KARNATAK LAW SOCIETY'S

GOGTE INSTITUTE OF TECHNOLOGY

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

(APPROVED BY AICTE, NEW DELHI)

Third to Eighth semester B.E.

(2022 Scheme)

INFORMATION SCIENCE AND ENGINEERING

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

DEPARTMENT VISION
Department of Information Science & Engineering shall provide excellent learning environment with focus on innovation, research and entrepreneurship among aspiring engineers to contribute to the workforce of the nation

MISSION
To impart Quality Technical Education in the field of Information Technology and enhance intellectual and professional competence among the aspiring engineers

PROGRAM OUTCOMES (POs)	
1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PROGRAM SPECIFIC OUTCOMES (PSOs)
1	Problem solving Skills: An ability to analyze a problem design, implement and evaluate software solutions related to algorithms, system software, web design big data analytics & networking.
2	Professional skills: An ability to develop standard software solutions for existing and emerging industry verticals and research domains
3	Career Skills: An ability to harness Information Science & Engineering knowledge with ethics and societal concern for career and further educational abilities along with entrepreneurial skills.

KLS Gogte Institute of Technology
3rd to 8thsem B.E.
Scheme of Teaching and Examination- 2022

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2023-24)

Total credits for B.E. Program: 160

Credit definition:

Offline Courses	Online Courses
● 1-hour Lecture **(L)** per week = 1 Credit ● 2 hours Tutorial **(T)** per week = 1 Credit, ● 2 hours Practical /Drawing **(P)** per week = 1 Credit	04 weeks =1 Credit 08 weeks = 2 Credit 12 weeks = 3 Credit

Semester wise distribution of credits for B.E program

Year	Semester	Credits	Total/Year	Cumulative Credits
1st	I	20	40	40
	II	20		
2nd	III	20	40	80
	IV	20		
3rd	V	22	40	120
	VI	18		
4th	VII	24	40	160
	VIII	16		
Total			160	

Curriculum frame work:

Structure of Undergraduate Engineering program

S.No.	Category of courses	VTU Breakup of credits	KLSGIT Breakup of credits
1	Humanities and Social Sciences including Management courses (English, Kannada, Indian Constitution, Environmental Sciences, Health and Management)	9	10
2	Basic Science courses	22	22
3	Engineering Science courses including ETC, PLC & Drawing	24	24
4	Professional Core Courses	54	54
5	Professional Elective courses relevant to chosen	12	12

	specialization/branch		

6	Open subjects – Electives from other technical, emerging, arts, Commerce	9	9
7	Mini, Project, Major Project work and Seminar	10	10
8	Summer Internship and Research /Industrial Internship	10	10
9	Ability Enhancement Courses, including Research Methodology, NCC/NSS/ Sports/Ex- Curricular, Online Certification Course	8	7
10	Universal Human Values	2	2
	TOTAL	**160**	**160**

L-T-P Model for Courses

	Contact Hours				**Credits**	
S.No.	**L-T-P**	**Lecture**	**Tutorial**	**Practical**	**L-T-P**	**Total**
1	3 - 0 - 0	3	0	0	3 - 0 - 0	3
2	3 - 2 - 0	3	2	0	3 - 1 - 0	4
3	3 - 0 - 2	3	0	2	3 - 0 - 1	4
4	2 - 0 - 2	2	0	2	2 - 0 - 1	3
5	1 - 0 - 4	1	0	4	1 - 0 - 2	3

Theory courses having the corresponding lab are converted to integrated type course. Also, the electives (if possible) can also be made integrated type.

Integrated courses (Professional Core/Electives): Integrated courses will have **Theory Syllabus with Practical Syllabus of the same course**. In such a course there could be **no Semester End Examination (SEE) for the practical syllabus** of the course, however, Continuous Internal Evaluation (CIE) will be conducted for the practical topics.SEE can include questions from practical topics.

SDA-Skill Development Activities, TD/PSB- Teaching Department / Paper Setting Board, ASC-Applied Science Course, ESC- Engineering Science Courses, ETC- Emerging Technology Course, AEC- Ability Enhancement Course, HSMS-Humanity and Social Science and Management Course, SDC- Skill Development Course,

2nd Year B.E. Scheme of Teaching and Examination 2022

3rd Semester					Hours/week			Total contact hours/week	Credits	Examination		
S.No.	Course Type	Course Code	Course Title	Teaching Dept.	L	T	P			CIE	SEE	Total
1	PCC/BSC	22MATIS31	Fundamentals of statistics and probability for data science	Maths	3	0	0	03	3	100	100	200
2	IPCC	22IS32	Software Engineering and Design	ISE	3	0	2	05	4	100	100	200
3	IPCC	22IS33	Object Oriented Programming using Java	ISE	3	0	2	05	4	100	100	200
4	PCC	22IS34	Data Structures and Applications	ISE	3	0	0	03	3	100	100	200
5	ESC	22IS35X	Engineering Science Course	ISE	2	0	2	04	3	100	100	200
6	UHV	22IS36	Social Connect and Responsibility		0	0	2	02	1	100	--	100
7	AEC	22AECIS37X	Ability Enhancement Course	ISE	If the course is a Theory 1 0 0 If a course is a laboratory 0 0 2			01 02	1	50	50	100
8	MC	22IS381	National Service Scheme (NSS)	NSS coordinator	0	0	2	02	0	100	--	100
		22IS382	Physical Education (PE) (Sports and Athletics) and Yoga	Physical Education dept& Yoga instructor								
		22IS383	Clubs- Social, Cultural & Academic	Coordinators								
9	PCCL	22ISL39	Data Structures Lab using C	ISE	0	0	2	02	1	50	50	100
Total									**20**	**800**	**600**	**1400**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical,**S:**SDA: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation :This letter in the course code indicates common to all the stream of engineering. **ESC**: Engineering Science Course, **ETC**: Emerging Technology Course, **PLC**: Programming Language Course

Engineering Science Course			
22IS351	Object oriented Programming with C++ (2-0-2)	22IS353	Digital Electronics (2-0-2)
22IS352	Web Programming – A practical approach (2-0-2)	22IS354	Python Programming – A practical approach (2-0-2)
Ability Enhancement Course – III – Department Specific			
22IS371	Heartfulness Enabled Leadership Master	22IS373	Computer and Network Maintenance
22IS372	Microsoft Office Essentials	22IS374	Mathematics I

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga/Clubs: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG) and Clubs with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Club activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

4th Semester					Hours/week			Total contact hours/week	Credits	Examination		
S.No.	**Course Type**	**Course Code**	**Course Title**	**Teaching Dept.**	**L**	**T**	**P**			**CIE**	**SEE**	**Total**
1	PCC	22IS41	Operating System	ISE	3	0	0	03	3	100	100	200
2	IPCC	22IS42	Algorithm Analysis and Design	ISE	3	0	2	05	4	100	100	200
3	IPCC	22IS43	Database Management Systems	ISE	3	0	2	04	4	100	100	200
4	ESC	22IS44X	Engineering Science Course		3 2	0 0	0 2	03 04	3	100	100	200
5	AEC/ SEC	22AECIS45X	Ability Enhancement Course	ISE	If the course is Theory 1	0	0	01	1	50	50	100
					If the course is a lab 0	0	2	02				
6	BSC	22IS46	Biology For Engineers		3	0	0	03	3	100	100	200
7	UHV	22IS47	Universal human values course		1	0	0	01	1	50	50	100
8	MC	22IS481	National Service Scheme (NSS)	NSS coordinator	0	0	2	02	**0**	100	--	100
		22IS482	Physical Education (PE) (Sports and Athletics) and Yoga	Physical Education dept& Yoga instructor								
		22IS483	Clubs- Social, Cultural & Academic	Coordinators								
9	PCCL	22ISL49	Operating System Lab	ISE	0	0	2	02	1	50	50	100
Total									**20**	**750**	**650**	**1400**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K :This letter in the course code indicates common to all the stream of engineering.

Engineering Science Course			
22IS441	Discrete Mathematical Structures and Graph Theory	22IS443	Digital Electronics (2-0-2)
22IS442	Web Programming – A practical approach (2-0-2)	22IS444	Python Programming – A practical approach (2-0-2)
Ability Enhancement Course – IV			
22AECIS451	Heartfulness Enabled Leadership Master	22AECIS453	Computer and Network Maintenance
22AECIS452	Microsoft Office Essentials	22AECIS454	Mathematics II

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga/Clubs: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG) and Clubs with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Club activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

FUNDAMENTALS OF STATISTICS AND PROBABILITY FOR DATA SCIENCE

Course Code:	**22MATS31**	**Course type**	**PCC/BSC**	**Credits L-T-P**	3 – 0– 0
Hours/week: L-T-P	3 – 0 – 0			**Total credits**	3
Total Contact Hours	L = 40 Hrs; T = 0Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course Learning Objectives At the end of the course students should be able to	
1	Fit a suitable curve for the data using regression.
2	Get knowledge about various probability distributions involving discrete /continuous random variable.
3	Get familiar with various sampling distributions and estimation of various parameters.
4	Get acquainted with various hypothesis testing techniques.
5	Understand Joint discrete PDF and various stochastic processes.

Pre-requisites: Basic statistics, Basic probability.

Unit – I	**Contact Hours = 8 Hours**
Correlation and Regression: Curve fitting by least square method. Fitting the curve , $y = a+bx$, , $y = ax^b$, $y = a+bx+cx^2$.Karl Pearson coefficient of correlation, Linear Regression: Problems. Multiple correlation and regression. Partial correlation and regression.	

Unit – II	**Contact Hours = 8 Hours**
Random Variable: Revision of basic probability, conditional probability upto Bayes theorem. Discrete and Continuous Random Variable, (DRV,CRV) Probability Distribution Functions (PDF) and Cumulative Distribution Functions(CDF), Expectations, Mean, Variance. Binomial, Poisson, Exponential and Normal Distributions. Practical examples.	

Unit –III	**Contact Hours = 8 Hours**
Joint PDF and Stochastic Process: Discrete Multivariable Joint PDF, Multivariable Conditional JointPDF, Expectations (Mean, Variance and Covariance). Definition and classification of stochastic processes. Discrete state and discrete parameter stochastic process, Unique fixed probability vector, Regular Stochastic Matrix, Transition probability, Markov chain.	

