

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
Second Year Bachelor of Technology (S.Y. B. Tech)
Semester- III and IV
(Computer Science and Engineering)**

UNDER

Faculty of Science & Technology

(As Per National Education Policy – 2020)

With Effect from Academic Year 2026-27 Onwards



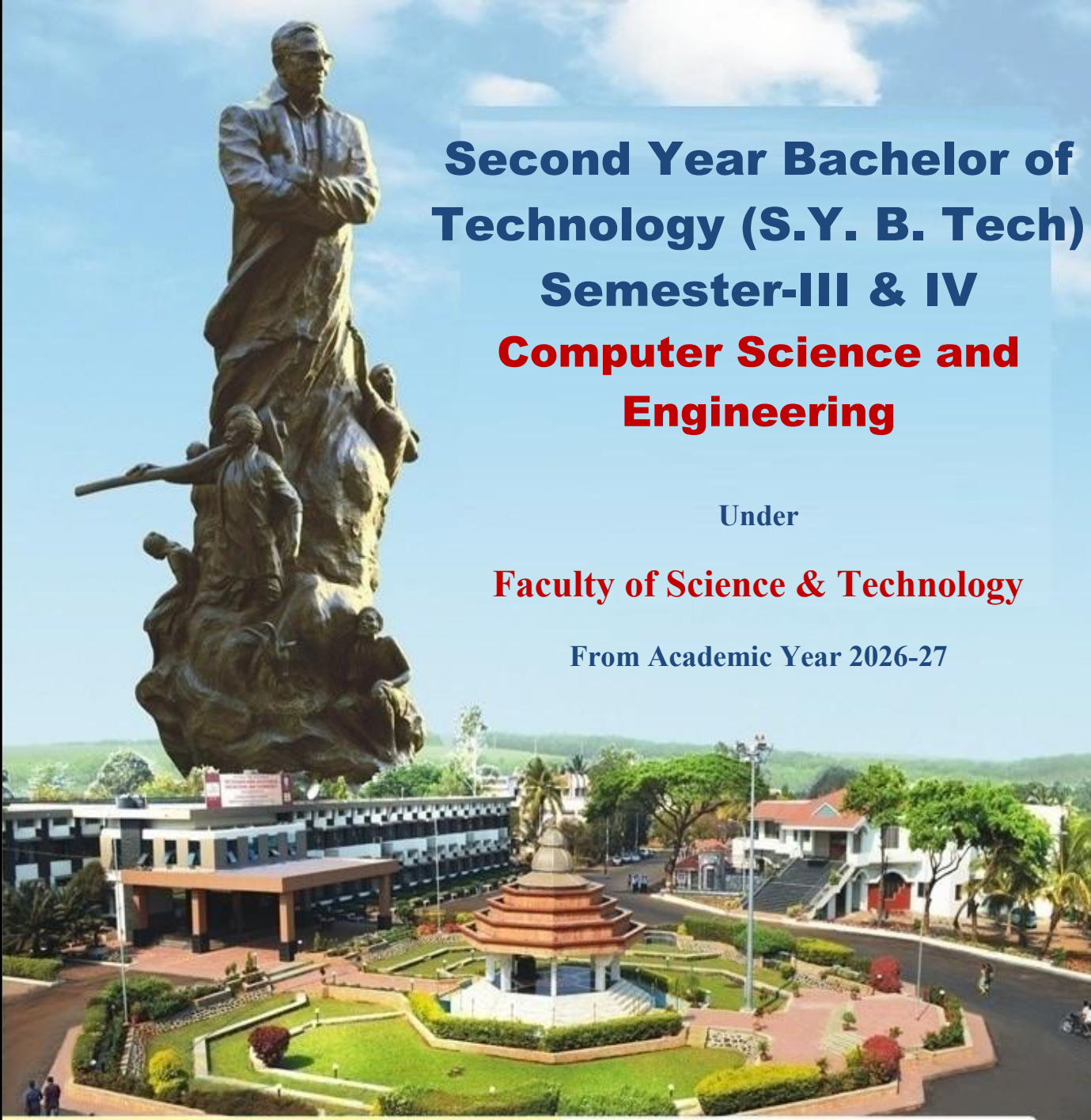
Shree Warana Vibhag Shikshan Mandal's
TATYASAHEB KORE INSTITUTE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS), WARANANAGAR, KOLHAPUR



Lead Institute of



WARANA UNIVERSITY, WARANANAGAR
(A State Public University)



Second Year Bachelor of Technology (S.Y. B. Tech) Semester-III & IV Computer Science and Engineering

Under

Faculty of Science & Technology

From Academic Year 2026-27

Structure and Syllabus as per NEP Policy 2020

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Preface

The National Education Policy (NEP) 2020 has marked a significant transformation in India's education system, aiming to align higher education with the evolving needs of the 21st century. Warana University is firmly committed to the effective implementation of NEP 2020 in its true spirit, with a strong emphasis on holistic, multidisciplinary, and outcome-based education in accordance with the guidelines of the Government of Maharashtra.

We are pleased to present the Second Year B. Tech Syllabus, meticulously crafted to align with the core philosophy of NEP 2020, effective from the Academic Year 2026 - 27. This curriculum is designed to provide students with a robust foundation in Mathematics and Sciences, while simultaneously integrating Vocational and Skill Enhancement courses, the Indian Knowledge System (IKS), and Co-curricular activities. Our goal is to nurture well-rounded engineers who possess both technical excellence and the adaptability required for global demands.

Special emphasis has been given to experiential learning, where theoretical concepts are reinforced through practical laboratory work, project-based learning, and industry-oriented activities. The syllabus also promotes research, innovation, and entrepreneurship, encouraging students to engage in creative and investigative pursuits from the early stages of their academic journey.

We extend our sincere gratitude to the Chairpersons and members of the various Boards of Studies for their dedicated efforts in designing this forward-looking curriculum.

At Warana University, we believe this syllabus will empower our students with the critical thinking, creativity, and technical proficiency necessary to excel in their professional lives. Warana University looks forward to supporting students in this transformative and enriching academic journey.

Vision

To become center of excellence in the field of Computer Science and Engineering and develop competent IT technocrats

Mission

1. To develop engineering graduates with high degree of professional excellence
2. To excel in academics and research through contemporary and real world problems
3. To enhance graduate employability through work based learning in social entrepreneurship
4. To encourage industrial and nationally recognized institutes collaboration
5. To create an environment to nurture lifelong learning

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 Educational Objectives (PEOs)

Graduates will be:

1. Able to design and develop computing systems using modern technologies by adapting business intelligence and addressing real-world challenges.
2. Able to acquire the capabilities and aptitude for higher education and entrepreneurship.
3. Able to function effectively as professionals with excellent interpersonal skills, ethical values, and social responsibility.
4. Able to work efficiently in multidisciplinary and multicultural environments.
5. Able to lead in their respective domains and contribute positively to the needs of society.

Program Specific Outcomes (PSOs)

Graduates will be able to:

1. Identify, design, and develop solutions for real-world problems by implementing the phases of the software development process model.
2. Analyze and apply Computer Science and Engineering solutions in societal and human contexts.
3. Demonstrate the skills and knowledge of contemporary issues in the field of Computer Science and Engineering.

Medium of Instruction

The medium of instruction for the Second-Year B.Tech. program shall be English.

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.

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.

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

- **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.

$$CGPA = \frac{\sum \left(\frac{Total\ Credits\ of\ a\ Semester \times SGPA\ of\ Respective\ Semester}{\sum(Course\ Credits) \text{ of all Semesters}} \right)}{\sum(Course\ Credits) \text{ of all Semesters}}$$

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



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WARANA UNIVERSITY, WARANANAGAR
 (A State Public University)

Second Year B. Tech

Curriculum Structure and Evaluation Scheme of Semester-III

Course Category	Course Code	Course Title	Teaching and Credit Scheme					Examination and Evaluation Scheme			
			L	T	P	CH	C	Component	Marks	Min for Passing	
PCC	2501UCSE-PCC301	Mathematics for Computer Science	3	-	-	3	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC302	Digital System & Microprocessor	2	-	-	2	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC302P	Digital System & Microprocessor Lab	-	-	2	2	1	ISA(TW)	25	10	20
								ESE(OE)	25	10	
	2501UCSE-PCC303	Data Structures	3	-	-	3	2	ISE	40	16	40
								ESE	60	24	
PCC	2501UCSE-PCC303P	Data Structures Lab	-	-	4	4	2	ISA(TW)	25	10	30
								ESE(POE)	50	20	
	2501UCSE-PCC304	Software Engineering	2	-	-	2	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC305	Discrete Mathematical Structures	2	-	-	2	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC305T	Discrete Mathematical Structures	-	1	-	1	1	ISA(TW)	25	10	10
MDM-1	2501UCSE-MDM1-306	Introduction to Data and Computing	2	-	-	2	2	ISA(TW)	50	20	20
EEC-1	2501UCSE-EEC1-307-1	Entrepreneurship Management	2	-	-	2	2	ISA(TW)	25	10	10
VEC1	2501UCSE-VEC1-307-1	Object Oriented Programming using C++	2*	-	2	4	1	ISA(TW)	25	10	20
								ESE(POE)	25	10	
CEP	2501UCSE-CEP-308	Field Project	1	-	2	3	2	ISA(TW)	25	10	10
Total			19	1	10	30	21	--	800	320	320



Second Year B. Tech

Curriculum Structure and Evaluation Scheme of Semester-IV

Course Category	Course Code	Course Title	Teaching and Credit Scheme					Examination and Evaluation Scheme			
			L	T	P	CH	C	Component	Mark	Min for Passing	
PCC	2501UCSE-PCC401	Automata Theory	2	-	-	2	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC402	Operating System	2	-	-	2	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC403	Computer Networks	3	-	-	3	2	ISE	40	16	40
								ESE	60	24	
	2501UCSE-PCC403P	Computer Networks Lab	-	-	2	2	1	ISA(TW)	25	10	30
								ESE(POE)	50	20	
	2501UCSE-PCC404	Computer Organization & Microcontroller	3	-	-	3	2	ISE	40	16	40
								ESE	60	24	
MDM-2	2501UCSE-MDM2-405	Data Analysis and Visualization	2	-	-	2	2	ISA(TW)	50	20	20
OE1	2501UCSE-OE1-406	Internet of Things	3	-	-	3	3	ISE	40	16	40
								ESE	60	24	
VSEC	2501UCSE-VSEC-407P	Python Programming	2*	-	4	6	2	ISA(TW)	25	10	30
								ESE(POE)	50	20	
AEC-2	2501UCSE-AEC2-408-1	Modern Indian Languages: Marathi	2	-	-	2	2	ISA(TW)	25	10	10
EEC-2	2501UCSE-EEC2-409-1P	Soft Skills	-	-	2	2	1	ISA(TW)	25	10	10
VEC-2	2501UCSE-VEC2-410-1P	Designing The Digital Solution for Societal Problems (Mini Project-I)	1	-	2	3	2	ISA(TW)	25	10	20
								ESE(POE)	25	10	
Audit-3	2501UGCSE-A-411	Environment Studies	-	-	-	-	-	-	-	-	-
Total			20	-	10	30	21	-	800	320	320

National Education Policy (NEP) 2020 Structure Branch: Computer Science and Engineering

Exit Option to Qualify Certification after First Year, Diploma after Second Year and B. Tech.
(Voc.) after Third Year

(To be implemented from 2026 - 27)

Credit Scheme as per NEP [Policy](#)

Exit Option to Qualify Certification completion of F. Y. B. Tech.:

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
2501UCSE-VSEC-212	VSEC	PC Assembly & Troubleshooting	2	--	2	3	4	ISA	50	20	20
2501UCSE-PCC-213	PCC	Computer Networks / CCNA	2	--	2	3	4	ISA	50	20	20
2501UCSE-PCC-214	PCC	Web Designing	1	--	2	2	3	ISA	50	20	20
			5	--	6	8	11	--	150	60	60

Note: An NPTEL / MOOC's course in the above subject carrying 8 credits shall be accepted for the Exit Course, subject to the University's credit transfer regulations.

Exit Option to Qualify Diploma completion of S. Y. B. Tech.:

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
2501UCSE-PCC-412	PCC	UI – UX Designing	2	--	2	3	4	ISA	50	20	20
2501UCSE-PCC-413	PCC	Introduction to Database Systems (Online)	2	--	2	3	4	ISA	50	20	20
2501UCSE-ELC-414	ELC	Mini Project using Java Script (Compulsory)	--	--	4	2	4	ISA	50	20	20
			4	--	8	8	12	--	150	60	60

Note: An NPTEL / MOOC's course in the above subject carrying 8 credits shall be accepted for the Exit Course, subject to the University's credit transfer regulations.

Exit Option to Qualify B. Tech. Vocational completion of T. Y. B. Tech.:

Course Code	Category	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
			L	T	P	C	CH	Component	Marks	Min for Passing	
2501UCSE-PCC 612	PCC	Advance Database Systems	2	--	2	3	4	ISA	50	20	20
2501UCSE-PCC 613	PCC	Linux OS / Red Hat Certification	2	--	2	3	4	ISA	50	20	20
2501UCSE-ELC 614	ELC	Internship	--	--	--	2	--	ISA	50	20	20
			4	--	4	8	8	--	150	60	60

Note: An NPTEL / MOOC's course in the above subject carrying 8 credits shall be accepted for the Exit Course, subject to the University's credit transfer regulations.

**National Education Policy (NEP) 2020
Structure Multidisciplinary Minor
(MDM) Courses Basket Branch:
Computer Science and Engineering**

Pathway 1: Artificial Intelligence and Machine Learning

Sr. No	Sem	Course Code	Category	Name of Course	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	III	2501UCSE-MDM1-306	MDM - 1	Introduction to Data and Computing	2	-	--	2	2	ISA	50	20	20
2	IV	2501UCSE-MDM2-405	MDM – 2	Data Analysis and Visualization	2	-	--	2	2	ISA	50	20	20
					4	-	0	4	4		100	40	40

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-PCC301 Course Name: Mathematics for Computer Science

Teaching Scheme	Credit	Evaluation Scheme
Lectures: 03 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks

Course Objectives: The objective of the course is to

1)	To develop mathematical skills and enhance analytical power of students.
2)	To prepare students to analyze data using statistical methods & interpret the solution in real world.
3)	To give the knowledge to the students of fuzzy set theory and Numerical methods.
4)	Understand the concept of regression and its applications and Use regression models for prediction and decision-making.
5)	Apply numerical techniques to solve algebraic and transcendental equations
6)	Use appropriate methods for data analysis, prediction, and optimization.

