis concepts to evaluate consumer and producer surplus.	Apply
CO3	Analyze production functions and cost structures in different market conditions.	Evaluate
CO4	Understand and interpret key macroeconomic indicators and models.	Understand
CO5	Evaluate the effects of monetary and fiscal policies on business cycles and economic stability.	Apply

Section – I

Unit-1	**Microeconomics:** Principles of Demand and Supply - Supply Curves of Firms - Elasticity of Supply; Demand Curvesof Households - Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve)	**06 Hours**
Unit-2	**Welfare Analysis:** Consumers' and Producers' Surplus - Price Ceilings and Price Floors; Consumer Behaviour - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications -Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect	**06 Hours**
Unit-3	**Theory of Production:** Production Function and Iso-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition.	**06 Hours**

Section – II		
Unit-4	Macroeconomics: National Income and its Components - GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports	**06 Hours**
Unit-5	Money: Definitions; Demand for Money -Transitionary and Speculative Demand; Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model	**06 Hours**
Unit-6	Business Cycles and Stabilization**:** Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment	**06 Hours**

Mapping of POs & COs:

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

References	
Text Books :	
1	Microeconomics – 8th edition - Chris Chatfield - Pindyck, Robert S., and Daniel L. Rubinfeld and- Pearson
2	Microeconomics – 12th edition - Dornbusch, Fischer and- McGraw Hill.
3	Economics – 20th edition - P.A.Samuelson, W.D.Nordhaus and - McGraw Hill.
4	Microeconomics – 8th edition - M.L.Jingan and – Vrinda publications, New Delhi.
Reference Books :	
1	Intermediate Microeconomics: A Modern Approach – 8th edition - Hal R, Varian - Springer India Pvt. Ltd. India
2	Principles of Macroeconomics – 7th edition - N.Gregory Mankiw - Cengage India Pvt. Ltd.

Course Code: 2501UCBSHSM206 Course Name: Business Communication & Value Science –II

Teaching Scheme	**Credits: 01**	**Evaluation Scheme**
Lectures : 2 Hrs/Week		**ISE : 25 Marks**
Tutorials : --		**ESE : 50 Marks**

Course Description:

This course provides a comprehensive introduction to both microeconomics and macroeconomics. It covers fundamental principles such as demand and supply, consumer behavior, and production theory. Students will explore key macroeconomic concepts including national income, money supply, and business cycles. The course also examines welfare analysis, the theory of production, and stabilization policies

Prerequisites	No specific prerequisites.

Course Objective: The objectives of this course are

1	To improve reading comprehension and writing proficiency.
2	To develop effective employment communication tools, including cover letters and resumes.
3	To enhance presentation skills and strategies for professional settings.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and apply effective reading strategies to improve text comprehension and retention.	Understand
CO2	Create and organize professional written documents	Apply
CO3	Demonstrate effective communication skills during job interviews and group discussions.	Apply
CO4	Design and deliver engaging professional presentations using advanced presentation techniques.	Apply
CO5	Utilize life skills such as emotional intelligence	Apply
	Section – I	
Unit-1	**Enhancing Reading and Writing Skills:** Effective reading: Importance, types, overcoming common obstacles, tips and strategies Effective writing: Importance, paragraph writing techniques, journal/blog writing, Catherine Morris and Joanie McMahon's writing techniques	**02 Hours**
Unit-2	**Employment Communication:** Covering letter and resume, Group discussion, Interviews	**02 Hours**
Unit-3	**Presentation skills:** Techniques of effective professional presentations, collaborative/team presentations.	**02 Hours**
	Section – II	
Unit-4	**Business Meetings:**	**02**

	Types of meetings, strategies of conducting meetings effectively, Documentation (notice, agenda,minutes)	**Hours**
Unit-5	**Life Skills/Soft Skills-1:** Developing personality Self esteem: Know thyself	**02 Hours**
Unit-6	**Life Skills/Soft Skills-2:** Emotional Intelligence, Leadership and Teamwork, Time management	**02 Hours**

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-
CO5	-	-	-	-	-	-	-	1	1	2	-	-

References	
Text Books :	
1	Communication Skills - 2013 edition - Meenakshi Raman and Sangeeta Sharma and - OxfordUniversity Press (OUP).
2	Business Communication – 2015 edition - S. Kalia and S. Agarwal and – Wiley
3	An Introduction to Professional English and Soft Skills - 2012 edition - Das et al and Cambridge University Press
Reference Books :	
1	Guiding Souls: Dialogues on the purpose of Life- 2015 edition - Kalam A.A.Alred, G. J., - Prabhat Prakashan
2	Handbook of Technical Writing – 10th edition - Brusaw, C. T., & Oliu, W. E.- St. Martin'sPress Sherman
3	Skimming and Scanning Techniques- 2014 edition- Barbara - Liberty University

Course Code: 2501UCBSBSC202T Course Name: Statistical Methods Lab

Teaching Scheme		Credits: 01	Evaluation Scheme	
Lectures	**: --**		**ISA**	**: 25 Marks**
Practical	**: 2 Hrs/Week**		**POE**	**: ---**