Unit – IV	**Contact Hours = 8 Hours**
Hypothesis Testing: Null and alternate hypothesis, Critical region, Sampling, Sampling errors, Level of significance and confidence limits, Testing hypothesis of mean, Testing hypothesis of variance, Testing hypothesis of proportion.	

Unit – V	Contact Hours = 8 Hours
Sampling distribution: Sampling distribution, Sampling distribution of means, Test of significancefor small and large samples. 't' and 'chi square' distributions, F- distribution. Practical examples.	

Unit No.	Self-Study Topics
1	Regression models, Regression strategies.
2	Discrete and Continuous Random vectors in different areas such as Mutual funds, lottery draw, decision making, decision trees etc…
3	Restate the research question as research hypothesis and a null hypothesis about the populations and determine the characteristics of the comparison distribution.
4	Eliminating variability during gathering statistical data.
5	Monte Carlo Simulation.

Books	
	Text Books:
1.	B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 42thEd., 2021 onwards.
2.	Erwin Kreyszig: "Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
	Reference Books:
1.	B.V. Ramana**: "**Higher Engineering Mathematics"McGraw-Hill Education, 11thEd., 2004 onwards.
2.	Srimanta Pal &Subodh C. Bhunia: "Engineering Mathematics"Oxford University Press,3rd Ed., 2016 onwards
3.	N.P Bali and Manish Goyal:"A textbook of Engineering Mathematics Laxmi Publications, 10th Ed., 2022 onwards
4.	C. Ray Wylie, Louis C. Barrett: **"**Advanced Engineering Mathematics"McGraw –HillBook Co., New york, 6thEd., 2017 onwards
5	H. K. Dass and Er. RajnishVerma**:** Higher Engineering Mathematics"S. Chand Publication, 3rd Ed., 2014.
	E-resources:
1.	https://nptel.ac.in/courses/111106111
3	https://nptel.ac.in/courses/111104025
4	https://nptel.ac.in/courses/117105085
5	https://nptel.ac.in/courses/111105042

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)
3.	Flipped Classes	3.	Course Seminar
4.	Practice session/Demonstrations in Labs	4.	Quizzes
5.	Virtual Labs (if present)	5.	Semester End Examination

Course Outcome (COs)				
Learning Levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Understand** regression analysis for data analysis.	**Re,Un,Ap**	**1**	**1**
2.	**Apply** the knowledge of Discrete and Continuous Random vectors in different areas such as Mutual funds, lottery draw, decision making, decision trees etc…	**Re,Un,Ap**	**1**	**1**
3.	**Apply** knowledge of Sampling distribution and Hypothesis Testing to conduct basic statistical analysis of data.	**Re,Un,Ap**	**1**	**1**

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Two Assignments (Open/Industry /Certification etc.)**	**Course project (CP)/ Case study etc.**	**Total Marks**
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

- Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

- Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
- Lack of minimum score in IA test will make the student Not Eligible for SEE
- Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)													CO-PSO Mapping(planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓												✓		
2	✓												✓		
3	✓												✓		

SOFTWARE ENGINEERING AND DESIGN

Course Code	22IS32	**Course type**	**IPCC**	**Credits L-T-P**	3 - 0 - 1
Hours/week: L - T- P	3 - 0 - 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	Contrast use of Software Engineering and associated processes using standard models.
2.	Identify the software functions and associated component to design architectural framework.
3.	Decide the separation of concern and design relevant processes for the required operations.
4.	Prepare test cards to measure project performance accomplishing specified requirements.

Required Knowledge of: Basics of any programming language, software types, functions and steps of software development

Unit – I	**Contact Hours = 8 Hours**
Introduction: Professional software development, Software engineering ethics, Case studies. **Software Processes:** Software Process models: The Waterfall model – A Case study, Incremental development, Reuse-oriented software engineering, Process activities: Software specification, Software design and implementation, Software validation, Coping with Change: Prototyping, Incremental Delivery, Boehm's Spiral Model.	

Unit – II	**Contact Hours = 8 Hours**
Requirements Engineering: Functional and non-functional requirements: Functional requirements. Non-functional requirements, Introduction to Requirements specification. **Agile Software Development:** Agile methods- Plan driven and Agile Development, Introduction to Extreme Programming.	

Unit – III	**Contact Hours = 8 Hours**
Design and Implementation: Object-oriented design using UML: System Context and Interaction, Architectural design, Object Class identification, design Models, Interface Specification, Design Patterns, Implementation issues, Open-Source development.	

Unit – IV	**Contact Hours = 8 Hours**
Software Testing: Development Testing: Unit Testing, Choosing Unit Test Cases, Component Testing, System Testing, Test Driven Development, Release Testing: Requirements Based Testing, Scenario Testing, Performance Testing, User Testing. A Demo of Selenium.	

Unit – V	Contact Hours = 8 Hours
Quality Management: Introduction, Software quality, Software standards: The ISO 9001 standard framework, Reviews, and inspection. **Configuration management:** Introduction to Change management, Version management, System building, Release management.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Software Processes & process flow diagram using online open-source design tool.
2	2	Requirements Engineering: Requirement collection, listing of important functions and analysis. Tools Used for Story card Preparation and estimation of task
3	3	Software Design & Development listing the actors with relevance and listingof use-cases summarizing the purpose. Design sequence diagram any one of the functions identified with all suitable constructs. Draw an activity diagram for any software design tools.
4	3	Software Testing-Unit Testing with example & Prepare software Test Document compare test results. Testing based on system testing, Integration tests & automation using the tool.
5	1	Project work: use case of any Common Software Application listing all the functional & non-functional requirements, Show the suitable process model with justification along with mode of data transaction using ER diagram. Design test cases & prototype model by using FIGMA.

Unit No.	Self-Study Topics
I	Identification of requirements for any common software in use by business domain and the advantages.
II	Classification of functional and non-functional requirements of any software used in business domain. Software Architectural patterns, implementation and uses.
III	Object oriented software and UML: Business use-case Design and Activity diagrams

IV	Software testing ISO 9001 series – Guidelines applicable to software industry
V	Software Quality & Performance: Git-Hub based topics with ref. link: https://github.com/ICTU/quality-time

Books	
	Text Books:
1.	Ian Summerville: Software Engineering, Pearson Education, 9th Edition onwards
	Reference Books:
1.	Roger .S. Pressman: Software Engineering-A Practitioners approach, 8th Edition and above, Tata McGraw Hill
2.	Paul C. Jorgensen: Software Testing Craftsman's Approach, 4th Edition CRC Press, Taylor Francis Group
3.	Rajib Mall, Fundamentals of Software Engineering , 4thEdition onwards PHI Learning Pvt. Ltd.
4.	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009 onwards Resources
	E-resources:
1.	https://nptel.ac.in/courses/106105182
2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3.	**IIT Chennai:** https://onlinedegree.iitm.ac.in/course_pages/BSCCS3001.html

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Define** the professional practice for software development and understand the ethical responsibilities of Software Engineer.	Re	1	1
2.	**Explain** the requirements for associated processes, feasibility and decide the suitable model of software.	Un	2	1, 2
3.	**Choose** software design accumulating information and the functional components for the development.	Ap	2, 3, 5	2, 3
4.	**Apply** the software testing methods.to check the accuracy based on	Ap	3, 4, 5	2, 3

	the analysis of contextual requirement.			
5.	**Analyze** software that matches with industry needs and adapt the changes based on demand for the continuous quality improvement.	An	4	3
6.	**Apply** the learnings inculcated throughout the course and **develop** a course project or present a course seminar.	**Cr**	9, 10, 11, 12	1, 2

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Conduction**	**Lab test**	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion, and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph, and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):

1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer: 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2		✓											✓	✓	
3		✓	✓		✓								✓	✓	
4		✓		✓	✓									✓	✓
5			✓	✓	✓										✓
6									✓	✓	✓	✓	✓	✓	

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Project development	**IT Sector**	Software Engineer
2	Software Design and development		Software Developer

OBJECT ORIENTED PROGRAMMING USING JAVA

Course Code	22IS33	**Course type**	**IPCC**	**Credits L-T-P**	3 - 0 - 1
Hours/week: L-T-P	3 - 0 - 2			**Total credits**	4
Total Contact Hours	L = 40Hrs; T = 0Hrs; P = 20Hrs Total = 60Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	To understand the fundamentals of object-oriented programming and String class in Java.
2.	To demonstrate the object-oriented features such as encapsulation, inheritance and polymorphism to design and develop programs in Java.
3.	To understand exception handling mechanism supported in Java.
4.	To learn to use the data structures to organize data in the program using the collections framework in Java.
5.	To understand the concept of Packages, Interfaces and Lambda expressions in Java.

Required Knowledge of: Procedure Oriented Programming Languages

Unit – I	**Contact Hours = 8 Hours**
OOP Paradigm: The key attributes of object-oriented programming. **Java basics:** The Java language, JDK, arrays, multidimensional arrays, alternative array declaration, assigning array references, using the length member, the for-each loop. **Introducing classes and objects:** Class fundamentals, how objects are created, reference variables and assignment, String class	

Unit – II	**Contact Hours = 8 Hours**
Methods and classes: methods, returning from a method, returning a value, using parameters, constructors, parameterized constructors, the new operator revisited, garbage collection and finalizers, this keyword, controlling access to class members, pass objects to methods, argument passing, returning objects, method overloading.	

Unit – III	**Contact Hours = 8 Hours**
Inheritance: Inheritance basics, member access and inheritance, constructors, and inheritance, using super, multilevel hierarchy, when are constructors executed, superclass reference and subclass objects, method overriding, polymorphism, using abstract classes. **Interfaces:** interface fundamentals, creating, implementing, and using interfaces, implementing multiple interfaces.	

Unit – IV	**Contact Hours = 8 Hours**
Packages: Package fundamentals, packages and member access, importing packages, static import. **Exception handling:** the exception hierarchy, exception handling fundamentals, exception types,	

uncaught exceptions, using try and catch, multiple catch clauses, catching subclass exceptions, nested try, throw, throws, finally, Java's built-in exceptions, creating your own exception subclasses.