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Describe statistical data using statistical concepts, regression lines and curve fitting techniques	Understand
CO2	Calculate and interpret correlation coefficients (Karl Pearson's).	Understand
CO3	Explain various common distributions such as Binomial, Poisson, and Normal distributions.	Apply
CO4	Test hypothesis, examine data and make statistically significant inferences from the results	Evaluate
CO5	Demonstrate the basic ideas of fuzzy sets, operations and properties of fuzzy sets	Understand
CO6	Solve algebraic and transcendental equations using numerical methods.	Apply

Course Description: This course provides a comprehensive introduction to the fundamental concepts and techniques in statistics. It covers essential topics such as measures of central tendency, measures of dispersion, correlation and regression analysis, probability distributions, statistical inference, fuzzy sets, and numerical methods. The course is designed to equip students with the necessary statistical tools to analyze and interpret data effectively.

Course Content

Unit-1	Introduction to Statistics	8 Hours
Revision of basic definitions/concepts, Measures of central tendency: Arithmetic Mean (A.M.), Median, Mode, Combined Mean, Measures of Dispersion :Range, Quartile deviation, Mean deviation Standard deviation as Absolute measures of dispersion, Coefficient of range, quartile deviation, mean deviation, Coefficient of variation as Relative measures of dispersion.		
Unit-2	Correlation, Regression & Curve Fitting	8 Hours
Introduction, Karl Pearson's Coefficient of Correlation, Lines of regression of bivariate data, Fitting of		

Curves by method of Least-squares: Fitting of Straight lines, Fitting of exponential curves, Fitting of second-degree Parabolic curves.		
Unit-3	Probability Distribution	7 Hours
Random variables, Discrete Probability distribution, Continuous probability distribution, Binomial Distribution, Poisson Distribution, Normal Distribution.		
Unit-4	Statistical Inference-Test of Hypothesis	6 Hours
Introduction, Null Hypothesis, Alternate Hypothesis, Statistic, Critical Region, Errors in testing, Level of Significance, Test for population mean, equality of population means population proportion & equality of population proportions, Test of significance for small samples: t- test, Chi- Square Test, Test of significance for large samples.		
Unit-5	Introduction to Fuzzy sets	7 Hours
Introduction, Definition of Fuzzy set, Membership function, Difference between Crisp set and Fuzzy set, Basic concepts of fuzzy sets, Basic operations on fuzzy sets, Properties of fuzzy sets.		
Unit-6	Numerical Methods and Number series	6 Hours
Numerical solution of algebraic and transcendental equations: Bisection Method, Newton Raphson Method, Secant Method, Method of successive approximations series.		
Learning Resources:		
Text Books		
1)	Statistical Methods, S. P. Gupta, Sultan Chand & Sons	
2)	Numerical methods, Dr. B. S. Grewal, Khanna Publishers, Delhi	
3)	Probability and Statistics, John Schiller, Murray R. Spiegel, Schaum's outlines.	
4)	Fuzzy Sets and Fuzzy Logic: Theory and Applications George J. Klir and Bo Yuan, Prentice Hall 1995	
Reference Books		
1)	Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publishers, Delhi, 42nd Edition, 2012	
2)	2 A text book of Engineering Mathematics, N. P. Bali, Iyengar Laxmi Publications (P) Ltd., New Delhi 9 th Edition (2014)	
MOOC / NPTEL/YouTube Links		
1)	https://nptel.ac.in/courses/102101056 (Unit 1 to Unit 4)	
2)	https://nptel.ac.in/courses/111102130 (Unit 5)	
3)	https://nptel.ac.in/courses/122102009 (Unit 6)	

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-PCC302 Course Name: Digital System & Microprocessor

Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks

Prerequisites : 1. Engineering Mathematics -I [23FY102]
2. Computer Programming in C- [23FY111]

Course Objectives: The objective of the course is to

1)	Understand number systems, number conversions, and perform digital arithmetic operations used in digital systems.
2)	Study the fundamentals of Boolean algebra, logic gates, and logic minimization techniques for digital circuit simplification.
3)	Design and analyze combinational and sequential logic circuits for digital applications.
4)	Understand the architecture, addressing modes, and assembler directives of the 8086 microprocessor.
5)	Develop assembly language programming skills using the instruction set of the Intel 8086 microprocessor for solving practical problems.

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Perform the Number conversions and digital arithmetic on number systems.	Apply
CO2	Realize the basic logic gates and apply various reduction techniques of digital logic circuit.	Apply
CO3	Design and implementation of Combinational and Sequential logic circuit	Apply
CO4	Interpret the architecture of the 8086 microprocessor, addressing modes and assembler directives.	Understand
CO5	Write & execute the assembly language programs for given problems.	Apply

Course Description: This Course is designed to realize the standard building blocks of digital system and microprocessor. It covers number systems, binary arithmetic, logic gates, Boolean algebra, and combinational and sequential circuits. Students learn the architecture, operation, and programming concepts of the 8086 microprocessor. The course also develops skills in 8086 assembly language programming, including arithmetic, logical, branching, and string instructions.

Course Content

Unit-1	Number Conversions and Binary Arithmetic	5 Hours
Binary to Decimal, Decimal to Binary, Octal Number System, Hexadecimal Number System, Binary Addition, Representing Signed Numbers, and Addition in 2'S Complement System, Subtraction in 2'S Complement System, Binary Multiplication, Binary Division, BCD Addition, and Hexadecimal Arithmetic.		

Unit-2	Basic Logic Circuits	5 Hours
Logic Circuits: Truth Tables, OR Operation with OR Gate, AND Operation with AND Gate, NOT Gate, Exclusive-OR, Exclusive-NOR Gate and Universal Gates. Describing, Evaluation & Implementing of Logic Circuits Algebraically, Boolean Theorems, Sum of Product forms, Algebraic Simplification, Karnaugh Map Method, De-Morgan's Theorems.		
Unit-3	Combinational and Sequential Logic Circuits	7 Hours
Combinational logic: Adder, Subtractor, Encoder, Decoder, Multiplexer, Demultiplexer, Sequential Logic: Clocked S-R Flip Flops, Clocked J-K Flip Flops, Clocked D Flip Flops, D-Latch. Parity Generator and Checker, Application of Flip flops. Registers, Counters, Shift Registers, Ripple Counters.		
Unit-4	Microcomputers and 8086 Microprocessor	5 Hours
Overview of Microcomputers System: Hardware, Software, Address, General Operation of Computers, Addressing modes. 8086 Architecture: CPU Architecture, Internal operations. Programming Model of Microprocessor, Real Mode Memory		
Unit-5	8086 Assembly Language Programming-I	5 Hours
Assemble Instruction Format, Assembler: Introduction to Assembler and Assembler Directives, Data Transfer Instructions, Arithmetic Instructions, Logical Instructions and Branch Instructions		
Unit-6	8086 Assembly Language Programming-II	5 Hours
Loop Instructions, NOP and HLT Instructions, Flag manipulation instructions, Logical, Shift and Rotate Instructions, Byte and String Manipulations: String Instructions and REP Instructions.		
Learning Resources:		
Text Books		
1)	Digital System, Principles and Applications, Ronal Tocci, Neal Widmer, Gregory Moss, Pearson Education, 10 th Edition (2009)	
2)	Microcomputer Systems, The 8086/8088 Family Architecture, Programming and Design, Yu Cheng Liu Glenn A Gibson, PHI, 2 nd Edition (1998)	
Reference Books		
1)	Digital Logic and Computer Design, M. Morris Mano, Pearson Education, 1 st Edition, (2004)	
2)	The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium –II, Barry B. Brey, Pearson Education, 8 th Edition, (2009)	
Virtual Lab		
1)	Digital Logic Circuit Design Virtual Lab (New) https://dlcd-iitkgp.vlabs.ac.in/List%20of%20experiments.html	
MOOC / NPTEL/YouTube Links		
1)	NPTEL Course on Digital Circuits, Prof. Shantanu Murthy, IIT, Kharagpur https://onlinecourses.nptel.ac.in/noc24_ee147/preview	
2)	Basics of Digital Electronics, https://www.youtube.com/watch?v=ViEnnOhp-Mc	

CO-PO-PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	-	1	-	-	-	-	-	1	3	2	1
CO3	3	2	3	1	2	-	-	1	-	-	1	3	2	1
CO4	3	2	-	-	1	-	-	-	-	-	1	2	1	2
CO5	3	3	2	1	3	-	-	1	1	-	2	3	2	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)			
Course Code: 2501UCSE-PCC302P			
Course Name: Digital System & Microprocessor laboratory			
Teaching Scheme		Credit	Evaluation Scheme
Practical: 02 Hours/Week		01	ISA 25 (TW): Marks ESE 25 (OE): Marks
Prerequisites : 1. Engineering Mathematics -I [23FY102] 2. Computer Programming in C [23FY111]			
Course Objectives: The objective of the course is to			
1)	Understand number systems, number conversions, and digital arithmetic fundamentals.		
2)	Study and implement basic logic gates and universal gates for digital circuit realization.		
3)	Design and analyze combinational and sequential logic circuits using K-map and flip-flops.		
4)	Understand the instruction set and programming fundamentals of the 8086 microprocessor		
5)	Develop assembly language programs for arithmetic, logical, data transfer and string operations.		
Course Outcomes: After successful completion of the course, student will be able to			
CO	Description	Bloom's Level	
CO1	Perform number system conversions and solve basic digital arithmetic problems.	Apply	
CO2	Design and implement basic logic circuits using logic gates and universal gates.	Apply	
CO3	Analyze and design combinational and sequential circuits such as adders, 7-segment displays and flip-flops.	Apply	
CO4	Demonstrate understanding of the 8086-microprocessor instruction set and programming concepts.	Understand	
CO5	Write, execute, and analyze assembly language programs for arithmetic, logical, block transfer and string manipulation operations.	Apply	
Course Description: This course provides practical experience in digital systems and 8086 microprocessor concepts using software simulation tools. Students solve numerical problems on number systems and simulate basic digital circuits, adders, K-Maps, displays and flip-flops. The course develops skills in designing, analyzing and verifying digital circuits through simulation. Students also develop and execute 8086 Assembly Language Programs for arithmetic, logical, data transfer and string operations.			

Course Content		
Sr. No.	Experiments	Bloom's Level
1	Study of Number Conversions	Apply
2	Study of Basic Logic Gates	Understand
3	Realization of Basic Logic Gates using Universal Gates	Apply
4	Design of Half adder and full adder using logic gates	Apply
5	Study of K Map with examples	Apply
6	Design of 7 segment display	Apply
7	Study of JK flip flop, SR flip flop, D flip flop, T flip flop	Understand
8	Write an 8086 Assembly Language Program (ALP) to perform Addition, Subtraction, Multiplication and Division	Apply
9	Write an ALP to find even and odd number from given data	Apply
10	Write an ALP to perform Block Transfer	Apply
11	Write an ALP to perform logical operations	Apply
12	Write an ALP to perform String manipulation instruction	Apply

Learning Resources:

Text Books

1)	Digital System, Principles and Applications, Ronal Tocci, Neal Widmer, Gregory Moss, Pearson Education, 10 th Edition, (2009)
2)	Microcomputer Systems, The 8086/8088 Family Architecture, Programming and Design, Yu Cheng Liu Glenn A Gibson, PHI, 2 nd Edition, (1998)

Reference Books

1)	Digital Logic and Computer Design, M. Morris Mano, Pearson Education, 1 st (2004)
2)	The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium –II, Barry B. Brey, Pearson Education, 8 th Edition, (2009)

Virtual Lab

1	Digital Logic Circuit Design Virtual Lab (New) https://dlcd-iitkgp.vlabs.ac.in/List%20of%20experiments.html
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MOOC/NPTEL/YouTube Links

1)	NPTEL Course on Digital Circuits, Prof. Shantanu Murthy, IIT, Kharagpur https://onlinecourses.nptel.ac.in/noc24_ee147/preview
2)	Basics of Digital Electronics, https://www.youtube.com/watch?v=ViEnnOhp-Mc

CO-PO-PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	-	-	-	-	1	2	1	1
CO2	3	2	3	1	2	-	-	-	-	-	1	3	2	1
CO3	3	3	3	2	2	-	-	-	-	-	1	2	1	2
CO4	3	2	1	-	2	-	-	-	-	-	1	2	1	2
CO5	3	3	2	2	3	-	-	1	1	-	2	3	2	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-PCC303 Course Name: Data Structures		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 03 Hours/Week	03	ISE: 40 Marks ESE: 60 Marks
Prerequisites : Basic programming knowledge in C		
Course Objectives: The objective of the course is to		
1)	To introduce fundamental concepts and operations of data structures.	
2)	To develop understanding of searching, sorting, and their complexity.	
3)	To familiarize students with stacks, queues, and linked lists.	
4)	To introduce trees, AVL trees, heaps, and their applications.	
5)	To introduce graph representations, traversals, and applications	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Explain fundamental concepts and operations of data structure	Understand
CO2	Analyze searching and sorting techniques and their complexity.	Analyze
CO3	Implement stacks, queues, and linked lists for given problems.	Apply
CO4	Implement and analyze trees and heaps for given problems.	Analyze
CO5	Utilize appropriate data structures for solving real-time problems.	Apply
Course Description: This course is designed to develop skills for designing and analyzing simple linear and non-linear data structures. It strengthens students' ability to identify and apply suitable data structures for real-world problems.		
Course Content		
Unit-1	Basic Data Structures	4 Hours
Definition, Primitive and Non-Primitive data structures, Operations on data structures, Recursive and non-recursive algorithms, Introduction to pointers, Dynamic Memory Allocation		
Unit-2	Searching and Sorting Techniques	9 Hours
Searching Techniques: Linear search, Binary search, complexity comparisons and Analysis. Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Merge sort, Quicksort, Radix sort.		
Unit-3	Linear Data Structures	7 Hours
Stack: Definition, operations, Array representation of stack, Applications of Stack Queue: Definition, operations, Array representation of queues, Types of Queue -Circular queue, Priority queue, Double Ended Queue, Applications of Queue.		
Unit-4	Linked Lists	7 Hours

Definition, Types of Linked Lists, Operations, implementation and applications of singly, doubly and circular linked lists. Linked representation of Stack and Queue.		
Unit-5	Trees	6 Hours
Definition, Tree Terminology, Static And Dynamic Representation, Binary Tree, Types of Binary Tree, Binary Tree traversals, Binary search tree, AVL search tree, Heaps- Operations and their applications, Heap Sort.		
Unit-6	Graphs	6 Hours
The basic concept of graph theory, Terminology and Applications, Types of Graphs, representation graphs using Adjacency matrix and Adjacency list, graph traversal techniques- BFS and DFS, and Graph representation using sparse matrix.		
Learning Resources:		
Text Books		
1)	Schaum’s Outline of Data Structures with C – Seymour Lipschutz, McGraw Hill	
2)	Data Structures Using C – A. M. Tanenbaum, Y. Langsam, M. J. Augenstein, 7th Edition, Pearson	
Reference Books		
1)	Data Structures: A Pseudocode Approach with C – Richard F. Gilberg, Behrouz A. Forouzan, Cengage	
2)	Data Structures Using C – Reema Thareja, Oxford University Press	
3)	Data Structures Through C – Yashavant Kanetkar, BPB Publications	
e-Books		
1)	Data Structures Using C (2nd Edition) – Reema Thareja (Kindle)	
2)	Data Structures Using C – E. Balagurusamy (Kindle)	
3)	Data Structures Using C – A. K. Sharma (Google Books)	
MOOC / NPTEL/YouTube Links		
1)	Data Structures and Algorithms – Prof. Naveen Garg, IIT Delhi https://nptel.ac.in/courses/106102064	
2)	Programming, Data Structures and Algorithms using C, Prof. Hema A Murthy, Prof. Shankar Balachandran, Prof. N. S. Narayanaswamy, Prof. Sudarshan Iyengar IIT Madras https://nptel.ac.in/courses/106106127	
3)	Abdul Bari’s YouTube Channel https://www.youtube.com/@abdul_bari	
4)	Jenny’s Lectures (CS/IT) https://www.youtube.com/@JennyslecturesCSIT	
5)	MyCodeSchool (for visual learners) https://www.youtube.com/user/mycodeschool	