Course Objective: The objectives of this course are	
1	To Understand fundamental concepts of data analysis using R programming.
2	To Perform statistical operations on various datasets using R.
3	To Apply advanced statistical techniques to analyze and interpret data.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	**Apply** R programming to import and export data from real-life datasets.	Apply
CO2	**Analyze** data by computing summary statistics and visualizing results through graphs and tables.	Analyze
CO3	**Evaluate** the results of hypothesis tests and regression analyses, interpreting the significance of findings.	Evaluate

List of Experiments:	
01	Explore data types in R and practice importing and exporting datasets.
02	Compute basic summary statistics (mean, median, mode) for a given dataset.
03	Create various plots (bar charts, histograms, scatter plots) to visualize data distributions.
04	Apply correlation techniques to examine relationships between two variables in a dataset.
05	Fit a simple linear regression model to a dataset and interpret the coefficient of determination (R^2).
06	Conduct a hypothesis test for a sample mean and proportion using real-time data.
07	Test the hypothesis for two sample means and proportions to compare groups.
08	Perform ANOVA on a randomized block design dataset to analyze group differences.
09	Apply ANOVA techniques to a Latin square design dataset to examine treatments.
10	Use non-parametric tests (Sign test and Mann-Whitney test) to analyze datasets without normality assumptions.

Textbooks:

1. R- Software – Professional Version with 1+25 users subscription

References:

1. 3. Hands-on Programming with R - Garrett Grolemund
2. R for Everyone: Advanced Analytics and Graphics- Jared P. Lander

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-

Course Code: 2501UCBSPCC203P Course Name: Data structures and Algorithms – Lab

Teaching Scheme	**Credits: 01**	**Evaluation Scheme**
Lectures : --		**ISA : 25Marks**
Practical : 2 Hrs/Week		**POE : 50 Marks**

Course Objective: The objectives of this course are	
1	To Understand and apply fundamental concepts of data structures in programming.
2	To Develop proficiency in implementing algorithms for searching and sorting.
3	To Utilize abstract data types to address and solve practical computational problems.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Demonstrate the ability to develop programs that effectively manage and manipulate data.	Demonstrate
CO2	Apply searching and sorting techniques to efficiently organize and retrieve information.	Apply
CO3	Implement and operate various data structures to solve computational challenges.	Implement

List of Experiments:	
01	Implement binary search on a sorted array to find a given integer.
02	Develop a program to perform push, pop, and palindrome check operations on a stack.
03	Convert an infix expression to postfix using stack operations..
04	Implement a circular queue with insert, delete, and overflow/underflow detection.
05	Perform insertion, deletion, and display operations on a singly linked list.
06	Implement insertion, deletion, and double-ended queue operations on a doubly linked list.
07	Sort a list of integers using the selection sort algorithm..
08	Create and traverse a binary search tree, and search for a key.
09	Implement hashing with the remainder method and resolve collisions using linear probing.
10	Implement a program to create a graph using an adjacency matrix and traverse it using Depth-First Search (DFS) or Breadth-First Search (BFS).

Textbooks:

1. *The C Programming Language* – 2005 edition – **Bjarne Stroustrup**, Pearson Education.
2. *C and Object-Oriented Programming Paradigm* – 2004 edition – **Debasish Jana**, PHI Learning Pvt. Ltd.
3. *Programming in ANSI C* – Latest edition – **E. Balagurusamy**, McGraw Hill Education.

References:

1. *Let Us C* – 2019 edition – **Yashavant Kanetkar**, BPB Publications.
2. *A Complete Guide to Programming in C* – 2001 edition – **Peter Prinz and Ulla Prinz**, Jones and Bartlett Publishers.

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-

Course Code: 2501UCBSESC204P Course Name: Principals of Electronics Engineering – Lab

Teaching Scheme	**Credits: 01**	**Evaluation Scheme**
Lectures : --		**ISA : 25Marks**
Practical : 2 Hrs/Week		**POE : 50 Marks**

Course Objective: The objectives of this course are	
1	To Understand the principles of diodes and diode circuits.
2	To Learn the principles of bipolar junction transistors and field effect Transistor.
3	To Learn the working of operational amplifiers and digital electronic

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain operation of diode and its applications.	Understand
CO2	Understand the concept of BJT and FET & its applications.	Understand
CO3	Understand the concept of operational amplifiers anddigital electronics.	Understand

List of Experiments:	
01	Performance Evaluation of a Half-Wave Rectifier
02	Performance Evaluation of a Full-Wave Rectifier
03	Investigation of Transistor Characteristics
04	Examination of Oscillator Circuits
05	Implementation of Integrator and Differentiator Using Operational Amplifier
06	Exploration of Basic Logic Gates
07	Design and Simulation of Half and Full Adders
08	Implementation of Multiplexers and Demultiplexers
09	Study and Application of Shift Registers
10	Performance Evaluation of a Half-Wave Rectifier