Unit –V	**Contact Hours = 8 Hours**
The Java Collections Framework: overview, the collections interfaces, the collections classes, accessing a collection via an Iterator. **Java Lambda Expressions:** Syntax (0 parameter, 1 parameter, multiple parameters), Using Lambda expressions, examples	

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**1**	**1**	**1**	**1**	**1**

List of Experiments

Unit No.	**No. of Experiments**	**Topic(s) related to Experiment**
1	**2**	2-dimensional array.
		String handling.
2	**2**	Class and its member methods.
		Parameterized Methods and Constructors
3	**2**	Inheritance and interfaces.
		Method Overloading and overriding
4	**2**	Packages.
		Customized exception handling.
5	**2**	Collection classes and interfaces.
		Lambda expressions.

Unit No.	**Self-Study Topics**
1	String class

Books	
	Text Books:
1.	Herbert Schildt& Dale Skrien, "Java Fundamentals A Comprehensive Introduction", 7th Edition onwards, Tata McGraw Hill, 2007.
2.	E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

	Reference Books:
1.	Kathy Sierra & Bert Bates, "Head First Java", O'Reilly, 2nd Edition and onwards.
2.	Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
	E-resources:
1.	https://www.w3schools.com/java
2.	https://freecodecamp.org
3.	https://www.tutorialspoint.com/java8
4.	https://www.javatpoint.com

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Identify** classes, objects, members of a class and relationships among them needed for a specific problem.	Un	1,2,3,9,10,12	1,3
2.	**Apply** OOP principles (encapsulation, inheritance, polymorphism etc.) and proper program structure to write application programs.	Ap	1,2,3,5,9,10,12	1,2,3
3.	**Demonstrate** skills in writing programs using exception handling techniques.	Ap	1,2,3,5,9,10,12	1,2,3
4.	**Use** the type hierarchy in the Collections Framework and Lambda expressions.	Ap	1,3,9,10,12	1,3
5.	**Demonstrate** the concept of packages and interfaces.	Ap,An	1,3,9,10,12	1,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	**IA test 2**	**Conduction**	**Lab test**	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion, and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph, and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer: 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)													**CO-PSO Mapping(planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓						✓	✓		✓	✓		✓
2	✓	✓	✓		✓				✓	✓		✓	✓	✓	✓
3	✓	✓	✓		✓				✓	✓		✓	✓	✓	✓
4	✓		✓						✓	✓		✓	✓		✓
5	✓		✓						✓	✓		✓	✓		✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable try Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Good knowledge of OOP concepts	IT Sector	Java Developer / Java Programmer
2	Familiarity with development tools like Eclipse		
3	Familiarity with popular Java EE frameworks		

DATA STRUCTURES AND APPLICATIONS

Course Code	22IS34	Course type	PCC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives	
1.	To learn the fundamentals of data structure and realize their importance in designing variety of applications.
2.	To illustrate the implementation of data structures such as stack, queue and linked list and to apply them for the given problem.
3.	To introduce nonlinear data structures like Binary Tree, Heap and their applications and also to provide insight of advanced searching techniques like Hashing.
4.	To create and use appropriate data structures for solving real life problems.

Pre-requisites: Basic computer concepts & C programming.

Unit – I	Contact Hours = 8 Hours
Pointers, Structures: Introduction to Pointers, Pointers and Arrays, Pointers to Pointers, Pointers to functions. **Introduction to Structures**: Declaration, Initialization, Accessing Structures, Internal implementation of Structures. **Files in C:** Text input output with respect to files in C, Basic file handling functions in C.	

Unit – II	Contact Hours = 8 Hours
Stacks & Queues: **Stacks:** Basic Stack operations, Stack applications: Conversion of Expression (Infix to Postfix), Evaluation of Expressions. **Queues:** Queues, Circular Queues , Queue applications	

Unit – III	Contact Hours = 8 Hours
Linked lists: **General linear lists:** Basic operations, Implementation: circular linked lists, doubly linked lists, implementation of Stack and Queue using linked list.	

Unit – IV	Contact Hours = 8 Hours
Trees and Heaps: Basic tree concepts, Binary trees, Binary search tree (BST) concept, BST operations. **Heap:** Basic concepts, Heap implementation, Heap applications	

Unit – V	Contact Hours = 8 Hours
Hashing **Hashing:** Basic concept, Hashing methods: Division Method, Mid Square Method, Folding Method, Multiplication Method. Collision Resolution Techniques: Separate chaining (open hashing), Open addressing (closed hashing): Linear Probing, Quadratic Probing.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Richard.F.Gilberg, Behrouz.A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, 2nd edition 2007 and onwards
2.	Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2007 and onwards.
	Reference Books:
1.	Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, Pearson Education, 2nd Edition and onwards.
2.	ReemaThareja, Data structures using C, Oxford Higher Education, 1st edition, 2011 onwards
	E-resources
1.	https://nptel.ac.in/courses/106102064/
2.	https://swayam.gov.in/course/1407-programming-and-data-structures
3.	https://www.edx.org/course/data-structures-fundamentals

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)				
Learning Levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create**				
At the end of the course, the student will be able to:		**Learning Level**	**PO(s)**	**PSO (s)**
1.	**Understand** basics of C programming language	**Un**	1	1
2.	**Explain** the fundamental concepts of various data structure	**Un**	2,3	1
3.	**Develop** solutions using different data structures likeStack, Queue, linked List and Tree.	**Ap**	2,3 9, 12	1,3
4.	**Develop** programming skills to solve real life problems using appropriate data structures and build projects	**Ap**	1,3,11,12	1,3

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments (Open/Industry /Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

- Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

- Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
- Lack of minimum score in IA test will make the student Not Eligible for SEE
- Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓												✓		
2		✓	✓										✓		
3		✓	✓						✓			✓	✓		✓
4	✓		✓								✓	✓	✓		✓

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Programming and Problem-solving skills	IT Sector	Software Developer
2		IT Sector, Academics	Researcher
3		IT Sector, Academics	Freelancer

DATA STRUCTURE LAB USING C

Course Code	22ISL39	**Course type**	**PCCL**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20 Hrs Total = 20 Hrs			**CIE Marks**	50
Flipped Classes content	--			**SEE Marks**	50

Course Learning Objectives	
1.	Demonstrate the abstract properties of various data structures such as stacks, queues, lists, and trees.
2.	Compare different implementations of data structures and recognize the advantages and disadvantages of the different implementations
3.	Able to demonstrate features of different data structures such as Linked List, Hash Table, Queues to solve real world problems.

Required Knowledge of: C programming Skills

Lab Experiment – I	**Contact Hours = 2 Hours**
Write a C program to merge contents of two files containing USNs of students in a sorted order in to the third file such that the third file contains Unique USNs. Program should also display common USNs in both the files.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Consider a calculator that needs to perform checking the correctness of parenthesized arithmetic expression and convert the same to postfix expression for evaluation. Develop and execute a program in C using suitable data structures to perform the same and print both the expressions. The input expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and /(divide)	
Lab Experiment – 3	**Contact Hours = 2 Hours**
A calculator needs to evaluate a postfix expression. Develop and execute a program in C using a suitable data structure to evaluate a valid postfix expression. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Write a C program to simulate the working of Messaging System in which a message is placed in a Queue by a Message Sender, a message is removed from the queue by a Message Receiver, which can also display the contents of the Queue.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Consider a super market scenario where sales manager wants to search for the customer details using a customer-id. Customer information like (custid, custname, & custphno) arestored as a structure, and custid will be used as hash key. Develop and execute a program in C using suitable data structures to implement the following operations:	

a. Insertion of a new data entry.
b. Search for customer information using custid.
c. Display the records. (Demonstrate collision and its handling using linear probing method).

Lab Experiment – 6	**Contact Hours = 2 Hours**

Consider a warehouse where the items have to be arranged in an ascending order. Developand execute a program in C using suitable data structures to implement warehouse such that items can be traced easily.

Lab Experiment – 7	**Contact Hours = 2 Hours**

Consider a polynomial addition for two polynomials. Develop and execute a program in C using suitable data structures to implement the same.

Lab Experiment – 8	**Contact Hours = 2 Hours**

Develop and execute a program in C to perform following operations on binary search tree:

a. To count number of non-terminal nodes.
b. To count number of terminal nodes.
c. To count nodes with degree 2.
d. To count total number of nodes.

Lab Experiment – 9	**Contact Hours = 2 Hours**

Develop and execute a program in C using suitable data structures to create a binary tree for an expression. The tree traversals in some proper method should result in conversion of original expression into prefix, infix and postfix forms. Display the original expression along with the three different forms also.

Lab Experiment – 10	**Contact Hours = 2 Hours**

Develop and execute a program in C using suitable data structures to perform Searching a data item in an ordered list of items in both directions and implement the following operations:

a. Create a doubly linked list by adding each node at the start.
b. Insert a new node at the end of the list.
c. Display the content of a list.

Consider an integer number as a data item.

Books	
	Text Books:
1.	Richard.F.Gilberg, Behrouz.A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, 2nd edition 2007 and onwards
2.	Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2007 and onwards.
	E-resources
1.	https://nptel.ac.in/courses/106102064/
2.	https://swayam.gov.in/course/1407-programming-and-data-structures

3.	https://www.edx.org/course/data-structures-fundamentals

Course delivery methods		Assessment methods	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
		4.	Lab Test
		5.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Demonstrate** the understanding of structured programming.	**Ap**	1, 2	1
2.	**Analyze** the problem statement and able to choose right data structure for implementation.	**An**	3, 4	1
3.	**Develop** an ability to construct robust, maintainable programs which satisfy the requirements of user.	**Ap**	3, 4, 5	1, 2
4.	**Apply** the learnings inculcated throughout the course and develop a course project	**Cr**	9, 10, 11, 12	3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments & viva-voce	Journal	Lab project/ Open ended experiment	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks = 20 marks
2. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks
3. Lab project/ Open ended experiment: 10 marks
3. Lab Test: 15 marks

Eligibility for SEE:

1. 40% and above (20 marks and above)

2. Lab test is COMPULSORY

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	

	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓											✓		
2			✓	✓									✓		
3			✓	✓	✓								✓	✓	
4									✓	✓	✓	✓			✓

OBJECT ORIENTED PROGRAMMING USING C++

Course Code	22IS351	**Course type**	**ESC**	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2 - 0 – 2 **(Project based)**			**Total credits**	03
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hrs			**SEE Marks**	100

Course Learning Objectives	
1.	To introduce the basic concepts of Object-Oriented Programming.
2.	To Analyze the problem statement and build object-oriented system model.
3.	To Explain function overloading, operator overloading and virtual functions.
4.	To Solve the problem with object-oriented approach.