CO-PO Mapping:

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	–	1	1	-	-	-	1	3	1	1	-
CO2	3	3	2	2	2	1	-	-	-	1	2	1	2	-
CO3	3	3	3	1	2	1	-	-	-	1	2	2	2	-
CO4	3	3	3	2	2	1	-	-	-	1	2	3	3	-
CO5	3	3	3	2	2	1	-	-	-	1	3	2	3	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-PCC303P Course Name: Data Structure Lab		
Teaching Scheme	Credit	Evaluation Scheme
Practical: 04 Hours/Week	02	ISA: 25 Marks POE: 50 Marks
Prerequisites: <ul style="list-style-type: none">• Basic programming knowledge in C• Understanding of control structures, functions, and arrays• Familiarity with pointers and memory concepts		
Course Objectives: The objective of the course is to		
1)	Develop practical skills to implement fundamental data structures using C.	
2)	Enable students to analyze the performance of searching and sorting algorithms.	
3)	Provide hands-on experience in implementing linear and non-linear data structures.	
4)	Enhance problem-solving, debugging, and logical thinking skills through structured experiments	
Course Outcomes: After successful completion of the course, student will be able to		
CO1	Implement various searching and sorting algorithms and analyze their performance.	
CO2	Implement all stack and queue operations using arrays.	
CO3	Develop programs for singly and doubly linked lists with various operations.	
CO4	Implement tree and graph traversals using appropriate data structures.	
CO5	Perform and validate the prescribed data structure experiments using C programming.	
Course Description: Practical implementation of data structures in C, covering searching, sorting, stacks, queues, linked lists, trees, and graphs.		
Course Content		
Sr. No.	Experiments	Blooms
1	Experiment 1: Recursion	Apply
	Develop a program to compute factorial using recursive and non-recursive methods and compare their performance.	
2	Experiment 2: Dynamic Memory Allocation	Apply
	Write a program to dynamically allocate memory for an array, accept values, display them, and deallocate memory.	
3	Experiment 3: Searching	Analyze
	Implement Linear Search and Binary Search to find an element and compare number of comparisons.	
4	Experiment 4: Sorting	Analyze
	Sort a list using Bubble, Selection, and Insertion Sort and compare	

	performance.	
5	Experiment 5: Advanced Sorting	Apply
	Implement Merge Sort and Quick Sort using divide-and-conquer strategy.	
6	Experiment 6: Stack Operation	Apply
	Implement stack using array with push, pop, peek, and display operations.	
7	Experiment 7: Evaluation of Postfix Expression	Apply
	Implement program take input as infix expression and convert it into postfix and evaluate and display result using stack data structure.	
8	Experiment 8: Queue Operation	Apply
	Implement queue using array with enqueue, dequeue, and display operations.	
9	Experiment 9: Circular and Priority Queue	Apply
	Implement Circular Queue and Priority Queue with insertion, deletion, and display.	
10	Experiment 10: Singly Linked List	Apply
	Implement singly linked list with insertion, deletion, and traversal operations.	
11	Experiment 11: Doubly Linked List	Apply
	Implement doubly linked lists with insertion, deletion, and traversal.	
12	Experiment 12: Circular Doubly Linked List	Apply
	Implement Circular doubly linked lists with insertion, deletion, and traversal.	
13	Experiment 13: Binary Tree Traversal	Apply
	Create a binary tree and perform inorder, preorder, and postorder traversals.	
14	Experiment 14: Binary Search Tree	Apply
	Implement Binary Search Tree operations and Heap with heap sort.	
15	Experiment 15: BFS and DFS Traversal	Apply
	Represent graph using adjacency matrix/list and perform BFS and DFS traversals	

Learning Resources:

Text Books

1)	Schaum's Outline of Data Structures with C – Seymour Lipschutz, McGraw Hill
2)	Data Structures Using C – A. M. Tanenbaum, Y. Langsam, M. J. Augenstein, Pearson

Reference Books

1)	Data Structures: A Pseudocode Approach with C – Richard F. Gilberg, Behrouz A. Forouzan
2)	Data Structures Using C – Reema Thareja, Oxford University Press
3)	Data Structures Through C – Yashavant Kanetkar, BPB Publications

e-Books

1)	Data Structures Using C (2nd Edition) – Reema Thareja (Kindle)
2)	Data Structures Using C – E. Balagurusamy (Kindle)
3)	Data Structures Using C – A. K. Sharma (Google Books)

MOOC / NPTEL/YouTube Links

1)	NPTEL Courses (IIT Delhi, IIT Madras)
2)	YouTube: Abdul Bari, Jenny's Lectures, MyCodeSchool
3)	Coding Platforms: GeeksforGeeks, HackerRank

CO-PO/PSO Mapping:

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	-	-	1	1	-	2	3	1	2
CO2	3	2	1	1	2	-	-	1	1	-	2	3	-	2
CO3	3	3	2	2	2	-	-	1	1	-	2	3	-	2
CO4	3	3	2	2	2	1	-	1	2	-	2	3	2	3
CO5	2	2	1	1	2	-	1	2	3	1	3	3	-	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-PCC304 Course Name: Software Engineering		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks
Prerequisites: - 1. Basic knowledge of any programming language (such as C or C++). 2. Fundamental understanding of computer terminology and logic development.		
Course Objectives: The objective of the course is to		
1)	Understand software process models and importance of Software Development Life Cycle	
2)	Learn of software requirements gathering and analysis process and prepare Software Requirement Specification document.	
3)	Understand the different software design and architectural styles.	
4)	Learn different software testing approaches and software quality management	
5)	Develop the ability to design and implement software solutions based on given requirements.	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Describe various software engineering concepts, Software Development Process Models.	Remember
CO2	Interpret the structure and essential sections of Software Requirement Specifications documents	Understand
CO3	Describe different architectural views and identify software architecture for a given problem	Understand
CO4	Design and demonstrate Software system or applications using SRS document.	Apply
CO5	Identify different software testing techniques and understand standards related to software reliability and quality management.	Understand
Course Description: This course provides fundamentals of Software Development Life Cycle (SDLC), principles of software engineering practices and introductory concepts of software project management		
Course Content		
Unit-1	Introduction to Software Engineering	5 Hours
Cost, Schedule & Quality, Scale and Change, Software Processes: Process & Project, Software Development Process Models: Waterfall model, Prototyping, Iterative Development, Rational Unified Process, Time boxing Model, Extreme programming and agile software development, Using process models in a project, Project Management Process.		
Unit-2	Software Requirement Engineering	4 Hours
Requirement Gathering and Analysis, Software Requirement Specification (SRS)		

Case Study 2.1 • Gather the requirements for automation of the office work at CSE department. Case Study 2.2 • Study the SRS of Library Management Software. Write SRS in IEEE format for given Project Statement Case Study. 2.3 Study the functional and non-functional requirements of Library Management Software (or any software) Identify the important functional and non-functional requirement for given Project Statement.														
Unit-3			Software Architecture									5 Hours		
Role of Software Architecture, Architecture View, Component and Connector View, Architecture styles for Component and Connector View, Evaluating Architectures. Project Planning: Sliding Window Planning, Software Project Management Plan (SPMP) Document, COCOMO Model.														
Unit-4			Software Design									5 Hours		
Design Concepts, Function Oriented Design: Structure Charts, Structured Design Methodology, An Example. Object Oriented Design: OO Concepts, Unified Modeling Language (UML), A Design Methodology, Examples. Detailed Design Case Study 4.1 Study the design of Library Software / or any project statement.														
Unit-5			Coding and Testing									5 Hours		
Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Program Analysis Tools, Integration Testing, System Testing Case Study 5.1 Study of Automation Testing Tool: Selenium.														
Unit-6			Software Reliability and Quality Management									5 Hours		
Software Reliability, Software Quality, ISO 9000, SEI Capability Maturity Model, Six Sigma														
Learning Resources:														
Reference Books														
1)	Software Engineering, Ian Sommerville, Pearson,9th Edition, 2017													
2)	Software Engineering: A Practitioner’s Approach, Roger Pressman, McGraw-Hill,6 th Edition, 2004													
3)	The Unified Modeling Language User Guide Grady BoochIvar Jacobson James Rumbaugh Addison-Wesley 2 nd Edition,2005													
MOOC / NPTEL/YouTube Links														
1)	NPTEL Course on Software Engineering Prof. Rajib Mall IIT Kharagpur https://onlinecourses.nptel.ac.in/noc19_cs69/preview													
CO-PO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	1	1	-	1	1	2	1	-	3	1	2
CO2	2	2	3	1	1	-	-	1	-	1	-	3	3	1
CO3	1	1	2	-	1	-	-	-	-	1	-	3	1	2
CO4	1	1	2	2	-	-	-	-	-	-	-	3	3	2
CO5	3	2	-	-	-	-	-	-	2	-	-	2	1	-

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-PCC305 Course Name: Discrete Mathematical Structures		
Teaching Scheme	Credit	Evaluation Scheme
Lectures : 02 Hours/Week Tutorial: 01 Hours	03	ISE: 40 Marks ESE: 60 Marks
Prerequisites: Concepts of Basic Mathematics		
Course Objectives: The objective of the course is to		
1)	To expose the students to the mathematical logic related to computer science areas	
2)	To enhance the problem-solving skills in the areas of theoretical computer science	
3)	To use mathematical concepts in the development of computer applications.	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Explain and use the principles of propositional logic, predicate calculus, and set theory to solve logical and mathematical problems.	Understand
CO2	Perform operations on sets, relations, functions, and lattices, and interpret their properties in computational contexts.	Apply
CO3	Classify various algebraic systems based on their properties and structures.	Understand
CO4	Apply Boolean algebra to model, simplify, and implement logical expressions in computing systems.	Apply
CO5	Demonstrate and utilize Graphs theory to solve graph related problems	Apply
Course Description: This course provides detailed insights on Discrete Mathematics used in Computer Science		
Course Content		
Unit-1	Mathematical Logic	8 Hours
Statements & Notations, Connectives, Well-formed formulas & Tautologies, Equivalence of formulas & Duality law, Tautological Implications, Other Connectives, Predicate Calculus		
Unit-2	Set Theory	4 Hours
Basic concepts of set theory, Operations on Sets, Venn Diagrams, Ordered pairs & n-tuples, Cartesian product		
Unit-3	Relation & Functions	8 Hours
Relations, Properties of binary relations, Representation of relation , Equivalence Relations, Composition of Binary Relation, POSET & Hasse Diagram, Functions, Types of Functions		
Unit-4	Algebraic Systems	5 Hours
Algebraic Systems: Examples & general properties, Semigroups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism		
Unit-5	Lattice & Boolean Algebra	7 Hours

Lattice as partially ordered sets, Lattice as Algebraic Systems, Special Lattices, Boolean Algebra: Definitions & examples, Boolean Functions, Representation & Minimization of Boolean Functions														
Unit-6			Graph Theory									7 Hours		
Basic concepts of graph theory, Paths, Reachability & Connectedness, Matrix Representations of Graphs, Storage Representation & Manipulations of Graphs, PERT & Related technologies														
Learning Resources:														
Text Books														
1)	Discrete Mathematical Structures with Application to Computer Science, J. P. Tremblay & R. Manohar (MGH International).													
Reference Books														
1)	Elements of Discrete Mathematics, C.L.Liu & D.P.Mohapatra (SIE Edition) TATAMcGraw Hill.													
2)	Discrete Mathematics and its Applications - Kenneth H. Rosen (AT&T Bell Labs)													
3)	Discrete Mathematics - Semyour Lipschutz, MarcLipson (MGH), Schaum’s outlines													
4)	Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S.C.Ross and Nadeemur-Rehman (Pearson Education)													
e-Books														
1)	https://dpvipracollege.ac.in/wp-content/uploads/2023/01/Discrete-Mathematical-Structures-2nd-Ed.pdf													
MOOC / NPTEL/YouTube Links														
1)	NPTEL Course on Discrete Mathematics - IIT Ropar Prof. Sudarshan Iyengar, Prof. Anil Shukla https://onlinecourses.nptel.ac.in/noc24_cs92													
CO-PO-PSO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	1	-	-	-	-	2	3	1	2
CO2	2	-	-	1	-	-	-	-	1	-	2	3	1	2
CO3	3	1	1	1	-	1	-	-	-	-	1	2	1	2
CO4	3	2	2	2	1	1	-	-	-	1	2	3	1	2
CO5	3	2	2	2	-	1	-	1	-	1	1	3	2	2

2501UCSE-PCC305T - Discrete Mathematical Structure	
Teaching Scheme	Evaluation Scheme
Tutorial : 1 Hrs/Week Credits : 1	ISA : 25 Marks

Expt. No.	Experiments	Bloom's Taxonomy
1	Statement formulas & Well-formed formula	Understand
2	Equivalence of formulas & Tautological Implications	Understand
3	Set theory concepts & Set Operations	Understand
4	Relation concepts & Properties of Relations	Understand
5	POSET & Functions	Understand
6	Algebraic Systems & it's Types	Remember
7	Lattices & examples	Understand
8	Boolean Algebra & Boolean Function	Apply
9	Graph Concepts & Matrix Representation	Understand
10	Storage Representation & Applications of graph	Apply