Textbooks:

1. Electronic Devices and Circuits -8th edition 2005- R. Boylestad & L. Nashelsky and - Prentice Hall
2. Electronic devices & circuits - Allen Mottershed and- PHI
3. Fundamentals of Digital Circuits- Anand Kumar and- PHI

References:

1. Electronic devices & circuits – IV edition- David A. Bell - Prentice- Hall India
2. Electronic devices & circuits - II edition- Millman & C.Halkias - Tata McGraw Hill Publication
3. An Engineering Approach to Digital Design - Willim I. Fletcher - PHI/ Pearson

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	-	-	-	-	-	-	-	-
CO2	2	2	2	1	-	-	-	-	-	-	-	-
CO3	2	2	2	1	-	-	-	-	-	-	-	-

Course Code: 2501UCBSHSSM206T Course Name: Business Communication & Value Science –II- LAB

Teaching Scheme		Credits: 01	Evaluation Scheme	
Lectures	**: --**		**ISA**	**: 25 Marks**
Practical	**: 2 Hrs/Week**		**POE**	**: --**

Course Objective: The objectives of this course are to	
1	Enhance communication skills through effective group discussions and mock interviews.
2	Develop teamwork and leadership capabilities by creating and presenting a vision for an NGO.
3	Cultivate presentation and documentation skills essential for business environments and professional settings.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	**Analyze** group discussions for communication strategies	Analyze
CO2	**Demonstrate** interview techniques through mock interviews.	Demonstrate
CO3	**Create** and present business proposals effectively.	Create

List of Experiments:	
01	**Beginner Group Discussion**: Learn tips and analyze individual performances.
02	**Master Group Discussion**: Conduct evaluations and progress checks.
03	**Beginner Mock Interview**: Explore interview FAQs and participate in mock interviews.
04	**Master Mock Interview**: Engage in prepared and formal mock interviews.
05	**NGO Formation**: Develop a vision, mission, and design a logo.
06	**Presentation Skills - Part 1**: Present your NGO and receive audience feedback.
07	**Presentation Skills - Part 2**: Address social issues through ICT-enhanced presentations.
08	**Business Meetings**: Draft documentation and participate in mock meetings.
09	**Business Proposals**: Collaborate on and present a business proposal.
10	**Life Skills Movie Session**: Analyze life skills and values from a selected film

Textbooks:

1. Orelly Talk Digital Language Lab Software–Professional Version with 1+50users subscription

References Books:

1. Better English Pronunciation -2nd edition- J.D. O'Connor and – OUP
2. A Practical Course in Spoken English – 1st edition- J.K. Gangaj - PHI LearningPvt. Ltd.

3. English Language Laboratories – 2nd edition- Nira Konar - PHI Learning

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-

Course Code:2501UCBSVSEC207T Course Name:Web Designing LAB

Teaching Scheme	Credits: 01	Evaluation Scheme
Lectures : --		**ISA : 25 Marks**
Practical : 2 Hrs/Week		**POE : --**

Course Objective: The objectives of this course are	
1	To Develop foundational knowledge of web technologies and the structure of web pages**.**
2	To Foster problem-solving skills by designing and implementing functional, user-friendly web interfaces.
3	To Encourage creativity in web development by applying best practices and innovative design techniques.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	**Create** static web pages with text, images, and links.	Create
CO2	**Develop** functional web forms for user input.	Develop
CO3	**Design** accessible web pages using HTML5 semantic elements.	Develop

List of Experiments:

01	**Create** a simple webpage using basic HTML elements like headings, paragraphs, and lists.
02	**Design** a webpage demonstrating various text formatting options like bold, italic, and underline.
03	**Add** an image and hyperlinks to a webpage with proper alt text and clickable links.
04	**Build** a table to display data with column and row spans for better formatting.
05	**Create** a form with input fields, checkboxes, radio buttons, and a submit button to collect user information.
06	**Embed** a video and audio file into a webpage with proper descriptions and controls.
07	**Implement** HTML5 semantic elements like `<header>`, `<footer>`, and `<section>` to structure a webpage.
08	**Develop** a webpage with a navigation bar using unordered lists for internal or external linking.
09	**Design** an image map with clickable areas that link to different pages or sections.
10	**Create** a simple multi-page website with a homepage, about page, and contact page without using CSS.

Textbooks:

1 J. Duckett, *HTML and CSS: Design and Build Websites.* Hoboken, NJ: John Wiley & Sons

2. J Robbins, *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics,* 5th ed. Sebastopol, CA: O'Reilly Media, 2018.

References Books:
1. Robbins**,** *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics***,** 5th ed. Sebastopol, CA: O'Reilly Media, 2018**.** 2. **M**. MacDonald**,** *HTML5: The Missing Manual***,** 2nd ed. Sebastopol, CA: O'Reilly Media

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	2	-	-	-	-	-	-	-
CO2	2	3	1	1	2	-	-	-	-	-	-	-
CO3	2	3	2	2	2	-	-	-	-	-	-	-