Required Knowledge of: Any Programming Language

Unit – I: Beginning with C++ and its features	**Contact Hours = 8 Hours**
What is C++? Applications and structure of C++ program, Different Data types, Variables, Different Operators, expressions, operator overloading.	

Unit – II: Functions, classes, and Objects	**Contact Hours = 8 Hours**
Functions, Inline function, function overloading, friend and virtual functions, Specifying a class, C++ program with a class, memory allocation to objects.	

Unit – III: Constructors, Destructors and Operator overloading	**Contact Hours = 8 Hours**
Constructors, Multiple constructors in a class,Copy constructor, Dynamic constructor, Destructors.	

Unit – IV: Inheritance, Pointers, Virtual Functions, Polymorphism	**Contact Hours = 8 Hours**
Derived Classes, Single, multilevel, multiple inheritance, Pointers to objects and derived classes, this pointer, Virtual.	

Unit – V: Streams and working with files:	**Contact Hours = 8 Hours**
C++ streams and stream classes, Unformatted I/O operations, managing output with manipulators, Classes for file stream operations, opening and closing a file,	

Flipped Classroom Details:

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**1**	**1**	**1**	**1**	**1**

Unit No.	Self-Study Topics
1	Control structures in C++
2	Array of objects.
3	Overloading Unary and binary operators
4	Pure virtual functions
5	Detecting EOF

List of experiments:

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
II	5	1. Program on class and object
		2. Program illustrating use of reference type in C++
		3. Program on function overloading
		4. Program on dynamic memory management in C++
		5. Program on array of objects
III	2	6. Program on constructors and destructors
		7. Program on operator overloading
IV	2	8. Program on inheritance
		9. Program on virtual function and pure virtual functions
V	1	10. Program on file streams

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	E. Balagurusamy, " Object Oriented Programming with C++", Tata McGraw Hill, 6th edition onwards.
	Reference Books:
1.	Robert Lafore, "Object Oriented Programming using C++", Programming in C, Galgotia publication 2010 onwards
	E-resources:
1.	https://nptel.ac.in/noc/individual_course.php?id=noc18-cs32
2.	https://www.edx.org/course/object-oriented-programming-2

Course delivery methods		Assessment methods	
1.	Chalk & Talk	1.	IA test
2.	I A Test	2.	Journal writing
3.	Mini Project	3.	Lab project/ Open ended experiment
4.	Periodic Journal Evaluation	4.	Lab Test
5.	Practice session/Demonstrations in Labs	5.	Semester End Examination

Course Outcome (COs) Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the salient features of C++ Programming Language.	**Un**	**1, 2,3**	**1**
2.	**Apply** the concept of encapsulation to implement data hiding.	**Ap**	**1,2,3, 5**	**1,2**
3.	**Apply** the concept of object instantiation and operator overloading.	**Ap**	**1,2,3, 5**	**1,2**
4.	**Apply** the concept of static and dynamic polymorphism and streams for file handling. to solve real world problems.	**Ap**	**1,2,3, 5**	**1,2**
5.	**Apply** the learning inculcated throughout the course by developing the course project or by presenting a course seminar	**Cr**	**1,2,3,5,9,10,11,12**	**1,2,3**

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (40 marks)		**PROJECT (60 marks)**			**Total**
IA test (Theory)	**IA test (Lab)**	**Project Phase 1**	**Project Phase 2**	**Project report**	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks

-Theory IA test should be of one-hour duration.
-Lab IA test should be of two/three-hour duration.
-Project batch will ideally consist of 2 students (maximum of 3).
-Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester.
-Submission of Project report is compulsory.

Eligibility for SEE:
1. 40% and above (16 marks and above) in theory component
2. 40% and above (24 marks and above) in project component
3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 3 hours duration.		
2.	**Lab Open ended program/problem/experiment** Write-up & execution (1 open ended expt)- (20 marks write-up + 20 marks algorithm/flowchart + 10 marks execution)	50 marks	100 marks
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome b. Hardware project: Exhibiting and demonstration of working of project.	10 marks 30 marks	

	Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project. c. Viva-voce	10 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓										✓		
2	✓	✓	✓		✓								✓	✓	
3	✓	✓	✓		✓								✓	✓	
4	✓	✓	✓		✓								✓	✓	
5	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Well verse with Object Oriented Programming and Concepts	IT Sector Application Domain	Software Engineer

WEB PROGRAMMING – A PRACTICAL APPROACH

Course Code	22IS352	**Course type**	ESC	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2- 0 – 2 **(Project Based)**			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	To learn the basics of web development and develop basic web applications using HTML5, CSS3 and JavaScript
2.	To develop advanced web applications using Tailwind and JavaScript frameworks
3.	To understand and implement the concepts of responsive design and retina ready websites
4.	To deploy applications on AWS and generate static websites
5.	To understand the working of web APIs and use them in building web applications

Prerequisites: Basic Programming knowledge and basics of computer science

Unit – I	**Contact Hours = 8 Hours**

HTML and AWS

Writing HTML code using Header Tags, Paragraphs, Ordered and Unordered lists, Forms, Links and Tables, Iframes and Images, Text Formatting, Image Maps, Creating an Amazon Web Services ,AWS) account and how to deploy a static website to AWS Simple Storage Service ,S3 Working Encoding URL, Introduction to XHTML, Using HTML5 introduced features, Handling of multiple file upload using multiple attribute, HTML5 Local Storage, HTML5 form validate /novalidate,HTML5 canvas, embedding audio and video in a webpage, Drag and drop, HTML5 web workers and server sent events

Introduction to Figma, Working with UI- Design , Components , Mobile App design

Unit – II	**Contact Hours = 8 Hours**

CSS3

Styling of HTML elements-text; Links, lists and tables; Different ways to write CSS e.g. external, internal, inline; Creating Navigation Bars; Writing Media Rules; Hide visibility of an element; CSS Image Sprites and Gradients; CSS Pseudo Classes and Pseudo Elements

CSS3 Text Effects using different text fonts; Creating 2D and 3D transformations; Applying animations and transitions to HTML elements; CSS3 resize UI and multiple columns feature

Unit – III	**Contact Hours = 8 Hours**

Tailwind CSS and JavaScript

What is Tailwind CSS? advantages of tailwind CSS, comparison of tailwind CSS and bootstrap, getting started with tailwind, colors, element sizing, flexbox and grid, padding and margins, styling text, typography, borders and shadows.

Java Script datatypes; Variables and arrays; Creating loops and writing if-else decision-making statements; Defining and calling JavaScript functions on events; Manipulating DOM elements

Unit – IV	Contact Hours = 8 Hours
Twitter Bootstrap Getting started with Twitter Bootstrap 3; Bootstrap features like fixed drop-down menu; Carousel,text and image grids; Custom Thumbnails; Bootstrap modal; Using Font Awesome Icons; Building a real-world website using Twitter; Bootstrap 3 features like bootstrap fixed dropdown menu; Carousel; Bootstrap modal; Font awesome icons; custom Thumbnails; Text and Imagegrids; Accordions; Signin/Signup form and Jumbotron	

Unit – V	Contact Hours = 8 Hours
Web APIs, Ajax Bootstrap ScrollSpy AJAX XML; Http Request object; Making an AJAX call and retrieving the response; Working with Google APIs Adding social plugins on your web page provided by LinkedIn,Facebook, Quora and Twitter, Web APIs, Introduction to CI/CD, Using git- commands and concepts, hosting a static website on GitHub Pages	

List of Experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	Figma, HTML5, and AWS
2	2	CSS transformations, UI and multi column features
3	2	Tailwind and JavaScript
4	2	Twitter Bootstrap, Jumbotron
5	2	Git and AJAX

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Robert Sebesta, Programming the World wide web, 6th Edition
2.	Jennifer Robbins, Learning Web Design, 5th Edtion, 2018
3.	Noel Rappin, Modern CSS with Tailwind: flexible styling without the fuss, programmatic bookshelf, 2021
	Reference Books:
1.	DarioCalonaci, Designing user interfaces, BB publications, 2021
2.	David Cochran, Twitter Bootstrap Web development-How to, packt publishing, 2012
	E-resources:
1.	Responsive Web Design https://www.freecodecamp.org/learn/2022/responsive-web-design/
2.	Front End Development Libraries https://www.freecodecamp.org/learn/front-end-development-libraries

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Enquiry Based Learning		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr – Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Explain** the basic concepts of frontend web development using HTML5, CSS3 and other libraries	Un	1	1
2.	**Understand** the real world problem and **Create** a wireframe model of the application	Cr	1, 3, 5, 9 , 10, 12	1,2,3
3.	**Demonstrate** the use of concepts learnt and integrate them to build real world applications	Ap	1, 3, 5, 9 , 10, 12	1,2,3
4.	**Develop** and Deploy the application on hosting services	Ap	5	2

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test (Theory)	**IA test (Lab)**	**Project Phase 1**	**Project Phase 2**	**Project report**	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks

-Theory IA test should be of one-hour duration.

-Lab IA test should be of two/three-hour duration.

-Project batch will ideally consist of 2 students (maximum of 3).

-Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester.

-Submission of Project report is compulsory.