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-MDM1-306 Course Name: Introduction to Data and Computing		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISA: 50 Marks
Prerequisites: Basic understanding of mathematics.		
Course Objectives: The objective of the course is to		
1)	Introduce students to the concept of data and its importance in real-world applications	
2)	Develop basic understanding of data types and simple data handling techniques	
3)	Familiarize students with fundamental statistical measures	
4)	Enable students to visualize data using simple charts and tools	
5)	Provide exposure to basic computing tools used for data analysis	
6)	Build foundation for advanced courses like Data Analytics and Machine Learning	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Explain basic concepts of data, types, and real-life applications	Understand
CO2	Apply basic statistical measures such as mean, median, and mode	Apply
CO3	Interpret simple data using tables and charts	Analyze
CO4	Use basic tools (Excel/Spreadsheet) for simple data handling	Apply
CO5	Develop simple visualizations and present insights from data	Create
Course Description:		
This course provides a foundational understanding of data and its role in modern engineering applications. It introduces basic statistical concepts, data handling techniques, and visualization using simple tools like spreadsheets. The course is designed for students from non-computer science backgrounds to build confidence in working with data and prepare them for advanced interdisciplinary subjects such as Data Analytics and Machine Learning.		
Course Content		
Unit-1	Introduction to Data	5 Hours
What is data? Importance in engineering, Types of data: numerical, categorical, Real-life examples (industry, business, social media), Data lifecycle overview.		
Unit-2	Basics of Statistics	5 Hours
Mean, Median, Mode. Range and basic variability, Simple real-life datasets, Interpretation.		
Unit-3	Data Organization	5 Hours
Tables and data representation, Sorting and filtering, Introduction to spreadsheets, Basic data entry and formatting		

Unit-4	Data Visualization	5 Hours												
Bar chart, Pie chart, Line graph, When to use which chart, Interpretation of graphs, Real-world datasets.														
Unit-5	Basic Data Handling Tools	5 Hours												
Introduction to Excel / CSV / Google Sheets, Basic formulas (SUM, AVERAGE), Simple data cleaning, Creating charts														
Unit-6	Applications of Data	5 Hours												
Data in different engineering fields, Case studies (traffic, energy, sales, etc.), Introduction to data-driven decision making, Link to Data Analytics & ML.														
Learning Resources:														
Text Books														
1)	<i>Data Science for Beginners: 4 Books in 1 – Python Programming, Data Analysis, Machine Learning</i> Author: Andrew Park Publisher: Independently Published. Edition: 1st Edition, 2020													
3)	<i>Introduction to Data Science</i> Authors: Vijay Kotu, Bala Deshpande Publisher: Morgan Kaufmann (Elsevier) Edition: 1st Edition, 2019 ISBN: 978-0128147610													
Reference Books														
1)	<i>Naked Statistics: Stripping the Dread from the Data</i> Author: Charles Wheelan Publisher: W. W. Norton & Company Edition: Revised Edition, 2014													
3)	<i>Introduction to Data Analytics</i> Author: S. Sridhar Publisher: Oxford University Press Edition: 1st Edition, 2014													
e-Books														
1)	Google Data Analytics (Beginner Level) https://static.googleusercontent.com/media/www.google.com/en//grants/education/Google_Analytics_Training.pdf													
MOOC / NPTEL/YouTube Links														
1)	NPTEL: Data Science for Engineers https://nptel.ac.in/courses/106106179													
2)	Coursera: Data Analysis with Excel https://www.coursera.org/learn/excel-data-analysis													
CO-PO-PSO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	1	-	2	-	-	-
CO2	3	2	-	1	1	-	-	-	-	-	2	1	-	-
CO3	2	3	-	2	1	-	-	-	1	-	2	1	1	-
CO4	2	2	1	2	3	-	-	-	-	-	2	2	2	1
CO5	2	2	2	2	2	1	-	1	2	1	3	2	2	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-EEC1-307-1 Course Name: Entrepreneurship Management		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISA: 25 Marks
Prerequisites: <ul style="list-style-type: none">- Basic communication and analytical skills.- Interest in entrepreneurship, innovation, and business development.		
Course Objectives: The objective of the course is to		
1)	Understand the concepts, characteristics, functions, and role of entrepreneurship in economic development.	
2)	Explain the importance of Small-Scale Industries (SSIs), government policies, and institutional support for entrepreneurship.	
3)	Develop the ability to identify business opportunities, conduct feasibility studies, and prepare project reports.	
4)	Analyze different forms of industrial ownership and business organizations for entrepreneurial ventures.	
5)	Encourage entrepreneurial thinking, innovation, and self-employment for sustainable business development.	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Explain the concepts, characteristics, functions, types, and role of entrepreneurship in economic development.	Understand
CO2	Explain the objectives, scope, institutional support, and government policies related to Small Scale Industries (SSIs).	Understand
CO3	Apply project identification, feasibility analysis, and project report preparation techniques for entrepreneurial ventures.	Apply
CO4	Analyze business opportunities and evaluate different forms of industrial ownership for establishing enterprises.	Analyze
CO5	Develop entrepreneurial ideas and prepare business plans for sustainable and innovative ventures.	Create
Course Description: <p>This course introduces the fundamental concepts of entrepreneurship, Small Scale Industries (SSIs), institutional support, project formulation, business opportunity identification, feasibility analysis, and industrial ownership. It aims to develop entrepreneurial skills, innovation, leadership, and self-employment capabilities while encouraging students to establish sustainable and socially responsible business ventures.</p>		
Course Content		
Unit-1	Entrepreneurship	5 Hours
Characteristics of Entrepreneur, Qualities of an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Development of Entrepreneurship, Stages in Entrepreneurial Process, Role of Entrepreneurship in Economic Development, Entrepreneurship in India, Barriers to Entrepreneurship, Women Entrepreneurship		

Unit-2	Small Scale Industries (SSI)	5 Hours												
Objectives of SSIs, Scope of SSIs, Role of SSIs in Economic Development, Advantages of SSIs, Steps to Establish Small Scale Industries, Government Policy towards SSIs, World Trade Organization (WTO), Ancillary Industry, Tiny Industry														
Unit-3	Institutional Support	5 Hours												
Institutions assisting Small Scale Industries, State Small Industries Development Corporation (SSIDC), Small Scale Industries Board (SSIB), District Industries Centre (DIC) / Single Window Concept, Technical Consultancy Organizations (TCOs), Small Industries Service Institutes (SISIs), Industrial Credit and Investment Corporation of India (ICICI), National Small Industries Corporation (NSIC), Small Industries Development Organisation (SIDO), Industrial Development Bank of India (IDBI)														
Unit-4	Project Preparation	5 Hours												
Project Identification, Project Selection, Need and Significance of Project Report, Contents of Project Report, Project Formulation, Preparation of a Project Report														
Unit-5	Business Opportunities	5 Hours												
Identification of Business Opportunities, Sources of Business Ideas, Market Feasibility Study, Technical Feasibility Study, Financial Feasibility Study, Social Feasibility Study														
Unit-6	Industrial Ownership	5 Hours												
Sole Proprietorship, Advantages and Disadvantages of Sole Proprietorship, Partnership: Definition and Meaning, Characteristics of Partnership, Types of Partners, Partnership Deed, Registration of Partnership Firm, Rights, Duties, and Liabilities of Partners														
Learning Resources:														
Text Books														
1)	N. V. R. Naidu and T. Krishna Rao, <i>Management and Entrepreneurship</i> , I.K. International Publishing House.													
3)	Vasant Desai, <i>Dynamics of Entrepreneurial Development and Management</i> , Himalaya Publishing House.													
Reference Books														
1)	Peter F. Drucker, <i>Innovation and Entrepreneurship</i> , Harper Business.													
3)	Eric Ries, <i>The Lean Startup</i> , Crown Business.													
e-Books														
1)	Freebookcentre.net https://www.freebookcentre.net/Business/Entrepreneurship-Books.html													
MOOC / NPTEL/YouTube Links														
1)	NPTEL: Entrepreneurship https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_mg81													
CO-PO-PSO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	2	1	2	-	1	1	1	-	-
CO2	2	2	-	-	-	2	2	2	-	1	2	1	-	-
CO3	2	3	2	2	1	1	1	-	1	2	3	2	1	-
CO4	1	3	2	2	-	2	1	1	1	2	2	2	1	-
CO5	2	3	3	2	1	2	2	2	3	3	3	2	2	1

Tatyasaheb Kore Institute of Engineering and Technology		
Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-VEC1-307-1 Course Name Object Oriented Programming using C++		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	01	ISA: 25 Marks ESE(POE): 50 Marks
Prerequisites: Computer Programming in C [2501UFYEPCC111]		
Course Objectives: The objective of the course is to		
1)	To learn advanced features of the C++ programming language as a continuation of the previous course	
2)	To learn the characteristics of an object-oriented programming language: data abstraction, inheritance, and dynamic binding of the messages to the methods.	
3)	To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity	
4)	To enhance problem solving and programming skills in C++ with extensive programming projects	
5)	To become familiar with the UNIX software development environment	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Understand basic concepts of Object-Oriented Programming.	Understand
CO2	Write well-structured C++ programs, including the use of classes, objects, constructors, destructors, and member functions to solve computational problems	Apply
CO3	Implement the features of an object-oriented programming language	Apply
CO4	Implement the concept of template, exception handling and file handling using C++	Apply
CO5	Implement the solution for diverse problem using C++	Apply
Course Description: The course introduces students to the fundamental concepts and principles of object-oriented programming (OOP). It helps students to choose proper OOP concepts to solve different problems. Upon completion, students should be able to write efficient, reusable programs for a given problem using OOP concepts.		
Course Content		
Unit-1	Basics of Object-Oriented Programming	4 Hours
The Origins and history of C++, relations of Classes & Structures, Features of Object-Oriented Programming Classes & Objects, Encapsulation, DataAbstraction, Inheritance, Inline Function, Constructor & Destructor, function overloading & Operator overloading, classes,Friend functions, Friend class		
Unit-2	Functions in C++	5 Hours
Static class member, Static Member Function, Scope resolution Operator, Access members Data member & member Function, defining member functions, Passing Object to Functions, Pointers in C++, Dynamic Allocation Pointers: -New & Delete Operator		
Unit-3	Polymorphism in C++	4 Hours
Functions Overloading, Operator Overloading, Types of Constructors, Destructors, Operator Overloading Using Friend Function, Unary & Binary Operator Overloading		
Unit-4	Inheritance & Virtual Function	6 Hours
Inheritance, Single Inheritance, Types of Derivations, Multiple Inheritance, Multilevel Inheritance, Hybrid		

Inheritance, Hierarchical Inheritance, Virtual function, calling a Virtual function through a base class reference, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Early and late binding

Unit-5

Templates & Exception handling

5 Hours

Function Template, Class Template, Generic Classes, Generic Functions, Applying Generic Functions Type Name, Standard Template Library (STL): -STL Container, STL Algorithm, STL iterator. Exception handling: - Exception handling fundamentals, Catching, Throwing, & HandlingException.

Unit-6

I/O System Basics, File I/O

4 Hours

Streams, File Pointers & Redirections Streams, C++ stream, C++ Predefined stream classes, Formatted I/O, C++ file I/O, manipulators, fstream and the File classes.

Learning Resources:

Text Books

1)	Object oriented Programming in C++, Rajesh K. Shukla (Wiley), India Edition Manohar (MGH)
2)	The Complete Reference C++, Herbert Schildt, Tata McGraw Hill, 4th Edition

Reference Books

1)	Object-Oriented Programming with C++, E. Balaguruswamy, Tata McGraw Hill, 6th Edition
2)	Object oriented Programming With C++, Sourav Sahay, Oxford Press, 2nd Edition

CO-PO-PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	-	2	-	-	-	-	1	-	3	2	1
CO3	3	3	2	1	2	-	-	-	-	1	-	3	2	1
CO4	3	3	2	1	2	-	-	-	-	1	-	3	3	2
CO5	3	3	3	2	3	-	-	-	1	1	-	3	3	2

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-VEC1-307-1 Course Name Object Oriented Programming using C++

Teaching Scheme	Credit	Evaluation Scheme
Practical: 02 Hours/Week	01	ISA: 25 Marks POE: 25 Marks

Prerequisites: Computer Programming in C [2501UFYEPCC111]

Course Objectives: The objective of the course is to

1)	To learn advanced features of the C++ programming language as a continuation of the previous course
2)	To learn the characteristics of an object oriented programming language: data abstraction, inheritance, and dynamic binding of the messages to the methods.
3)	To learn the basic principles of object oriented design and software engineering in terms of software reuse and managing complexity
4)	To enhance problem solving and programming skills in C++ with extensive programming Projects
5)	To become familiar with the UNIX software development environment

Course Outcomes: After successful completion of the course, student will be able to

CO1	Understand basic concepts of Object Oriented Programming
CO2	Write well-structured C++ programs, including the use of classes, objects, constructors, destructors, and member functions to solve computational problems
CO3	Implement the features of an object oriented programming language
CO4	Implement the concept of template, exception handling and file handling using C++
CO5	Implement the solution for diverse problem using C++

Course Description:

Course Content

Sr. No.	Experiments	Blooms
1	Implementation of simple class and object concept. Create a class called 'employee' that has (1) Emp_code and Emp_name as data members. (2) Member function get data() to input data. (3) Member function display to output data. (4) Create array of objects to accept and display the details of at least 5 employees	Apply
2	Implementation of inline function Write a program to find out largest of three numbers by using inline function.	Apply
3	Implementation of different types of constructors and destructors. Write a program to calculate fix deposit for specific no of Years and particular rate by using constructor and destroy the object by using destructor	Apply

4	Implementation of 'this' pointer Write a program to display the value and address of an object using 'this' pointer	Understand
5	Implementation of function overloading Write a program to compute power (m,n) where • 'm' is double and 'n' is integers • 'm' and 'n' are integers	Apply
6	Implementation of operator overloading Create a matrix class of size m*n overload the '+' Operator to add two matrix objects	Analyze
7	Implementation of friend function Create a class 'Complex' to hold a complex Number, write a friend function to add two complex numbers	Apply
8	Implementation of friend class Create a friend class 'Customer' containing member functions withdraw, deposit and balance enquiry which access data members from class 'Account'	Apply
9	Implementation of Multiple &Multilevel inheritance concept. 1. To implement multiple inheritances in OOP by combining account and transaction classes in a banking system. 2. Write a program to implement multilevel inheritance to calculate student result. By creating a Class student-name, roll-no, Test-marks, result-average.	Analyze
10	Implementation of Hybrid inheritance concept The 'MASTER' class derives information from 'ACCOUNT' and 'ADMIN' classes which in turn derives information from 'PERSON' class. Define four classes and write a Program to create, update and display all information. Person (name, code) Account (pay) Admin (Experience).	Analyze
11	Implementation of virtual function. Write a program to implement virtual function for Bubble sort and selection sort.	Analyze
12	Implementation of function template & Class template 1. Define function template for displaying transpose of Integer and float matrices 2. Create a class template to hold two data members, write a program to add two integer and double numbers	Apply
13	Implementation of exception handling. Write a program to implement exception handling for Exception divide by zero.	Apply
14	Implementation of file handling. Using class and object write employee information to file named "EMPLOYEE" and by reading from the same file display the contents on the screen.	Apply

Learning Resources:

Text Books:

1)	Object oriented Programming in C++, Rajesh K. Shukla (Wiley), India Edition Manohar (MGH)
2)	The Complete Reference C++, Herbert Schildt, Tata McGraw Hill, 4th Edition

Reference Books:

1)	Object-Oriented Programming with C++, E. Balaguruswamy, Tata McGraw Hill, 6th Edition
2)	Object oriented Programming With C++, Sourav Sahay, Oxford Press, 2nd Edition

MOOC / NPTEL/YouTube Links:

1)	NPTEL Course on Programming in Modern C++ Prof.Partha Pratim Das IIT, Kharagpur. https://nptel.ac.in/courses/106105234
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CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	-	2	-	-	-	-	1	-	3	2	1
CO3	3	3	2	1	2	-	-	-	-	1	-	3	2	1
CO4	3	3	2	1	2	-	-	-	-	1	-	3	3	2
CO5	3	3	3	2	3	-	-	-	1	1	-	3	3	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-CEP-308 Course Name: Field Project		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 01 Hours/Week Practical: 02 Hours/Week	02	ISA: 25 Marks
Prerequisites: 1) Communication Skills Lab [2501UFYEHSSM106]		
Course Objectives: The objective of the course is to		
1)	To introduce the students to the use of engineering approaches to solve real-time problems.	
2)	To adhere to the software engineering approach methods and tasks.	
3)	To acquire project management abilities, which involve planning, execution, and evaluation	
4)	To develop the abilities of team building and collaboration.	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Do a survey for the field project	Understand
CO2	Perform the requirements analysis and specifications.	Apply
CO3	Enhance teamwork and communication skills by working together.	Apply
CO4	Implementing the concepts of the field project.	Apply
CO5	Prepare a report and present the field project.	Apply
Course Description: The Field Project is designed to provide students with practical and field experience by engaging them in a project that addresses the general aspects of real time problems.		
Course Content		
UNIT-I: Problem Identification & Requirement Engineering		
Activity – 1	Orientation and Domain Selection	
Introduction to Field Project, objectives, team formation, ethics, project planning, identification of application domains (Education, Healthcare, Agriculture, Business, Smart Systems, etc.)		
Activity – 2	Field Survey and Problem Identification	
Conduct field survey, interact with stakeholders, identify real-world problems, analyze existing systems, define project scope and objectives.		
Activity – 3	Field Visit and Data Collection	
Visit the selected organization/field, observe the current system, collect data through interviews, questionnaires, and observations		
Activity – 4	Synopsis Presentation	
Present the identified problem statement, motivation, objectives, feasibility, expected outcomes, and project scope.		

Activity – 5	Requirement Elicitation													
Gather functional and non-functional requirements using interviews, questionnaires, brainstorming, and observation techniques.														
Activity – 6	Requirement Analysis and Feasibility Study													
Analyze collected requirements, prepare Software Requirement Specification (SRS), perform feasibility study (Technical, Economic, Operational, Schedule).														
Activity – 7	Preparation of SRS Document as per Industry Standard													
Develop an IEEE-compliant SRS document including introduction, overall description, functional requirements, non-functional requirements, use cases, and constraints														
Activity – 8	Second Presentation: SRS Presentation													
Present the SRS document, requirement models, and proposed solution before the project guide and evaluation committee.														
UNIT-II: Design, Development & Documentation														
Activity - 9	Project Planning and Module Finalization													
Divide the project into modules, assign responsibilities among team members, prepare milestones, timeline, and work breakdown structure (WBS).														
Activity – 10	System Design (Flowchart and Algorithms)													
Design system architecture, database schema, UML diagrams (Use Case, Class, Activity, Sequence), Data Flow Diagram (DFD), Flowcharts, Algorithms, and User Interface prototypes.														
Activity – 11	Implementation and Testing													
Develop project modules using appropriate programming languages and tools, integrate modules, perform unit testing, integration testing, and debugging.														
Activity – 12	Report Preparation and Final Presentation													
Prepare the final project report following institute guidelines, demonstrate the working system, present achievements, limitations, future scope, and answer evaluation panel questions.														
CO-PO-PSO mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	2	1	1	3	2	1	2	1	-
CO2	1	2	1	1	1	2	-	1	1	2	1	3	-	1
CO3	1	-	1	1	-	1	1	1	2	3	1	1	2	-
CO4	1	2	3	2	1	1	-	1	1	2	1	2	2	2
CO5	1	1	1	1	2	1	1	1	2	2	2	-	1	3

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-PCC401 Course Name: Automata Theory

Teaching Scheme	Credit	Evaluation Scheme
Lectures : 02 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks

Prerequisites:

- 1) Discrete Mathematical Structure [2501UCSE-PCC305]
- 2) Mathematics for Computer Science [2501UCSE-PCC301]

Course Objectives: The objective of the course is to

1)	To introduce mathematical foundations of computation, the theory of formal languages and grammars.
2)	To strengthen the students' ability to understand and conduct mathematical proofs for computations
3)	To understand the types of languages and their properties
4)	To analyse and design finite automata, pushdown automata, grammars & Turing machines

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Demonstrate the basic concept of languages and their properties	Understand
CO2	State and demonstrate the properties of Regular Languages, Context free languages and Recursively Enumerable languages	Understand
CO3	Demonstrate and apply the properties of Regular Grammars and Context Free Grammars.	Apply
CO4	Differentiate the various types of languages and identify the respective automata	Apply
CO5	Apply various theories to classify the language as appropriate language.	Apply

Course Description:

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine.

Course Content

Unit-1	Regular Languages and Finite Automata	8 Hours
Proofs, Recursive Definitions, Regular expressions and regular languages, Finite Automata, unions, intersection & complements of regular languages, Case Study: use of JFlap Tool to design and understand the machine.		

Unit-2	Nondeterminism and Kleene's Theorem	6 Hours												
Nondeterministic finite automata, NFA with null transition, Kleene's Theorem (Part I & Part II), Minimal Finite Automata														
Unit-3	Context free Grammars	6 Hours												
Definition, Regular Grammar, Derivation trees and ambiguity, Simplified forms and normal forms														
Unit-4	Parsing and Pushdown Automata	7 Hours												
Definition of Pushdown Automata, Deterministic PDA, Equivalence of CFG's & PDA's, Top-down parsing, bottom-up parsing														
Unit-5	Context free and non-context free languages	5 Hours												
CFL's and non CFL's, Pumping Lemma, intersections and complements of CFLs														
Unit-6	Turing Machines	8 Hours												
Definition, TM as language acceptors, combining Turing Machines, Computing partial function with a TM, Multi-tape TMs, and Universal TM.														
Learning Resources:														
Text Books														
1)	Introduction to Languages & the Theory of Computations” - John C. Martin (Tata MGH)													
Reference Books														
1)	Introduction to Automata Theory, Languages and computation - John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition)													
2)	Introduction to theory of Computations - Michael Sipser (Thomson Books/Cole)													
3)	Theory of Computation - Vivek Kulkarni													
4)	Theory of Computation A problem Solving Approach - Kavi Mahesh Wiley India													
MOOC / NPTEL/YouTube Links														
1)	NPTEL Theory of Computation -Prof.Raghunath Tewari IIT Kanpur https://onlinecourses.nptel.ac.in/noc24_cs71													
CO-PO-PSO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	1	-	-	-	-	-	2	1	1
CO2	2	-	-	1	-	-	-	-	1	-	-	2	1	1
CO3	3	1	1	1	-	1	-	-	-	-	-	3	2	2
CO4	3	2	2	2	1	1	-	-	-	-	1	2	1	1
CO5	3	2	2	2	-	1	-	1	-	-	1	3	2	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-PCC402 Course Name: Operating System		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks
Prerequisites: Digital Systems & Microprocessors [2501UCSE-PCC302]		
Course Objectives: The objective of the course is to		
1)	Make students understand basic concepts of operating system	
2)	Understand what a process is and processes are managed.	
3)	Understand how processes are synchronized.	
4)	Understand how processes are scheduled.	
5)	Understand different approaches to I/O Management	
6)	Understand different approaches to memory management	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Learn basic concepts of Operating Systems its types & services.	Remember
CO2	Describe various features of process and operation management	Understand
CO3	Present process synchronization and critical section problem with its solutions	Understand
CO4	Illustrate the working of different scheduling schemes and basics of deadlock with their possible solutions	Apply
CO5	Understand basics of deadlock with their possible solutions	Understand
CO6	Understand various memory management strategies like paging, swapping, and virtual memory management	Understand
Course Description: This course is introduced at second year level to get the students familiar with the basic concepts of computer operating systems.		
Unit-1	Introduction, Overview and Structure of Operating Systems	8 Hours
Overview of Operating Systems, operations of an operating system, OS interaction with computers and user programs, Classes of an OS: Batch Processing, Multiprogramming, Time sharing system, Real-time OS, Distributed OS, Operating System with Monolithic Structures, Kernel based OS, Micro-kernel bases OS		
Unit-2	Process Management	6 Hours
Process and Program, Implementing Process: Process state and state transition, Process context and process control block, Context save, scheduling and dispatching, event handling, sharing, communication and synchronization, Introduction to threads		
Unit-3	Process Synchronization	7 Hours

What is process Synchronization, Race Condition, The Critical section problem, synchronization approaches: looping Vs blocking, H/W support for process synchronization, Classic process synchronization problems: Producer-consumer, Readers and writers, dining Philosophers, Semaphore		
Unit-4	Scheduling	5 Hours
Terminologies and concepts, Non- Pre-emptive scheduling: FCFS, SRN, HRN Pre-emptive scheduling: Round Robin, LCM, STG, Scheduling in practice: Long, medium and short term schedule		
Unit-5	Deadlock	5 Hours
What is deadlock, Deadlock in resource allocation, handling deadlocks, Deadlock detection and resolution, Deadlock prevention, Deadlock avoidance		
Unit-6	Memory Management	5 Hours
Memory allocation to a process: Stack and Heap, Memory allocation Model Heap Management: Reuse of memory, Contiguous memory, Non-Contiguous memory Paging, Segmentation. Virtual Memory Basics, Page replacement Policies		
Learning Resources:		
Text Books		
1)	Operating Systems- A Concept-Based Approach Dhananjay M. Dhamdhare (MGH International) 3rd Edition 2006	
Reference Books		
1)	Operating Systems –Concepts and Design, Milan Milenkovic TATA-McGraw Hill, 9th Edition	
2)	Operating Systems: Internals and Design Principles William Stallings AT&T Bell Labs, 8 th Edition	
e-Books		
1)	https://theswissbay.ch/pdf/Gentoomen%20Library/Operating%20Systems/Operating.System.s.-.A.concept-based.approach.pdf	
MOOC / NPTEL/YouTube Links		
1)	NOC: Operating System Fundamentals IIT Kharagpur Prof. Santanu Chattopadhyay https://nptel.ac.in/courses/106105214	

CO-PO/PSO mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	1	1	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
CO3	1	-	2	3	-	-	-	-	-	-	-	3	2	1
CO4	1	2	1	1	-	-	-	-	-	-	-	3	2	2
CO5	1	1	1	1	-	-	-	-	-	-	-	2	2	2

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-PCC403 Course Name: Computer Networks

Teaching Scheme	Credit	Evaluation Scheme
Lectures: 03 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks

Prerequisites : Basics of computers and operating systems

Course Objectives: The objective of the course is to

1)	Understand basics of data communication, networking, and models like OSI Model and TCP/IP Protocol Suite.
2)	Learn data link layer concepts such as error detection, correction, and flow control.
3)	Study MAC protocols and LAN technologies.
4)	Understand routing, IP addressing, and congestion control in network layer.
5)	Learn transport layer concepts of TCP and UDP.
6)	Understand application layer protocols like DHCP, DNS, HTTP, and FTP.

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Define concepts of OSI Model, TCP/IP Protocol Suite, and physical layer fundamentals.	Remember
CO2	Perform framing, error detection and correction, and flow control techniques in data communication.	Apply
CO3	Analyse medium access control techniques and protocols for efficient channel utilization.	Analyze
CO4	Explain IP addressing, IP protocols, routing algorithms, and congestion control mechanisms.	Understand
CO5	Illustrate process-to-process communication, multiplexing, and functions of transport and application layer protocols.	Understand

Course Description:

This course helps students understand the OSI Model and TCP/IP Protocol Suite. It explains the functions of each network layer and introduces common application layer protocols. Overall, it builds strong basic knowledge of networking concepts.

Course Content

Unit-1	Introduction to Networks	5 Hours
Data Communication, Networks, Internet, Protocols and Standards, Layered Task, OSI Model and Layers, TCP/IP Protocol Suite, Addressing , Physical Layer and Media		
Unit-2	Data Link Control Layer	7 Hours
Error Detection and Correction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum, Data Link Control: Framing, Flow and Error Control, Protocols: Noiseless channels, Noisy Channels		

Unit-3	Medium Access Control Sub layer	6 Hours												
Channel allocation Problem, Multiple Access Protocols: ALOHA, CSMA, Collision free protocols, Limited contention protocols, IEEE Standard 802 for LANS and MANS, Bridges														
Unit-4	Network Layer	6 Hours												
Network layer services, Addressing: - Classful Addressing/ Classless Addressing, IP packet format, Routing Algorithms: - Properties of routing, Optimality principle, Shortest path routing, Distance Vector routing, Flooding														
Unit-5	Transport Layer	6 Hours												
Transport layer Services, functions, Process to Process Communication, Addressing-Port numbers, UDP- datagram, services & Applications, TCP services, Segments and connection, congestion control & Prevention policies														
Unit-6	Application layer	6 Hours												
DHCP: DHCP operation, Packet Format, DNS: Need, Name Space, Domain Name Space, Distribution of name space, and DNS in internet, Resolution, FTP, HTTP and SMTP														
Learning Resources:														
Text Books														
1)	Data Communications and Networking – Behrouz A Forouzan (The McGraw Hill) (Unit 1,2,3)													
2)	Computer Networks – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition (Unit 3, 4)													
3)	TCP/IP Protocol Suite- Behrouz Forouzan-(The McGraw Hill) (4,5,6)													
Reference Books														
1)	Computer Networking with Internet Protocols and Technology, William Stallings (Prentice Hall)													
2)	Data Communication and Computer Networks-Ajit Pal, Prentice Hall India Learning 1st Edition 2013.													
CO-PO-PSO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	-	-	-	3	2	1
CO2	2	2	-	-	2	-	-	-	-	-	-	3	2	2
CO3	1	1	2	1	3	-	-	-	-	-	-	3	3	2
CO4	2	2	-	1	1	-	-	-	-	-	-	3	2	2
CO5	1	2	1	1	2	-	-	-	-	-	-	3	3	2

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-PCC403P Course Name: Computer Networks Lab

Teaching Scheme	Credit	Evaluation Scheme
Tutorial/Practical: 02 Hours/Week	01	ISA: 25 Marks ESE(POE): 50 Marks

Prerequisites:

- Basic knowledge of computers and operating systems
- Basic understanding of networking concepts (helpful for OSI Model and TCP/IP Protocol Suite)

Course Objectives: The objective of the course is to

1)	Understand basic networking concepts, devices, and topologies
2)	Analyse working of layered models like OSI Model and TCP/IP Protocol Suite
3)	Implement data link layer techniques such as framing and error control
4)	Study routing algorithms and transport layer communication
5)	Configure and analyse real-world network protocols
6)	Develop practical skills using simulation and programming tools

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Configure basic network devices and topologies using simulation tools like cisco packet tracer.	Apply
CO2	Analyse OSI and TCP/IP models through practical experiments	Analyse
CO3	Implement flow control and routing protocols in network simulation	Apply
CO4	Configure and test transport and application layer protocols (TCP/UDP, DNS, DHCP, HTTP)	Apply
CO5	Configure and test transport and application layer protocols (TCP/UDP, DNS, DHCP, HTTP)	Apply

Course Description:

This lab course provides hands-on experience in computer networking concepts. Students perform experiments using tools like Cisco Packet Tracer, Wireshark, and Python to understand network setup, protocols, error handling, routing, and application services. The course bridges theory with practical implementation.