Eligibility for SEE:

1. 40% and above (16 marks and above) in theory component
2. 40% and above (24 marks and above) in project component
3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 3 hours duration.		
2.	**Lab Open ended program/problem/experiment** Write-up & execution (1 open ended expt)- (20 marks write-up + 20 marks algorithm/flowchart + 10 marks execution)	50 marks	100 marks
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome b. Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project. c. Viva-voce	10 marks 30 marks 10 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓		✓				✓	✓		✓	✓		
2	✓		✓		✓				✓	✓		✓	✓	✓	✓
3	✓		✓		✓				✓	✓		✓	✓	✓	✓
4	✓		✓		✓				✓	✓		✓		✓	

Sl No	Skill & competence enhanced afterundergoing the course	Applicable Industry Sectors& domains	Job roles students can take up after undergoing the course
1	Website Development	IT Sector	Web Developer
2	Ajax programmer		Developer

DIGITAL ELECTRONICS

Course Code	**22IS353**	**Course type**	**ESC**	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2 - 0 – 2 **(Project Based)**			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	Understand the basics of Digital Electronics.
2.	Comprehend the knowledge of digital circuits to construct combinational and sequential sub-systems useful for digital system designs.
3.	Implement digital circuits for a particular application using simulation and Virtual Lab platform.
4.	Analyse digital circuits and systems to model using Verilog HDL.

Pre-requisites: Basic Electronics

Unit – I	**Contact Hours = 8 Hours**
Introduction: Revision of Logic gates and Boolean algebra, Simplification of Boolean functions using Basic Logic gates, Universal Gates, SOP, POS form, K-Map Simplification (up to 4 variables), Don't-care Condition.	

Unit – II	**Contact Hours = 8 Hours**
Data Processing Circuits: Multiplexers, De-multiplexers, Decoder, Encoders and implementation of Boolean functions using multiplexer and Decoders, Magnitude Comparators (1 bit and 2 bit).	

Unit – III	**Contact Hours = 8 Hours**
Clocks and Flip Flops: Clock waveforms, TTL clock, RS Flip Flops, Gated flip-flops, Edge triggered RSFlip-Flops, Edge triggered D Flip-Flops, and Edge triggered JK Flip-Flops, JK master slave Flip Flops, various representations of Flip Flops.	

Unit – IV	**Contact Hours = 8 Hours**
Analysis of Sequential Circuits: Conversion of flip flops: A synthesis example, Types of ShiftRegister, SISO, SIPO, PISO and PIPO, Applications of Shift Registers as Ring Counter, Johnson Counter, Serial Adder. **Counters:** Asynchronous counters (4 bit), Synchronous Counters (4 bit), changing the counter Modulus.	

Unit – V	**Contact Hours = 8 Hours**
Introduction to HDL: Types of Model, Syntax for Data Flow model	

Flipped Classroom details:

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**1**	**1**	**1**	**1**	**1**

List of experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
	2	Construction of half and full adder using XOR and NAND gates and verification of its operation.
	3	Realization of logic functions with the help of Universal Gates (NAND, NOR).
	4	Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
2	5	To Study and Verify Half and Full Subtractor.
	6	Implementation and verification of decoder or de-multiplexer and encoder using logic gates.
	7	Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
	8	Verify the truth table of one bit and two bit comparator using logic gates.
3	9	Construction of a NOR gate latch and verification of its operation.
	10	Verify the truth table of RS, JK, T and D flip-flops using NAND and NOR gates.
4	11	Design and Verify the 4-Bit Serial In - Parallel Out Shift Registers.
	12	Design and verify the 4- Bit Synchronous or Asynchronous Counter using JK Flip Flop.
5	13	Develop HDL (Verilog) code to implement simple SOP equation.
	14	Develop HDL (Verilog) code to implement Multiplexer.
	15	Develop HDL (Verilog) code to implement Adder.

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Donald P Leach, Albert Paul Malvino and Goutam Saha: Digital Principles and Applications, 7th Edition and onwards, Tata McGraw Hill, 2011.
	Reference Books:
1.	Donald Givone: Digital Principles and Design, Palgrave Macmillan, 2003 and onwards.
2.	R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2012 and onwards.

3.	Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007 and onwards.
	E-resources:
1.	**https://nptel.ac.in/courses/117106086/**

Course delivery methods		**Assessment methods**	
1.	Chalk & Talk	1.	IA test
2.	IA Test	2.	Journal writing
3.	Mini Project	3.	Lab project/ Open ended experiment
4.	Periodic Journal Evaluation	4.	Lab Test
5.	Practice session/Demonstrations in Labs	5.	Semester End Examination

Course Outcome (COs)

Learning Levels:
Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1	**Apply** the knowledge of Digital Electronics to design digital systems.	**Ap**	1,2,3,5	1,2
2	**Design** Combinational and Sequential Circuits for digital systems.	**Ap**	1,2,3,5	1,2
3	**Utilize** the simulation tool/ Virtual Lab platform to implement the digital circuits.	**Ap**	1,2,3,5	1,2
4	**Analyse** the digital circuits developed using HDL Verilog.	**An**	1,2,3,5	1,2
5	**Apply** the learnings inculcated throughout the course and develop a course project.	**An**	1,2,3,5, 9,10,11,12	1,2,3

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓		✓								✓	✓	
2	✓	✓	✓		✓								✓	✓	
3	✓	✓	✓		✓								✓	✓	
4	✓	✓	✓		✓								✓	✓	
5	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Digital Circuit Design, Logic Design and Analysis	Electronics Industry	Digital Circuit Designer
2	Digital System Simulation	Semiconductor Industry	FPGA Engineer
3	Microcontrollers and Embedded Systems	Embedded Systems	Embedded Systems Engineer

Python Programming – A practical approach

Course Code	**22IS354**	**Course type**	**ESC**	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2 - 0 – 2 **(Project based)**			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	Gain knowledge about basic Python language syntax and semantics to write Python programs using the procedure oriented programming paradigm.
2.	Appreciate the usage of high level data constructs provided by Python and work with file and exception handling mechanisms.
3.	Write Python applications using the object-oriented programming paradigm.
4.	Become acquainted with the development of database and GUI applications and usage of various packages.

Prerequisites: Procedure Oriented and Object Oriented Programming Languages

Unit – I	**Contact Hours = 8 Hours**
Python Fundamentals: **An Introduction to Python programming:** Introduction to Python, IDLE to develop programs **How to write your first programs:** Basic coding skills, data types and variables, numeric data, stringdata, five of the Python functions **Control statements:** Boolean expressions, selection structure, iteration structure	

Unit – II	**Contact Hours = 8 Hours**
Define and use Functions and Modules: define and use functions, more skills for defining and using functions and modules, create and use modules, standard modules **Higher Data Constructs:** **Lists and tuples:** Basic skills for working with lists, list of lists, more skills for working with lists, tuples **Dictionaries:** get started with dictionaries, more skills for working with dictionaries	

Unit – III	**Contact Hours = 8 Hours**
Files, Exception Handling, Database Programming **File I/O:** An introduction to file I/O, text files, CSV files, binary files **Exception Handling:** handle a single exception, handle multiple exceptions **Work with a database:** An introduction to relational databases, SQL statements for datamanipulation, SQLite Manager to work with a database, use Python to work with a database	

Unit – IV	Contact Hours = 8 Hours
Object Oriented Programming: **Define and use your own classes:** An introduction to classes and objects, define a class, object composition, encapsulation **Inheritance:** Inheritance, override object methods	

Unit – V	Contact Hours = 8 Hours
Packages: **How to build a GUI Program:** Create a GUI that handles an event **Numpy Basics:** Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes **Getting started with Pandas:** Introduction to Pandas Data Structures, Summarizing and Computing Descriptive Statistics, Handling missing data	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	2	Functions and lists
		Functions and dictionaries
3	2	File I/O and exception handling mechanisms
		Implement a Python program to work with a database
4	2	Object composition and encapsulation
		Inheritance and polymorphism
5	2	GUI application
		NumPy and Pandas packages

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2.	Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012
	Reference Books:
1.	SciPy and NumPy, O`Reilly, 1st Edition, 2012

2.	Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
	E-resources:
1.	The joy of computing using python - https://onlinecourses.nptel.ac.in/noc21_cs32/preview
2.	Programming in python- https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Enquiry Based Learning		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Illustrate** basic principles of Python programming and **Demonstrate** programs using the procedure-oriented programming paradigm.	**Ap**	1,3,5	1
2.	**Develop** Python programs for file operations, exception handling, GUI, database operations and **Make use of** different packages for computing and manipulation.	**Ap**	1,3,5	1,2
3.	**Explain** the concepts of object-oriented programming paradigm and **Apply** the same to develop programs.	**Ap**	1,3,5	1,2
4.	**Apply** the learnings inculcated throughout the course by developing a course project.	**Ap**	1,2,3,5, 9,10,11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (40 marks)		**PROJECT (60 marks)**			**Total**
IA test (Theory)	**IA test (Lab)**	**Project Phase 1**	**Project Phase 2**	**Project report**	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks

-Theory IA test should be of one-hour duration.

-Lab IA test should be of two/three-hour duration.

-Project batch will ideally consist of 2 students (maximum of 3).

-Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester.

-Submission of Project report is compulsory.

Eligibility for SEE:

1. 40% and above (16 marks and above) in theory component
2. 40% and above (24 marks and above) in project component
3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 3 hours duration.		
2.	Lab Open ended program/problem/experiment Write-up & execution (1 open ended expt)- (20 marks write-up + 20 marks algorithm/flowchart + 10 marks execution)	50 marks	100 marks
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome b. Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project. c. Viva-voce	10 marks 30 marks 10 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓		✓								✓		
2	✓		✓		✓								✓	✓	
3	✓		✓		✓								✓	✓	
4	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	**Skill & competence enhanced afterundergoing the course**	**Applicable Industry Sectors& domains**	**Job roles students can take up after undergoing the course**
1	Procedure Oriented Programming Using Python	Healthcare, Finance, Retail, Agriculture, Manufacturing Networks, Security, Big Data etc,	Python Developer, Software Developer, Data and Research Analyst, Senior Backend / Software Developer Python, Big Data Developer Python Framework Developer – AI Developer, etc.
2	Object Oriented Programming using Python		
3	Use of various packages		

SOCIAL CONNECT AND RESPONSIBILITY

Course Code	22IS36	**Course type**	**UHV**	**Credits L-T-P**	0-0-1
Hours/week: L - T- P	0-0-2			**Total credits**	1
Total Contact Hours	16 Hours			**CIE Marks**	100
Flipped Classes content	--			**SEE Marks**	--

Course Learning Objectives	
1.	Bridging the gap between theory and practice through community engagement
2.	Interaction with the community for identification and solution to real life problems faced by the community
3.	Catalyzing acquisition of values and responsibilities for public service to make better citizens

Required Knowledge of: Interpersonal skills, Communication skills

Activities to be planned and conducted by the Department Associations are:

1. **Linking learning with the community through Knowledge Sharing**: In this the students can apply their knowledge and skills to improve the lives of the people. The knowledge available with the students can be shared to the school students of the local community. It can be inthe form of engaging the classes, developing projects which can used by the students and teachers, training sessions on MS word, Excel, PPT for students and teachers etc.
2. **Creating Awareness about health and hygiene:** The students can arrange talks on Importance of cleanliness, health, and hygiene by taking help of Doctors, Public HealthOrganizations, NGOs etc.
3. **Including the Practitioners as teachers:** Arrange the invited talks by experts in agriculture for the farmers in the local community to create awareness about Organic farming, new methods of agriculture such as hydroponics, vertical farming etc.
4. **Environmental Sustainability:** Students can take initiatives to educate the local community regarding protecting our environment through tree plantations, preserving water bodies etc.
5. **Social Innovations for Rural development**

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Gain knowledge about the culture and societal realities	Un	6,9	
2.	Develop sense of responsibility and bond with the local community	Un	6,9	

3.	Make significant contributions to the local community and the Society at large	Ap	6,9	
4	Identify opportunities for contribution to the Socio-economic development	Ev	6,9	

Scheme of Continuous Internal Evaluation (CIE):

• Students must maintain the diary of the activities conducted. • The activities can be conducted in groups/batches. • Faculty members can design the evaluation system wherein weightage can be given to presentation of activities conducted & report writing.	50 marks

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						✓			✓						
2						✓			✓						
3						✓			✓						
4						✓			✓						

HEARTFULNESS ENABLED LEADERSHIP MASTER

Course Code	22AECIS371	**Course type**	**AEC**	**Credits L-T-P**	0 - 0- 1
Hours/week: L-T-P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1	To understand the self-core strength and improve decision making skills
2	To get acquainted with key life skills like positive habits, stress management and time management

Required Knowledge of: NIL

Unit – I	**Contact Hours = 5 Hours**
Start Up Connect, Core, Context, Choices, Causality, Community, Intrusion and trust building, self-awareness,Global citizenship, Decision making, creative thinking	

Unit – II	**Contact Hours = 5 Hours**
Discover –1 Heartfulness Enabled Leadership Mastery – An overview, Discovering oneself, Healthy Lifestyle Time Management - 1: Principles of Time, Time Management - 2: Focus, Befriending Stress, PeakPerformance, Situational Awareness, Heartful Conversations, Heartful Relationships, Review of Discover I	

Unit – III	**Contact Hours = 5 Hours**
Discover – 2 Silence is the Language of the Heart, The Science Behind Meditation: Habits and Change, The Art Behind Meditation: Observing and Diary Writing, The Heart Behind Meditation: Experience and Evolution, Live Light, Live Right, The Power of Pause, Designing your Destiny 1, Designing your Destiny2, Practice! Experience!, Review of Discover II	

Books	
	Text Books:
1	Designing destiny, Kamlesh Patel, Heartfulness Organization

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)				
Learning levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand their self-core awareness and improve their critical thinking ability	Un, Ap, An	6,8,9	1
2.	Apply the skills of time management ans stress management in the real time situations	Un, AP	6,8,9,10, 12	1

Scheme of Continuous Internal Evaluation (CIE):				
Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks
Conduct of Lab: 1. Conduction of the experiment: 15 marks + Viva voce: 5 marks 2. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks 3. Lab project/ Open ended expt: 10 marks **Lab Test:** 15 marks				
Eligibility for SEE: 1. 40% and above (20 marks and above) 2. Lab test is COMPULSORY				

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1						✓		✓	✓				✓		
2						✓		✓	✓	✓		✓	✓		

MICROSOFT OFFICE ESSENTIALS

Course Code	22AECIS372	**Course type**	**AEC**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1.	To understand the essentials of Microsoft office for effective report writing, presentations and data handling

Required Knowledge of: Basics of Computers

Unit – I	**Contact Hours = 5 Hours**

MS Word –

- MS Word interface
- Working with styles for professional looking documents
- Create Headers and Footers and numbered pages
- Create and control columns
- Insert illustrations, pictures, charts, icons, shapes, Smartart, and 3D graphics
- Create tables to organize text
- Create standardized and consistent styling
- Create numbered and bulleted lists
- Working with Mail Merge
- Creating styles
- Inserting Table of Contents
- Inserting captions, Table of figures,
- Working with Citation and Bibliography

Unit – II	**Contact Hours = 5 Hours**

MS Power Point-

- Master the Basic Features of PowerPoint
- Build Effective PowerPoint Presentations
- Enhance PowerPoint Presentations with Graphical Elements
- Levarage Advanced Text Editing Operations with PowerPoint
- Prepare to Deliver a PowerPoint Presentation

Unit – III	**Contact Hours = 5 Hours**

MS Excel –

- Working with controls in Excel and how to perform basic data entry with Excel spreadsheets
- Performing calculations using functions
- Find data with Filter and Sort
- Retrieve and change data using Find and Replace
- Using Conditional Formatting to highlight specific data
- Creating various charts

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	MS word – report and journal paper writing
2	1	MS Power point- Effective power point presentations
3	1	MS Excel- Data handling

Unit No.	Self-Study Topics
1	Shortcuts used to handle MS Word
2	Shortcuts used to handle MS Power Point
3	Shortcuts used to handle MS Excel

Books	
	Text Books:
1.	Online materials
2.	
3.	
4.	
	Reference Books:
1.	Online materials
2.	
	E-resources:
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	To create an effective project reports and journal papers	Ap	1,5,6,10,12	1,2,3
2.	To create an effective presentation for various purposes	Ap	1,5,6,10,12	1,2,3
3.	To handle and visualize the data effectively	Ap	1,2,5,6,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):				
Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks
Conduct of Lab: 4. Conduction of the experiment: 15 marks + Viva voce: 5 marks 5. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks 6. Lab project/ Open ended expt: 10 marks **Lab Test:** 15 marks				
Eligibility for SEE: 1. 40% and above (20 marks and above) 2. Lab test is COMPULSORY				

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓				✓	✓				✓		✓	✓	✓	✓
2	✓				✓	✓				✓		✓	✓	✓	✓
3	✓	✓			✓	✓				✓		✓	✓	✓	✓

COMPUTER AND NETWORK MAINTENANCE

Course Code	22AECIS373	**Course type**	**AEC**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 – 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1.	To understand the working of computer with respect to installations of OS and software.
2.	To handle and troubleshoot various hardware devices, network components and printers

Required Knowledge of : Nil

Unit – I	**Contact Hours = 5 Hours**
Introduction to Computer Hardware Components, Assembling and Disassembling, Installation of OS, Virtual OS installation, Understanding BIOS, Understanding DLL, API, Installation and Removal of Software, Partitioning the HDD.	

Unit – II	**Contact Hours = 5 Hours**
Troubleshooting Hardware Devices, Introduction to Various types of Computer Network Devices, Handling the Network Devices, Implementing of LAN and Sharing, Troubleshooting the network	

Unit – III	**Contact Hours = 5 Hours**
Configuring Internet, Understanding Client server Protocols, Installation and troubleshooting of Printers and Network Printers	

List of Experiments

Unit No.	**No. of Experiments**	**Topic(s) related to Experiment**
1	**2**	Assembling and Disassembling, Installation of OS, Virtual OS installation, Understanding BIOS, Partitioning
2	**2**	Handling the Network Devices, Implementing of LAN and Sharing, Troubleshooting the network
3	**2**	Configuring Internet, Installation and troubleshooting of Printers and Network Printers

Unit No.	**Self-Study Topics**
1	**Exploring Linux OS**

Books	
	Text Books:
1.	Online materials
2.	
3.	
4.	
	Reference Books:
1.	Online materials
2.	
	E-resources:
1.	
2.	

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	To Assemble the Computer system, install the OS and troubleshoot the hardware devices.	Ap	6,7,9,12	3
2.	To understand the network components, LAN and Internet	Re,Un	6,7,9,12	3
3.	To install and troubleshoot the printers	Ap	6,7,9,12	3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks
3. Lab project/ Open ended expt: 10 marks

Lab Test: 15 marks

Eligibility for SEE:

1. 40% and above (20 marks and above)
2. Lab test is COMPULSORY

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						✓	✓		✓			✓			✓
2						✓	✓		✓			✓			✓
3						✓	✓		✓			✓			✓

MATHEMATICS I

Course Code	22AECIS374	Course type	AEC	Credits L-T-P	1-0-0
Hours/week: L-T-P	1-0-0			Total credits	1
Total Contact Hours	L = 20 Hrs; T = 0 Hrs; P = 0 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	05 Hours			SEE Marks	50

Course learning objectives	
1.	Review basic differentiation and Integration
1.	Get acquainted with different applications of Calculus.
2.	Understand modular arithmetic.
5.	Get familiar with various topics in Linear Algebra.

Required Knowledge of: Basic Trigonometry, Calculus, Algebra

Unit– I: Basic Differentiation, Integration	Contact Hours =5 Hours
Rate of change, increasing/decreasing functions, tangents and normals, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).Integration of a variety of functions by substitution, by partial fractions and by parts, Basic properties of definite integrals and evaluation of definite integrals.	

Unit–II: Calculus	Contact Hours =5 Hours
Series expansion of functions (Taylor's and Maclaurin's series) Polar Curves, angle between radius vector and tangent, angle between polar curves,.	

Unit – III: Modular Arithmetic	Contact Hours =5 Hours
Introduction to congruence's, Linear Congruence's, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruence's, Euler's Theorem, Wilson Theorem and Fermat's little theorem (only statements) .	