Course Content

Sr. No.	Experiments	Blooms Levels
1	Network Setup and Device Configuration <ul style="list-style-type: none"> • Setup and configure a simple network using Hubs, Switches, and Routers using Cisco Packet Tracer. Draw the experiment block diagram and observation tables. • Explain how data is forwarded through a hub, switch, and router during network 	Apply

	communication.	
2	Demonstration of Network Topologies <ul style="list-style-type: none"> • Demonstrate different network topologies (Bus, Star, Ring) using Cisco Packet Tracer. Draw the experiment block diagram and observation tables. • Compare Bus, Star, and Ring topologies with respect to structure, advantages, disadvantages, and applications. 	Analyze
3	Simulation of OSI Model Layers <ul style="list-style-type: none"> • Simulate the OSI Model layers using network simulation software. Draw the experiment block diagram and observation tables. • Describe the encapsulation and de-encapsulation process in the OSI model. 	Understand
4	Unicast and Broadcast Addressing <ul style="list-style-type: none"> • Perform Unicast and Broadcast addressing in a network using Cisco Packet Tracer and observe packet delivery between nodes. Draw the experiment block diagram and observation tables. • Explain the concepts of Unicast, Multicast, and Broadcast communication and addressing methods. 	Apply
5	Implementation of Framing Techniques <ul style="list-style-type: none"> • Write and execute a Python program to perform Bit Stuffing, Byte Stuffing, or Character Stuffing for data framing. • Draw and explain all framing methods with examples and explain the need for framing. 	Apply
6	Implementation of Error Detection using CRC <ul style="list-style-type: none"> • Write a Python program for Cyclic Redundancy Check (CRC) error detection. • Calculate the CRC for data 1001101 using the divisor 1001 for sender and receiver side. 	Apply
7	Implementation of Error Detection using Checksum <ul style="list-style-type: none"> • Write a Python program to calculate and verify Checksum for error detection in data transmission. • Perform step-by-step Checksum calculation for a given set of binary data words. 	Apply
8	Implementation of Error Correction Techniques <ul style="list-style-type: none"> • Write and execute a Python program to generate Hamming Code for the given data and demonstrate error detection and correction. • Perform step-by-step Hamming encoding process for 8-bit data 10110010. 	Apply
9	Flow Control Protocols Simulation <ul style="list-style-type: none"> • Implement Stop-and-Wait and Sliding Window protocols using Cisco Packet Tracer and observe frame transmission. Draw the experiment block diagram and observation tables. • Write Stop-and-Wait algorithm and explain Sliding Window protocols in brief. 	Analyze
10	Configuration of Application Layer Protocols <ul style="list-style-type: none"> • Configure and test DNS, Email, and HTTP protocols in a network environment and verify their operation. Draw the experiment block diagram and observation tables. • Explain the working of DNS, Email, and HTTP protocols in brief. 	Analyze

Learning Resources:

Text Books

- | | |
|----|--|
| 1) | Data Communications and Networking – Behrouz A. Forouzan |
| 2) | Computer Networking: A Top-Down Approach – James F. Kurose, Keith W. Ross |

3)	Computer Networks – Andrew S. Tanenbaum
4)	Internetworking with TCP/IP – Douglas E. Comer

Reference Books

1)	TCP/IP Illustrated – W. Richard Stevens
2)	Data and Computer Communications – William Stallings
3)	Computer Networks – Andrew S. Tanenbaum

MOOC / NPTEL/YouTube Links

1)	NPTEL – Computer Networks course (IIT lectures) https://nptel.ac.in/courses/106105183
2)	Cisco Networking Academy – Packet Tracer tutorials https://www.netacad.com
3)	Wireshark Official Tutorials https://www.wireshark.org/docs/
4)	YouTube – Computer Networks full course (Neso Academy / Gate Smashers) https://www.youtube.com/results?search_query=computer+networks+full+course

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	1	3	-	-	1	1	1	-	3	1	2
CO2	2	3	2	2	2	-	-	-	1	1	-	2	1	2
CO3	3	3	3	2	3	-	-	1	1	1	-	3	2	3
CO4	2	3	2	2	3	-	-	-	1	1	-	2	1	2
CO5	2	2	2	2	3	-	-	1	2	1	-	3	2	3

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B. Tech)

Course Code: 2501UCSE-PCC404 Course Name: Computer Organization & Microcontroller

Teaching Scheme	Credit	Evaluation Scheme
Lectures: 03 Hours/Week	02	ISE: 40 Marks ESE: 60 Marks

Prerequisites: Digital Systems & Microprocessors [2501UCSE-PCC302]

Course Objectives: The objective of the course is to

1)	To introduce the fundamental organization of computer systems, I/O organization, and memory hierarchy.
2)	To develop understanding of arithmetic algorithms and floating-point operations in computer systems.
3)	To provide knowledge of embedded systems architecture, classifications, and application domains.
4)	To familiarize students with open-source embedded platforms such as Arduino and their programming environment.
5)	To introduce the fundamentals of ARM embedded system architecture, processing concepts, and instruction set for embedded application development.

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	Recognize the basic structure of computer organization, I/O organization, and memory systems.	Remember
CO2	Explain the concepts of memory hierarchy, cache organization, and processing unit operations.	Understand
CO3	Use arithmetic algorithms for addition, multiplication, division, and floating-point operations.	Apply
CO4	Describe the architecture, applications, and programming concepts of embedded systems using Arduino development boards.	Understand
CO5	Explain the fundamentals of ARM embedded systems, ARM processing architecture, registers, pipeline, exceptions, and instruction set operations.	Understand

Course Description:

This course introduces the principles of computer organization and the basic ARM embedded system concepts.

Course Content

Unit-1	Basic Structure of Computer and I/O Organization	5 Hours
Computer Types, Basic Operational Concepts, Performance, Historical Perspectives, Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Standard I/O Interfaces		
Unit-2	Memory Systems and Basic Processing Unit	5 Hours

Basic Concepts, Semiconductor RAM Memories: Internal organization of Memory Chips, Static Memories, Asynchronous DRAM, Synchronous DRAM, Cache Memories: Introduction, Mapping Functions, Replacement Algorithms, Performance Consideration: Hit Rate and Miss Penalty.		
Unit-3	Computer Arithmetic	5 Hours
Design of Fast Adders, Signed Operand Multiplication, Integer Division, Floating Point Numbers and Operations: IEEE 754 Standard for Floating Point Numbers.		
Unit-4	Introduction to Embedded System and Typical Embedded System	6 Hours
Introduction to Embedded System: Embedded Vs General Computing System, History of Embedded systems, Classification of Embedded systems, Major applications areas of embedded systems. The Typical Embedded System: Elements of Embedded System, Core of Embedded System, Memory, Sensor and Actuators, External Communication Interface		
Unit-5	Open-Source Embedded Development Board	6 Hours
Arduino: Birth, Open-Source community, Functional Block Diagram of Arduino. Functions of each Pin of Arduino, Arduino Development Board diagram (including different blocks only): IDE, I/O Functions, Looping Techniques, Decision Making Techniques, Designing of 1st sketch, Programming of an Arduino (Arduino ISP), Arduino Boot loader, Serial Protocol (serial port Interfacing), Initialization of Serial Port using Functions, Basic Circuit for Arduino.		
Unit-6	ARM Instruction Set and Assembly Code	6 Hours
Arm Embedded System: The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. Arm Processing Fundamentals: Registers, Current Program Status Register, Pipeline, Exception, Core Extensions, Introduction to The Arm Instruction Set: Data Processing Instructions, Branch Instructions, Load-Store Instructions		
Learning Resources:		
Text Books		
1)	Computer Organization and Embedded Systems, Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, McGraw Hill, 6 th Edition, 2011	
2)	Introduction to Embedded Systems, Shibu K. V Tata McGraw Hill, 2 nd Edition, 2020	
3)	Getting Started with Arduino, Massimo Banzi, Maker Media, 4 th Edition, 2022	
4)	ARM System Developer's Guide, Andrew Sloss, Morgan Kaufmann, 2 nd Edition, 2004	

Reference Books

1)	Computer Organization and Architecture, William Stallings, Pearson Education, 10 th Edition, 2016
2)	Microcontroller (ARM) and Embedded System, Raghunandan G. H. Cengage Learning, 1 st Edition, 2020
3)	Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw Hill, 2 nd Edition, 2008
4)	Exploring Arduino, Jeremy Blum, Wiley Publications, 1 st Edition, 2013.
5)	ARM System on-chip Architecture Steve Furber Pearson Education, 2 nd Edition, 2000

MOOC / NPTEL/YouTube Links

1)	NPTEL Course on Computer organization and Architecture Prof. Indranil Sengupta, Prof. Kamalika Datta, IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc22_cs88/preview
2)	NPTEL Course on Microprocessors and Microcontrollers by Prof. Santanu Chattopadhyay IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc20_ee42/preview
3)	Computer Organization and Architecture Lab, https://coa-iitkgp.vlabs.ac.in/
4)	Computer Organization, https://cse11-iiith.vlabs.ac.in/

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	1	1	-	-	-	1	2	1	1
CO2	3	2	1	-	1	1	-	-	-	-	1	2	1	2
CO3	3	3	2	1	1	1	-	-	-	-	1	3	1	2
CO4	2	2	2	1	3	2	1	1	1	-	2	3	3	3
CO5	3	2	1	-	2	1	1	-	-	-	2	3	2	3

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-MDM2-405 Course Name: Data Analysis and Visualization		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	02	ISA: 50 Marks
Prerequisites: Basic understanding of data and statistics (MDM-1)		
Course Objectives: The objective of the course is to		
1)	Build understanding of data analysis concepts and workflow	
2)	Introduction to basic data cleaning and preprocessing techniques	
3)	Develop skills in analyzing datasets using simple tools	
4)	Enable students to create meaningful visualizations for decision-making	
5)	Familiarize students with real-world datasets and applications	
6)	Prepare students for conceptual understanding of Machine Learning	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	Explain basic concepts of data analysis and data lifecycle	Understand
CO2	Perform basic data cleaning and preprocessing operations	Apply
CO3	Analyze datasets using simple techniques and tools	Analyze
CO4	Create effective visualizations using charts and dashboards	Apply
CO5	Interpret analyzed data to support decision-making	Evaluate
Course Description:		
This course focuses on data analysis and visualization techniques for students from non-computer science backgrounds. It covers data preprocessing, analysis, and visualization using user-friendly tools such as spreadsheets and introductory Python environment. The course emphasizes real-world applications and prepares students for advanced topics like Machine Learning by building strong analytical thinking skills.		
Course Content		
Unit-1	Introduction to Data Analysis	5 Hours
What is data analysis? Data analysis lifecycle, Types of data analysis (descriptive, diagnostic, predictive), Real-world applications in engineering		
Unit-2	Data Collection and Cleaning	5 Hours
Sources of data (structured/unstructured), Handling missing data, Removing duplicates, Basic data transformation, Introduction to clean datasets		
Unit-3	Exploratory Data Analysis (EDA)	5 Hours
Understanding datasets, Summary statistics, Identifying patterns and trends, Simple correlation concepts, Case-based examples		

Unit-4	Data Visualization Techniques	5 Hours
Bar charts, Line charts, Pie charts, Histograms and scatter plots, Choosing appropriate visualization Interpretation of visual data		
Unit-5	Tools for Data Analysis	5 Hours
Excel / Google Sheets advanced features, Basic dashboards (Tableau, PowerBI), Introduction to Python notebooks, Google Colab, Simple data visualization tools		
Unit-6	Applications and Case Studies	5 Hours
Data analysis in different engineering domains, Case studies (traffic, energy, manufacturing, business), Data-driven decision making, Bridge to Machine Learning concepts		
Learning Resources:		
Text Books		
1)	Data Analytics Made Accessible Author: Anil Maheshwari Publisher: World Scientific Publishing Edition: Latest Edition, 2025	
3)	Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking Authors: Foster Provost, Tom Fawcett Publisher: O'Reilly Media Edition: 1st Edition, 2013	
Reference Books		
1)	Storytelling with Data: A Data Visualization Guide for Business Professionals Author: Cole Nussbaumer Knafllic Publisher: Wiley Edition: 1st Edition, 2015	
3)	Data Analysis with Microsoft Excel Authors: Michael Alexander, Richard Kusleika Publisher: Wiley Edition: 2nd Edition, 2016	
e-Books		
1)	Google Data Analytics https://static.googleusercontent.com/media/www.google.com/en//grants/education/Google_Analytics_Training.pdf	
MOOC / NPTEL/YouTube Links		
1)	NPTEL: Data Analytics Course https://nptel.ac.in/courses/106107220	
2)	Coursera: Data Analysis with Excel / Python https://www.coursera.org/learn/excel-data-analysis	

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-OE1-406 Course Name: Internet of Things

Teaching Scheme	Credit	Evaluation Scheme
Lectures: 03 Hours/Week	03	ISE: 40 Marks ESE: 60 Marks

Prerequisites : Fundamentals of Computer Network and Internet

Course Objectives: The objective of the course is to

1)	Understanding of core IoT concepts and frameworks.
2)	To Provide knowledge on IoT mechanisms, including traffic characteristics, scalability, and security
3)	Understanding of RFID technology and its components in IoT systems.
4)	Enable hands-on experience with IoT hardware and software, focusing on Raspberry Pi.
5)	To apply IoT technologies in real-world scenarios like smart cities and home automation.

Course Outcomes: After successful completion of the course, student will be able to

CO	Description	Bloom's Level
CO1	To discuss IoT Concepts and Frameworks	Understand
CO2	To learn and implement different IOT mechanisms	Remember
CO3	To identify and describe the components of an RFID system	Understand
CO4	Develop basic IoT applications using Raspberry Pi.	Apply
CO5	Compare and evaluate various IoT communication technologies and apply appropriate IoT technologies to analyze real-world applications such as smart metering, e-health etc.	Analyze

Course Description:

This course provides an in-depth introduction to the Internet of Things (IoT), covering fundamental mechanisms, identification technologies, communication protocols, and practical applications, including hands-on experience with Raspberry Pi and various IoT systems.

Course Content

Unit-1	Introduction to IOT	3 Hours
IoT, Objects / Things, IoT definitions, IoT frame work, Identification technologies, Internet in IoTs		
Unit-2	Fundamentals of IoT mechanisms	4 Hours
Identification of IoT objects and services, Traffic characteristics, scalability and interoperability, security and privacy, Communication capabilities, Mobility support and device power, Sensor technology, RFID technology, and satellite technology.		
Unit-3	Radio Frequency Identification Technology	5 Hours
RFID, IoT objects and services, principles of RFID, Components of an RFID system, RFID reader, Tags, middleware, Sensor nodes, connecting nodes, networking nodes.		

Unit-4	IoT systems	4 Hours
Hardware and Software: Introduction to Raspberry Pi, Familiar with Raspberry Pi hardware, study of I/O ports, Programming with Raspberry Pi, Study of operating systems for Raspberry Pi.		
Unit-5	Communication Technologies	5 Hours
WPAN Technologies: Introduction to IEEE 802.15.4 standard, Zigbee, Bluetooth ,IEEE 802.15.6; WBANS, NFC, WLAN, Cellular and mobile technologies.		
Unit-6	IoT Application Examples	5 Hours
Smart Metering, advanced metering infrastructure, e-health / Body Area Network, City Automation (Smart City), Automotive Application, Environmental Applications, Home Automation, Control Applications.		
Learning Resources:		
Text Books		
1)	The Internet of Things-Connecting Objects to the Web, Hakima Chaouchi Wiley Publications 1st Edition 2010	
2)	Building the Internet of Things, Daniel Minoli, Wiley Publications, 1st Edition-2013	
3)	Introduction to Wireless Telecommunications systems and Networks,Gary J. Mulett, Cengage Learning, India Edition 2006	
Reference Books		
1)	Raspberry Pi for Dummies, Sean McManus, Mike Cook, Wiley (2 March 2023); Wiley India Pvt Ltd	
2)	Architecting the Internet of Things-Bernd Scholz, Reiter Springer 1st edition 2011	
SWAYAM Courses		
1	NPTEL Course on Introduction to Internet of Things Prof. Sudip Misra, IIT Kharagpur https://www.nptel.ac.in/courses/106105166	

CO-PO Mapping:														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	2	1	2
CO2	3	3	2	2	3	-	-	-	1	-	-	3	2	3
CO3	2	2	2	1	2	-	-	-	-	-	-	2	1	2
CO4	2	3	3	3	3	-	1	-	2	1	-	3	2	3
CO5	2	3	3	2	3	2	2	-	-	1	-	3	3	3

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-VSEC-407P Course Name: Python Programming		
Teaching Scheme	Credit	Evaluation Scheme
Lectures: 02 Hours/Week	01	ISA:25 Marks ESE(POE):50 Marks
Prerequisites: 1.Computer Programming in C Lab 2. Data Structure 3. Object Oriented Programming using C++		
Course Objectives: The objective of the course is to		
1)	To understand programming paradigms and develop a strong foundation in Python basics, including syntax, data types, and core constructs.	
2)	To learn and apply control structures such as looping, conditional statements, and string manipulation techniques for effective problem-solving.	
3)	To acquire Object-Oriented Programming (OOP) skills and understand file handling mechanisms for efficient data storage and retrieval.	
4)	To develop competence in exception handling and data manipulation techniques using Python for robust and reliable application development.	
Course Outcomes: After successful completion of the course, student will be able to		
CO	Description	Bloom's Level
CO1	To recall the concepts of Python Programming Language in Problem Solving scenario	Remember
CO2	Utilize of key concepts in the file handling, string handling, exception handling of strings and functions	Apply
CO3	To illustrate object-oriented concepts in various real time problems	Apply
CO4	To implement file handling and exception handling concepts for a given scenario	Apply
CO5	Plotting the data using appropriate Python visualization libraries/packages	Apply
Course Description: This course provides an introduction to Python Programming language. Students are introduced to key programming concepts like data structures, conditionals, loops, variables, and functions.		
Course Content		
Unit-1	Basics of Python Programming	5 Hours
Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input/Output operation, Comments, Reserved words, Indentation, Operators and expressions, Decision Control Systems: Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, break, continue, pass, else statement used with loops		

Unit-2	Functions and Modules	5 Hours
Definition, call, variable scope -global, local variables, global keyword, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.		
Unit-3	Python Strings & Data Structures	5 Hours
Python Strings: Concatenating, appending & multiplying strings, built in string functions, slicing comparing strings, Data Structures: Sequence, Lists, Tuples, Set, Dictionaries and all functions of these data types, list and dictionary comprehensions.		
Unit-4	Classes and Objects	5 Hours
Creating and Using a Class, Working with Classes and Instances, Inheritance and its types & Polymorphism, Operator overloading, Method overriding		
Unit-5	Exception Handling & File Handling	5 Hours
Exception Handling: Introduction to Errors & Exceptions, handling exceptions, multiple except blocks. File Handling: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files.		
Unit-6	Data Analysis & Visualization	5 Hours
NumPy: Creating Arrays, Array indexing, Array Slicing & Built-in Functions. Pandas: Series, DataFrame, & Built-in Functions. Data Visualization with Matplotlib: Plotting, markers, labels, grid, scatter plots, bar charts, histograms, & pie charts.		
Learning Resources:		
Text Books		
1)	Python Programming Using Problem Solving Approach (for Unit 1,2,3,4), Reema Thareja Oxford University Press. -2017	
2)	Python Crash Course: A Hands-On Project-Based Introduction to Programming (for Unit 5,6) Eric Matthes No Starch Press-2019	
Reference Books		
1)	Core Python Programming-R. Nageswara Rao, Dreamtech Press, 2nd (2017)	
2)	Learning Python, Romano Fabrizio Packt Publishing Limited,2nd Edition (2015)	
3)	Head First Python- A Brain Friendly Guide Paul Barry, SPD O'Reilly (2011)	
4)	Python: The Complete Reference-Martin C. Brown, McGraw Hill Education,1st Edition (2018)	
5)	Learning Python-Powerful Object-Oriented Programming, Mark Lutz 6 th Edition(2025)	
e-Books		
1)	https://www.scribd.com/document/796685826/Python-Programming-Reema-Thareja-Text-Book	

MOOC / NPTEL/YouTube Links

1)	NPTEL Course on Programming, Data Structures and Algorithms using Python Prof. Madhavan Mukund Chennai Mathematical Institute https://onlinecourses.nptel.ac.in/noc24_cs78/preview
2)	NPTEL Course on Programming in Python Dr. Rizwan Rehman Dibrugarh University https://onlinecourses.nptel.ac.in/noc24_cs78/preview

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	1	2	1	1
CO2	3	3	2	-	3	-	-	-	-	-	1	3	2	2
CO3	3	3	3	2	3	1	-	2	1	-	2	3	3	2
CO4	3	3	2	2	3	-	-	-	-	1	1	3	2	2
CO5	3	2	2	3	3	1	1	-	2	1	2	2	3	3

Tatyasaheb Kore Institute of Engineering and Technology
Second Year of Bachelor of Technology (S.Y. B.Tech)

Course Code: 2501UCSE-VSEC-407P

Course Name: Python Programming

Teaching Scheme	Credit	Evaluation Scheme
Practical: 04 Hours/Week	01	ISA: 25 Marks ESE(POE): 50 Marks

Prerequisites:

1. Computer Programming in C Lab
2. Data Structure
3. Object Oriented Programming using C++

Course Objectives: The objective of the course is to

1)	To understand programming paradigms and develop a strong foundation in Python basics, including syntax, data types, and core constructs.
2)	To learn and apply control structures such as looping, conditional statements, and string manipulation techniques for effective problem-solving.
3)	To acquire Object-Oriented Programming (OOP) skills and understand file handling mechanisms for efficient data storage and retrieval.
4)	To develop competence in exception handling and data manipulation techniques using Python for robust and reliable application development.

Course Outcomes: After successful completion of the course, student will be able to

CO1	To recall the concepts of Python Programming Language in Problem Solving scenario
CO2	Utilize of key concepts in the file handling, string handling, exception handling of strings and functions
CO3	To illustrate object-oriented concepts in various real time problems
CO4	To implement file handling and exception handling concepts for a given scenario
CO5	Plotting the data using appropriate Python visualization libraries/packages

Course Description: This course provides an introduction to Python Programming language. Students are introduced to key programming concepts like data structures, conditionals, loops, variables, and functions.

Course Contents

Sr. No.	Experiments	Bloom's Level
1	Data Types, Operators, and Expressions <ul style="list-style-type: none"> Write Python programs to demonstrate built-in data types (Numeric, Sequences, Mappings) and evaluate arithmetic, relational, logical, and bitwise operations. Write a program to solve complex expressions using explicit type conversion (typecasting) and dynamic typing in Python. 	Analyze
2	Control Flow Structures and Looping Mechanics <ul style="list-style-type: none"> Implement decision-making statements (if, if-else, if-elif-else) and iterative loops (for, while) along with loop control keywords (break, continue, pass). 	Analyze

	<ul style="list-style-type: none"> Develop a program to perform number theory tasks (e.g., Prime check, Fibonacci series, Armstrong number check, and nested pattern printing). 	
3	String Operations and Handling Techniques <ul style="list-style-type: none"> Develop programs to perform indexing, slicing, concatenation, and execution of built-in string methods (split(), join(), strip(), replace(), find()). Create a program to check for Palindromes, count vowels/consonants/special characters, and demonstrate string formatting (f-strings, .format()). 	Analyze
4	Python Core Data Structures (Lists, Tuples, Sets, Dictionaries) <ul style="list-style-type: none"> Implement programs using built-in methods on Lists, Tuples, Sets, and Dictionaries (e.g., list comprehensions, key-value manipulations, set operations). Build a menu-driven program to perform dynamic collection management (e.g., Student Record Management System using dictionary of lists). 	Create
5	File Operations and Context Management <ul style="list-style-type: none"> Implement Python programs to read, write, and append text/CSV files using standard file I/O operations and context managers (with statement). Write a program to count total lines, words, characters, and search/replace specific patterns inside an external text file. 	Analyze
6	Modular Programming using Functions and Modules <ul style="list-style-type: none"> Design programs using positional arguments, keyword arguments, default arguments, variable-length arguments (*args, **kwargs), and Lambda expressions. Implement recursive functions (e.g., Factorial) and create a user-defined modular package (.py files) to demonstrate code reusability. 	Create
7	Object-Oriented Programming: Constructors and Inheritance <ul style="list-style-type: none"> Build programs demonstrating class design, instance variables, parameterized/default constructors (__init__), and object instantiation. Implement Single, Multiple, Multilevel, and Hierarchical Inheritance patterns using the super() function. 	Analyze
8	Advanced Object Design: Class Methods, Static Methods, and Encapsulation <ul style="list-style-type: none"> Design a program to demonstrate the working of Class Methods (@classmethod), Static Methods (@staticmethod), and Instance Methods. Demonstrate Encapsulation by defining private/protected members and implementing getter/setter methods for data access control. 	Create
9	Polymorphism and Exception Handling <ul style="list-style-type: none"> Implement Polymorphism via Method Overloading, Method Overriding and Operator Overload mechanisms (using dunder methods like __add__, __str__). Develop a robust application incorporating Exception Handling constructs (try, except, else, finally) and custom user-defined exceptions. 	Create
10	Data Analysis and Visualization <ul style="list-style-type: none"> Write a program using NumPy to construct N-dimensional arrays and perform basic statistical computations. Create graphical representations (Line Plots, Bar Charts, Scatter Plots, Histograms) of structured data using Matplotlib/Seaborn libraries. 	Analyze

Learning Resources:

Text Books

1)	Python Programming Using Problem Solving Approach (for Unit 1,2,3,4), Reema Thareja Oxford University Press. -2017
2)	Python Crash Course: A Hands-On Project-Based Introduction to Programming (for Unit 5,6) Eric Matthes No Starch Press-2019

Reference Books

1)	Core Python Programming-R. Nageswara Rao, Dreamtech Press, 2nd (2017)
2)	Learning Python, Romano Fabrizio Packt Publishing Limited, 2nd Edition (2015)
3)	Head First Python- A Brain Friendly Guide Paul Barry, SPD O'Reilly (2011)
4)	Python: The Complete Reference-Martin C. Brown, McGraw Hill Education, 1st Edition (2018)
5)	Learning Python-Powerful Object-Oriented Programming, Mark Lutz 6 th Edition (2025)

e-Books

1)	https://www.scribd.com/document/796685826/Python-Programming-Reema-Thareja-Text-Book
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CO-PO/PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	1	2	1	1
CO2	3	3	2	-	3	-	-	-	-	-	1	3	2	2
CO3	3	3	3	2	3	1	-	2	1	-	2	3	3	2
CO4	3	3	2	2	3	-	-	-	-	1	1	3	2	2
CO5	3	2	2	3	3	1	1	-	2	1	2	2	3	3

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)		
Course Code: 2501UCSE-AEC2-408-1 Course Name: Modern Indian Languages: Marathi		
अध्यापन योजना	श्रेयांक	मूल्यमापन योजना
अधिव्याख्यने: २ तास/सप्ताह	२	सत्रमूल्यांकन: २५ गुण
अभ्यासक्रमाचा उद्देश:		
१	विद्यार्थ्यांच्यात मराठी भाषा आणि साहित्याविषयी जिज्ञासा निर्माण करणे.	
२	मराठी भाषेतील प्रतिभावंत साहित्यिकांच्या कृतींचा अभ्यास करणे.	
३	मराठी साहित्याच्या वाचनाची आवड निर्माण करणे.	
४	मराठी भाषेच्या प्रचार-प्रसारासाठी विविध उपक्रम राबवणे	
५	संगणक अभियांत्रिकीतील संकल्पना मराठी भाषेतून विशद करणे.	
अभ्यासक्रमाचा विधेय: अभ्यासक्रम यशस्वीरीत्यापूर्ण केल्यावर विद्यार्थी खालील विधेये साध्य करेल		
		ब्लूमचे अध्ययन स्तर
वि.१	मराठीतील विख्यात साहित्याचा आणि साहित्यिकांचा धांडोळा घेईल.	समजून घेणे
वि.२	अभ्यासक्रमाव्यतिरिक्त इतर साहित्यिकांच्या साहित्याचा आस्वाद घेईल.	उपयोजन करणे / अंमलबजावणी करणे
वि.३	विद्यार्थ्यांच्यात अवांतर वाचनाची गोडी लागेल.	विश्लेषण करणे
वि.४	सभाधीटपणा, नाट्य, संभाषण, वक्तृत्व विविध कला अवगत होतील.	उपयोजन करणे / अंमलबजावणी करणे
वि.५	संगणक अभियांत्रिकीतील संकल्पना मातृभाषेतून अधिक सुस्पष्ट होतील.	मूल्यमापन करणे
विवरण:		
मराठी भाषेतील विशेष साहित्यकृतींचा अभ्यास या विषयाचा क्षमता वृद्धिंगत अभ्यासक्रमांतर्गत समावेश करणेत आलेला आहे. संगणक अभियांत्रिकीतील संकल्पना मातृभाषेतून स्पष्ट केल्यास, विद्यार्थ्यांना त्या संकल्पना प्रभावीरीत्या समजण्यास मदत होते. संगणक अभियांत्रिकीच्या इंग्रजीतील शिक्षणामुळे विद्यार्थी आपल्या मातृभाषेपासून आणि पर्यायाने त्यातील साहित्या पासून दूर जाऊ शकतो. हा दुरावा कमी करणे, हा या विषयाचा मूळ उद्देश आहे. या विषयांतर्गत, मराठी भाषा :उत्पत्ती आणि विकास, विशेष साहित्यकृतींचा अभ्यास-गद्य, विशेष साहित्यकृतींचा अभ्यास-पद्य, मराठी रंगभूमी – एक सांस्कृतिक वारसा आणि उपक्रम असे एकूण पाच घटक समाविष्ट करण्यात आलेले आहेत.		
विषय घटक		
घटक १	मराठी भाषा :उत्पत्ती आणि विकास	०४ तास
प्राचीनकाल, मध्ययुग, मध्ययुगीनकाल, साहित्य आणि सांस्कृतिक विकास, मराठा साम्राज्यातील मराठी साहित्य, २०व्या शतकातील मराठी भाषेची उत्क्रांती, मराठी भाषेची सद्यस्थिती		