Unit– IV: Linear Algebra I	Contact Hours =5 Hours
Rank of a matrix by elementary transformation, consistency of system of linear equations-Gauss Jordan method and Gauss-Seidal method. Eigen value and Eigen vectors – Rayleigh's Power method.	

Flipped Classroom Details

Unit No.	I	II	III	IV
No. for Flipped Classroom Sessions	1	1	1	2

Books	
	Text Books:
1.	B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
2.	Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006.
3.	B. V.Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.
	Reference Books:
1.	Peter V. O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011.
2	Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010.

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session /Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create.

At the end of the course, the student will be able to:		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Review** basics of Differentiation and Integration	L1	1	1
2.	**Review** basic concepts of Calculus.	L1	1	1
3.	**Understand** modular arithmetic	L2	1	1
4.	**Understand** basic Linear Algebra**.**	L1	1	1

CO-PO Mapping(planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	**√**												**√**		
2	**√**												**√**		
3	**√**												**√**		
4	**√**												**√**		

Scheme of Continuous Internal Evaluation (CIE): Theory course (Non-Integrated)		
Components	**Addition of CIE components**	**Total Marks**
Written Test	**30**	**50**
Two Quizzes	**20**	
Scheme of Semester End Examination (SEE): Theory course (Non-Integrated)		
Components	**Total Marks**	
Written exams	**50**	

OPERATING SYSTEMS

Course Code	22IS41	Course type	PCC	Credits L-T-P	3 – 0 - 0
Hours/week: L - T- P	3 – 0 – 0			Total credits	3
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives	
1.	To introduce the functions of an operating system, design, structure, and associated system calls
2.	To study and analyze various scheduling algorithms and process synchronization techniques
3.	To develop an understanding of deadlocks and deadlock recovery techniques.
4.	To discuss and realize the importance of memory management techniques.
5.	To gain knowledge of file systems and secondary storage structures.

Pre-requisites: Basic knowledge of computer concepts & programming, Computer Organization.

Unit – I	Contact Hours = 8 Hours
Introduction to Operating System: System structures: What operating systems do; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Operating System Services; System calls; Operating System structure; System boot. **Introduction to UNIX File System:** Inside UNIX, Internal and External Commands, Command structure. **Case Study:** Android Operating System / iOS	
Unit – II	**Contact Hours = 8 Hours**
Process Management: Process concept; Process scheduling; Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms. **The Process:** Understanding the process, How a process is created, the login shell, init, internal and external commands, ps. **Case Study: OSSim Simulation Tool**	
Unit – III	**Contact Hours = 8 Hours**
Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Semaphores, Classical problems of synchronization: The Dining-Philosophers Problem. **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	

Unit – IV	Contact Hours = 8 Hours
Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement;	

Unit – V	Contact Hours = 8 Hours
File System: File System: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Protection. **The File System:** The parent child relationship, The UNIX file system, Absolute Pathnames, Relative Pathnames, pwd, cd, mkdir, rmdir, cp, rm, mv, cat. File Attributes: ls, ls-l, ls-d, file permissions, chmod.	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

Books	
	Text Books:
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Principles”, Wiley India, 6th edition and onwards.
2.	Sumitabha Das: “YOUR UNIX – The Ultimate Guide” , Tata McGraw Hill, 23rd reprint , 2012 and onwards.
	Reference Books:
1.	Gary Nutt, “Operating System”, Pearson Education, 2nd edition and above.
2.	Harvey M Deital, “Operating system”, Addison Wesley, 2nd edition and above.
3.	D.M Dhamdhere, “Operating System”, “A concept based Approach”, Tata McGraw- Hill, 2nd edition and onwards
4.	Behrouz A. Forouzan and Richard F. Gilberg: “UNIX and Shell Programming “, Cengage Learning, 2005 and onwards.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/ Tentative Course List (July - Dec 2023) - Google Drive
2.	https://www.coursera.org/specializations/codio-introduction-operating-systems
3.	Lectures on Operating Systems (iitb.ac.in)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

Learning Levels:
Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to:		Learning Level	PO(s)	PSO(s)
1.	**Explain** the computer system resources and the role of an operating system in managing those resources	**Un**	1	1
2.	**Develop** applications keeping concurrency and synchronization, semaphores, Monitors shared memory, mutual exclusion, and process scheduling services of general operating systems and do the case study on OSSim Simulation Tool.	**Ap**	1,2,5	1,2
3.	**Describe** and **analyze** memory management, file management, and secondary Memory Management techniques.	**Ap**	2,5	1,2
4.	**Discuss** UNIX shell commands for file handling, process control and do the case study on Android Operating System / iOS.	**Un**	1,2	1,2
5.	**Understand** the learnings inculcated throughout the course and present a course seminar or **develop** a course project.	**Re,Un,Ap**	1,2,3,5,9,10, 11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments (Open/Industry /Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

- Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

- Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
- Lack of minimum score in IA test will make the student Not Eligible for SEE
- Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):

1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓	✓			✓								✓	✓	
3		✓			✓								✓	✓	
4	✓	✓											✓	✓	
5	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Continuous Improvement: Continuous improvement is an ongoing process of improvement of products, services, and processes with the help of innovative ideas.	Product based companies	Software engineer Software Analyst Operations Systems Specialist
2.	Once they understand the basics of OS, they can start building, managing, and repairing hardware devices	Product based companies	Software Developer System Engineer
3.	Programming skills will be enhanced as whatever code they develop, will eventually run on an OS. Good understanding of OS is essential to become a programmer.	Software Industry	Computer System Engineer

ALGORITHM ANALYSIS AND DESIGN

Course Code	**22IS42**	**Course type**	**IPCC**	**Credits L-T-P**	**3 – 0 - 1**
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	To bring out the importance of the study of algorithms.
2.	To study and analyze time complexity of various algorithms.
3.	To discuss various algorithm design techniques.
4.	To develop a technique of analyzing and computing the performance of algorithms.

Pre-requisites: Basic Computer Programming

Unit – I	**Contact Hours = 8 Hours**
Introduction: Fundamentals of Algorithmic Problem Solving, Analysis Framework, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms,	

Unit – II	**Contact Hours = 8 Hours**
Divide and Conquer: Merge sort, Quicksort, Multiplication of Long Integers, Strassen's Matrix Multiplication. Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting,	

Unit – III	**Contact Hours = 8 Hours**
The General Greedy Technique, Illustration with examples. Applications of Greedy method: Kruskal's Algorithm – Minimum-Cost Spanning Trees: Prim's Algorithm, Single Source Shortest Path - Dijkstra's Algorithm, Huffman Trees – Encoding of Data	

Unit – IV	**Contact Hours = 8 Hours**
Dynamic Programming Definition and Concept Illustration. The General Method, Applications of Dynamic programming: Warshall's Algorithm – Transitive Closure, Floyd's Algorithm for the All-Pairs Shortest Paths, Knapsack using General Weights and 0/1 Knapsack.	

Unit – V	Contact Hours = 8 Hours
Backtracking: N-Queen's Problem, Sum of Subset Problem. Branch-and-Bound: Travelling Salesperson Problem, Assignment Problem Decision Trees: Decision Trees for Sorting NP and NP-Complete Problems: Basic Concepts, Non- Deterministic Algorithms, P, NP, NP Complete, and NP-Hard classes	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**2**	Fundamentals of Algorithmic
2	**2**	Divide and Conquer Decrease and Conquer
3	**1**	Applications of Greedy method
4	**2**	Applications of Dynamic programming All-Pairs Shortest Paths
5	**3**	Backtracking Branch-and-Bound Decision Trees

Unit No.	Self-Study Topics
1	Brute Force Approaches: Introduction, Selection Sort, linear search.
2	Application of DFS and BFS.

Books	
	Text Books:
1.	Introduction to the Design and Analysis of Algorithms, Anany Levitin, University, 3rd Edition, 2012, Pearson, ISBN 13: 978-0-13-231681-1.
2.	Computer Algorithms, Horowitz E., Sahani S., Rajasekharan S., 2nd Edition, 2006, Galgotia Publications,ISBN:9780716783169
	Reference Books:
1.	Kenneth Berman, Jerome Paul, Algorithms, Cengage Learning.

2.	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, introduction to Algorithms PHI, 2nd edition and above.
3	R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai: Introduction to the Design and analysis of Algorithms A Strategic Approach, TataMcGraw Hill.
	E-resources:
1.	https://onlinecourses.nptel.ac.in

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to:		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Apply** knowledge of computing and mathematics to algorithm analysis and design	**Ap**	1,2	1,2
2.	**Analyze** a problem and identify the computing requirements appropriate for a solution	**An**	1,2,3,4	1,2
3.	**Apply** algorithmic principles and computer science theory to the modeling for evaluation of computer- based solutions in a way that demonstrates comprehension of the trade-offs involved in design choices.	**Ap**	1,2,3,4	1,2
4.	**Investigate** and use optimal design techniques, development principles, skills and tools in the construction of software solutions of varying complexity.	**An**	1,,2,3,4	1,2
5.	**Understand** the learnings inculcated throughout the course and present a course seminar or **develop** a course project or assignments.	**Re,Un,Ap**	1,2,3, 5,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):				
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.				
THEORY (60 marks)		**LAB (40 marks)**		**Total**
IA test 1	**IA test 2**	**Conduction**	**Lab test**	
30 marks	30 marks	10 marks	30 marks	100 marks
IA Test: 1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks). 2. Remaining 20 marks questions in Part B & C should be descriptive.				
Conduct of Lab: 1. Conducting the experiment and journal: 5 marks 2. Calculations, results, graph, conclusion, and Outcome: 5 marks				
Lab test: (Batch wise with 15 students/batch) 1. Test will be conducted at the end of the semester 2. Timetable, Batch details and examiners will be declared by Exam section 3. Conducting the experiment and writing report: 5 marks 4. Calculations, results, graph, and conclusion: 15 marks 5. Viva voce: 10 marks				
Eligibility for SEE: 1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE 2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component. 3. Lab test is COMPULSORY 4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100. 5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE				

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer: 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)													CO-PSO Mapping (Planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓											✓	✓	
2	✓	✓	✓	✓									✓	✓	
3	✓	✓	✓	✓									✓	✓	
4	✓	✓	✓	✓									✓	✓	
5	✓	✓	✓		✓				✓	✓		✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Designing, Analyzing and writing algorithms	Software Industry	Software engineer Software Analyst Operations Systems Specialist

DATABASE MANAGEMENT SYSTEMS

Course Code	**22IS43**	**Course type**	**IPCC**	**Credits L-T-P**	**3 – 0 – 1**
Hours/week: L - T- P	3 – 0 – 2			**Total credits**	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 20 Hrs Total = 60 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	To discuss the concept of databases, ER Modeling and Schema mapping
2.	To gain the knowledge Relational model concepts and constraints and explore the various relational operations.
3.	To introduce a formal database design approach through various normal forms and study the importance of concurrent transactions and control algorithms.
4.	To understand the application of different query languages and query optimizations.