घटक २	विशेष साहित्यकृतींचा अभ्यास - गद्य	०४ तास										
मराठी साहित्यातील ख्यातनाम साहित्यिकांची ओळख आणि त्यांच्या साहित्यकृती – आचार्यप्र. के. अत्रे, पु. ल. देशपांडे, रणजीत देसाई, विश्वास पाटील, अण्णा भाऊ साठे इत्यादी												
घटक ३	विशेष साहित्य कृतींचा अभ्यास - पद्य	०४ तास										
मराठी साहित्यातील ख्यातनाम कवी आणि कवयित्रींची ओळख व त्यांच्या पद्यकृती – बहिणाबाई चौधरी, मंगेश पाडगावकर, इंदिरा संत, बा. भ. बोरकर, सुरेश भट इत्यादी												
घटक ४	मराठी रंगभूमी – एक सांस्कृतिक वारसा	०४ तास										
मराठी रंगभूमीची ओळख, मराठी नाट्यप्रकार, विख्यात मराठी नाटककार – गोविंद बल्लाळ देव, आचार्यप्र. के. अत्रे, पु. ल. देशपांडे, शंकरराव किर्लोस्कर, राम गणेश गडकरी इत्यादी												
घटक ५	उपक्रम	०८ तास										
वरील साहित्य कृतींचेसादरीकरण, हिप-हॉपशो, नाटिका, काव्यवाचन, कवितेचे रसग्रहण, अभिवाचन, संगणक अभियांत्रिकीतील एखाद्या संकल्पनेचेमराठी भाषेत अधिव्याख्यान, इत्यादी												
संदर्भग्रंथ सूची:												
१	अमृतसिद्धी: १ व २, मंगला गोडबोलेव स.ह.देशपांडे,मौज प्रकाशनगृह											
२	व्यक्ती आणि वल्ली, पु. ल. देशपांडेमौज प्रकाशनगृह											
३	मी कसा झालो? प्र. के. अत्रे, परचुरे प्रकाशन											
४	स्वामी, रणजीत देसाई, मेहता पब्लिशिंग हाउस											
५	झाडाझडती, विश्वास पाटील, राजहंस प्रकाशन											
६	बहिणाबाईची गाणी, बहिणाबाई चौधरी, सुचित्रा प्रकाशन											
७	बोलगाणी, मंगेश पाडगांवकर, मौज प्रकाशनगृह											
८	बोरकरांची समग्रकविता, खंड १ व २, बा. भ. बोरकर, देशमुख आणि कंपनी											
९	मृद्वंध, इंदिरा संत, मेहता पब्लिशिंगहाउस											
१०	रंग माझा वेगळा, सुरेश भट, मौज प्रकाशन गृह											
अभ्यासक्रम निष्पत्ती (CO) – कार्यक्रम निष्पत्ती (PO) मॅपिंग:												
CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 (वि.१)	2	2	–	–	–	–	–	3	–	2	–	2
CO2 (वि.२)	2	2	–	–	–	–	–	3	–	2	–	3
CO3 (वि.३)	2	3	–	–	–	–	–	2	–	2	–	3
CO4 (वि.४)	–	–	–	–	–	–	–	2	3	3	–	2
CO5 (वि.५)	3	2	–	–	2	–	–	–	–	3	–	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B.Tech)			
Course Code: 2501UCSE-EEC2-409-1P Course Name: Soft Skills			
Teaching Scheme		Credit	Evaluation Scheme
Practical: 02 Hours/Week		01	ISA: 25 Marks
Prerequisites: Basics of English language, Communication Skills [2501UFYEHSSM106]			
Course Objectives: The objective of the course is to			
1)	To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.		
2)	To develop and nurture the soft skills of the students through individual and group activities.		
3)	To expose students to right attitudinal and behavioural aspects and to build the same through activities.		
Course Outcomes: After successful completion of the course, student will be able to			
CO1	Effectively communicate through verbal/oral communication and improve the listening skills.	Understand	
CO2	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations	Understand	
CO3	Prepare precise briefs or reports and technical documents	Apply	
CO4	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.	Understand	
CO5	Present themselves with corporate readiness	Apply	
Course Description: This course focuses on developing a wide variety of soft skills, including communication, behaviour, teamwork, leadership, and other professional competencies.			
Course Content			
Sr. No.	Topics for Practical	Blooms	
1	Getting acquainted with Behavioral Skills & Self Analysis	Analyze	
	<ul style="list-style-type: none">• Personality Types - Extraversion, Introversion, Intuition, Thinking, Perceiving• Meaning and Importance of SWOC analysis• Johari window model - Building Self-Awareness and Trust• How to improve self confidence		
2	Developing Leadership and Team building Qualities	Evaluate	
	<ul style="list-style-type: none">• What are Leadership qualities and Why are they important?• Corporate Leadership Types and Style• What is a Team and Team Development Stages?• Types and Attributes of Successful Team		

	3	Formal Writing Skills	Create
		<ul style="list-style-type: none"> • Write Business Letters and Email • Report Writing • Job application and Resume Writing 	
	4	Effective Stress Management and Time Management	Apply
		<ul style="list-style-type: none"> • What is Stress? Sources and types of stress • Stress Management Techniques • Time Management Techniques • Strategies for effective time management 	
	5	Set of activity	Apply
		<ul style="list-style-type: none"> • Group task encouraging discussions • Team building, value sharing • Leadership and role play all at the same time 	

Learning Resources:

Text Books

1)	Developing Communication Skills-Krishna Mohan and Meera Banerji, MacMillan India Ltd., Delhi 2nd Edition 2009
2)	Soft Skills – An Integrated Approach to Maximize Personality-Gajendra Singh Chauhan, Sangeeta Sharma-WILEY INDIA, 1st Edition 2015
3)	Essentials of Effective communication-Ludlow and Pantheon Prentice Hall of India. 1st Edition 1992

Reference Books

1)	An Approach to Communication Skills-Indrajit Bhattacharya, New Delhi Dhanpat Rai, 2nd Edition 2011
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Virtual Lab

1)	Virtual Lab IIT Guwahati-Virtual English and Communication Lab https://ve-iitg.vlabs.ac.in/
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CO-PO-PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	3	3	-	2	2	1
CO2	-	-	-	-	-	-	-	-	3	3	-	2	3	2
CO3	-	-	-	-	-	-	-	-	3	2	-	3	2	2
CO4	-	-	-	-	-	-	-	2	1	2	-	2	3	2
CO5	-	-	-	-	-	-	-	-	-	3	-	2	2	3

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B. Tech)			
Course Code: 2501UCSE-VEC2-410-1P Course Name: Designing the Digital Solutions for Societal Problems (Mini Project-I)			
Teaching Scheme		Credit	Evaluation Scheme
Lecture:	01 Hours/Week	02	ISA: 25 Marks
Practical:	02 Hours/Week		ESE(POE): 25 Marks
Prerequisites : 1. Data Structures [23UG-PCC-CSE301], 2. Software Engineering [23UG-PCC-CSE304], 3. Object Oriented Programming using C++ [23UG-VEC1-CSE3081], Python or any other Programming knowledge.			
Course Objectives: The objective of the course is to			
1)	To form teams and share responsibilities according to individual skill strengths.		
2)	To encourage the students to identify the real real-world problems and design its digital solutions		
3)	To utilize the techniques, skills and modern Engineering tools for building the mini project.		
4)	To follow the methods and tasks as per SDLC Approach		
5)	To effectively demonstrate and present the ideas, methodology and technology used for the mini project		
Course Outcomes:			
COs	After successful completion of the course, student will be able to:	Bloom's Taxonomy	
CO1	Articulate a specific problem statement for the societal need	Understand	
CO2	Develop the mini project requirement and specification.	Create	
CO3	Design the various modules.	Create	
CO4	Implement the mini project using appropriate programming language.	Apply	
CO5	CO5 Prepare the report and present the mini project. Apply	Create	
Course Description: The Mini Project is designed to make the students to apply their practical knowledge with relevant tools and techniques to solve the society problems.			
Course Content			
Sr. No.	Activities for Practical		
Activity - 1	Identifying the area of Mini Project for Society Problems and Problem Identification		
	Students must identify the area to solve different kinds of problems. Students must identify the problem from chosen area.		
Activity - 2	Presentation-I (Synopsis Presentation)		
	Presentation on Synopsis		
Activity - 3	Requirement Elicitation, Analysis, and preparation of SRS Document.		

	Students must elicit the requirement for identified problem, analyse the requirement for identified problem, and prepare the SRS document.
Activity - 4	Presentation-II (SRS Presentation).
	Presentation on SRS documents
Activity - 5	Finalization of modules for Mini Project.
	Students must finalize the number of modules for mini project.
Activity - 6	Design the Modules and Module Implementation
	Students must determine the suitable data structures and algorithms to solve identified problem, and implement different modules.
Activity - 7	Presentation-III (Implementation).
	Presentation carries on Implementation of Mini Projects
Activity - 8	System Integration.
	Students must integrate the different functional modules to build whole system
Activity - 9	Mini Project Report Preparation.
	Students must prepare the final mini project report.
Activity -10	Presentation-IV (Final Presentation along with draft report).
	Students must present their mini project work in front of panel of examiner.

CO-PO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	3	-	1	1	-	1	2	1	2
CO2	2	3	3	1	2	1	-	2	2	1	1	3	2	2
CO3	2	2	3	2	2	-	-	2	1	1	1	3	3	2
CO4	2	2	2	1	3	-	-	2	1	1	2	3	3	2
CO5	-	1	1	-	1	-	-	2	3	1	1	1	1	2

Tatyasaheb Kore Institute of Engineering and Technology Second Year of Bachelor of Technology (S.Y. B. Tech)		
Course Code: 2501UGCSE-A-411 Course Name: Environment Studies		
Teaching Scheme	Credit	Evaluation Scheme
Course Objective:		
1	To provides an integrated, quantitative, and interdisciplinary study of environmental systems.	
2	To develop a better understanding of human relationships, perceptions, and policies towards the environment.	
3	To teach students to evaluate alternative energy systems.	
4	Covers pollution control and mitigation strategies and educates on natural resource management.	
5	Explores the effects of global climate change, helps students bring a systems approach to the analysis of environmental problems	
Course Outcomes:		
COs	At the end of successful completion of the course, the students will be able to	Bloom's Taxonomy
CO1	Identify ecosystems, food chains, food webs, and natural resources	Understand
CO2	Learn the causes, effects, and control methods of water, air, and noise pollution.	Remember
CO3	Describe key environmental laws and international/national efforts for environmental protection.	Understand
CO4	Discuss global warming, alternative energy, sustainable development, disaster management, and the role of IT in environmental and human health.	Understand
CO5	Use knowledge and skills to solve environment related problem	Apply
Section – I		
Unit-1	Ecology	
	Ecosystem, Ecological Pyramids, Food Chain, Food Web, Ecological Succession, Natural Resources and Associated Problems. Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Resources, Role of Individuals in Conservation of Natural Resources.	
Unit-2	Pollution	
	Water Pollution: Causes, Effects, Control, Drinking Water Quality Standards, Arsenic, Lead, Cadmium, Chromium, Fluoride Contamination & Its Effects, Water Treatment, Wastewater Treatment Air Pollution: Causes, Effects, Control, Air Pollution Controlling Equipments, Air Quality Standards, National Air Quality Index, Vehicular Emission, Alternative Fuels, Indoor Air Pollution, Thermal Inversions, Photochemical Smog and Acid Precipitation Noise Pollution: Causes, Effects, Control, Noise Standards Recommended By CPCB. Environmental Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, International and National Efforts for Environmental Protection.	

Unit-3	Waste management	
	Solid Waste Management, Biomedical Waste Management, E-Waste, Plastic Waste Management, Hazardous Waste Management, Carbon Footprint, Recycling of Waste, Role of Central Pollution Control Board (CPCB), State Pollution Control Board, and Role Of NGO'S	
Section – II		
Unit-4	Social Issues and Environment	
	Global Warming: Ozone Layer Depletion, Urban Problems Related To Energy, Alternative Energy Sources. Evolution of Sustainable Development: Timeline, Evolution of Green Movements in India. Disaster Management: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc., Swachh Bharat Mission, Role of Information Technology in Environment and Human Health.	

Mapping of POs & COs:

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

References

Text Books :

1	“Environmental Biology” by Agarwal K. C, Nidi publication Ltd., Bikaner 2001
2	A Textbook of Environmental Studies-D.K.Asthana, Meera Asthana-S.Chand Publication, Revised Edition 2006
3	Basic course in environmental Studies -S. Deswal & A. Deswal, Dhanpat Rai & Co Ltd. Publications, Delhi Second revised edition 2009

Reference Books :

1	Environmental science – A Study of Inter- Relationships Eldon D Enger, Bradley F. Smith Wm C Brown Publishers 2nd Edition 1989
2	Ecology of Natural resources-Francois Ramade, John Wiley & Sons Publication
3	John Wiley & Sons -Robert Leo Smith, Harper Collins Publishers,1998
4	Introduction to Environmental Engineering & Science-Gilbert M. Masters, Prentice Hall International Inc. Second Edition

SWAYAM Courses (Operational Timestamp: Thu, 25-Jul-2026 on 7:00 AM)

1	NPTEL Course on Environmental Studies Prof. Orus Ilyas, Dr.Sharad Kumar https://onlinecourses.swayam2.ac.in
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Virtual Lab (Operational Timestamp: Thu,11-July-2026 on 03:45 PM)

https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_hs155