Pre-requisites: Basics of Programming Knowledge.

Unit – I	**Contact Hours = 8 Hours**
Introduction: Introduction to database, Characteristics of Database approach, Advantages of using DBMS approach, Three-schema architecture and data independence, **Entity- Relationship Model:** Using High-Level Conceptual Data Models for Database Design;An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship types, Roles and Structural Constraints; Weak Entity Types. ER-Relational Mapping Rules.	

Unit – II	**Contact Hours = 8 Hours**
Relational Model : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION.	

Unit – III	**Contact Hours = 8 Hours**
Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. **Transaction Processing Concepts:** Introduction to Transaction processing, Transaction and System concepts, Desirable properties of Transactions and issues with concurrent transactions. 2PL and TSO algorithms	

Unit – IV	Contact Hours = 8 Hours
SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries; Nested and Correlated Queries, IN, ALL, EXIST operators. Insert, Delete and Update statements in SQL. Introduction to Query Optimization techniques; SQL Web Programming using PHP	

Unit – V	Contact Hours = 8 Hours
PL/SQL: PL/SQL Block Structure, PL/SQL Variables, PL/SQL Function, PL/SQL Procedure, PL/SQL IF Statement, PL/SQL Loop Statement: PL/SQL WHILE Loop Statement, PL/SQL FOR Loop Statement. Introduction to Cursors and Triggers.; Overview of NoSQL**,** Apache Hive as an HDFS, HBase	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	**2**	Entity-Relationship Model, ER-Relational Mapping Rules
2	**1**	Relational Operations
3	**1**	Normalization
4	**2**	DDL,DML, Web Programming
5	**2**	PL/SQL Programs, Cursors, Triggers

Unit No.	Self-Study Topics
1	Various users of DBMS, Classification od DBMS
2	Database and Java, Python connectivity

Books	
	Text Books:
1.	Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 6th edition and above.
	Reference Books:
1.	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill, 2nd edition and above.
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc22_cs51/preview
2.	https://www.udemy.com/topic/database-management/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests

2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)
4.	Online classes	4.	Course Seminar
5.	Enquiry Based Learning	5.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to:		Learning Level	PO(s)	PSO(s)
1.	**Analyze** the given database applications using E-R diagrams and apply the normalization to produce schema diagrams and relations.	**An**	1,2,3,4,5,9,10	1,2,3
2.	**Explain** the relational operators , SQL concepts and transaction processing.	**Re**	1,2,3,10	1,2,3
3.	**Apply** SQL , PL/SQL and NoSQL languages to design different Database applications.	**Ap**	1,2,3,4,5,10,12	1,2,3
4.	**Understand** the learnings inculcated throughout the course and present a course seminar or **develop** a course project or assignments.	**Re,Un, Ap**	1,2,3, 5,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (60 marks)		LAB (40 marks)		Total
IA test 1	**IA test 2**	**Conduction**	**Lab test**	
30 marks	30 marks	10 marks	30 marks	100 marks

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

Conduct of Lab:

1. Conducting the experiment and journal: 5 marks
2. Calculations, results, graph, conclusion, and Outcome: 5 marks

Lab test: (Batch wise with 15 students/batch)

1. Test will be conducted at the end of the semester
2. Timetable, Batch details and examiners will be declared by Exam section
3. Conducting the experiment and writing report: 5 marks
4. Calculations, results, graph, and conclusion: 15 marks
5. Viva voce: 10 marks

Eligibility for SEE:

1. Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests. Lack of minimum score in IA test will make the student Not Eligible for SEE
2. Student should score minimum 40% of 30 marks (i.e. 12 marks) in Lab test & should score 40% of 40 marks (i.e. 16 marks) in Lab component.
3. Lab test is COMPULSORY
4. Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.
5. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥35 &, however overall score of CIE+SEE should be ≥40%.
3.	Question paper contains three parts **A, B and C**. Students have to answer: 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓	✓	✓				✓	✓		✓	✓	✓	✓
2	✓	✓	✓							✓			✓	✓	✓
3		✓	✓	✓						✓		✓	✓	✓	✓
4	✓	✓	✓		✓				✓	✓		✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Analyzing and Designing Databases	Software Industry	Database Developers
2	Administration of Databases	Software Industry	Database Administrators

OPERATING SYSTEM LAB

Course Code	22ISL49	Course type	PCCL	Credits L-T-P	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	OSSim Simulation Tool			SEE Marks	50

Course Learning Objectives	
1.	Understand data structures and algorithms used to implement OS concepts
2.	Discuss the process, memory, synchronization, and other concepts to solve problems in operating system.
3.	Explore various UNIX shell commands and shell scripts

Required Knowledge of: Operating System, C programming

Lab Experiment – I	Contact Hours = 2 Hours
UNIX Internal and External Commands	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Scheduling algorithms	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Unix Process control system calls	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Process Synchronization - The Dining-Philosophers Problem	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Process Synchronization-Reader- writer and Producer –consumer Problem	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Deadlock – Banker's algorithm	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Memory Management - Page replacement	
Lab Experiment – 8	**Contact Hours = 2 Hours**
File allocation strategies	
Lab Experiment – 9	**Contact Hours = 2 Hours**
pwd, cd, mkdir, rmdir, cp, rm, mv, cat ; Unix shell scripts	
Lab Experiment – 10	**Contact Hours = 2 Hours**
File Attributes: ls, ls-l, ls-d, file permissions, chmod Unix shell scripts	

Books	
	Text Books:
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", Wiley India, 6th edition and onwards.
2.	Sumitabha Das: "YOUR UNIX – The Ultimate Guide" , Tata McGraw Hill, 23rd reprint , 2012 and onwards.
	E-resources:
1.	https://www.coursera.org/specializations/codio-introduction-operating-systems
2.	Lectures on Operating Systems (iitb.ac.in)

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
		4.	Lab Test
		5.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to:		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Analyze** data structures and algorithms used to implement OS concepts	**An**	1,2	1,2,3
2.	**Apply** process, memory, synchronization and other concepts to solve problems in operating system.	**Ap**	2,3	1,2,3
3.	**Demonstrate** various UNIX shell commands and shell scripts	**Un,Ap**	1,2	1,2,3
4.	**Understand** the learnings inculcated throughout the course and present it in a journal, viva-voce and project	**Re,Un,Ap**	1,2,3,8,9,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks
3. Lab project/ Open ended expt: 10 marks

Lab Test: 15 marks

Eligibility for SEE:

1. 40% and above (20 marks and above)
2. Lab test is COMPULSORY

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓											✓	✓	✓
2		✓	✓										✓	✓	✓
3	✓	✓											✓	✓	✓
4										✓		✓	✓	✓	✓

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Continuous Improvement: Continuous improvement is an ongoing process of improvement of products, services, and processes with the help of innovative ideas.	Product based companies	Software engineer Software Analyst Operations Systems Specialist
2.	Once they understand the basics of OS, they can start building, managing, and repairing hardware devices	Product based companies	Software Developer System Engineer
3.	Programming skills will be enhanced as whatever code they develop, will eventually run on an OS. Good understanding of OS is essential to become a programmer.	Software Industry	Computer System Engineer

DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY

Course Code:	**22IS441**	**Course type**	**ESC**	**Credits L-T-P**	3 –0– 0
Hours/week: L-T-P	**3 – 0 – 0**			**Total credits**	**3**
Total Contact Hours	L = 40 Hrs; T =0Hrs; P = 0 Hrs Total = 40 Hrs			**CIE Marks**	100
Flipped Classes content	10 Hours			**SEE Marks**	100

Course Learning Objectives:	
1.	Get acquainted with fundamentals and all laws of logic and quantifiers.
2.	Get familiar with relations and their closures, Posets and Lattices.
3.	Understand the theory of recurrence relations and generating functions.
4.	Get acquainted with basic concepts of graphs, trees and their applications.

Pre-requisites : Relations, Functions ,Permutations and combinations, Algebra.

Unit – I	**Contact Hours = 8 Hours**
Fundamentals of Logic: Basic connectives and Truth tables, Logical equivalence- Laws of Logic, Logical Implication-Rules of Inference. Quantifiers- Universal and Existential Quantifiers.	

Unit – II	**Contact Hours = 8 Hours**
Relations: Types and Properties of Relations (revision), n-ary Relations and Their Applications. Computer recognition-Zero One Matrices and Directed graphs, Transitive, closure, Warshall's algorithm, Equivalence relation and Partitions, Posets and Hasse Diagrams, Lattices.	

Unit – III	**Contact Hours = 8 Hours**
Recurrence relations: Definition, Homogeneous recurrence relations, Non Homogeneous recurrence relations. Solution of homogeneous and non-homogeneous recurrence relations. Generating functions. Solution of recurrence relation by generating function.	

Unit – IV	**Contact Hours = 8 Hours**
Graph Theory I: Definitions and Examples, Subgraphs, Matrix Representation of graphs. Complements and Graph Isomorphism, Connectivity, Euler Trails and Circuits, Shortest path: Dijkartas algorithm. Planar Graphs, Hamiltonian Paths and Cycles.	

Unit –V	**Contact Hours = 8 Hours**

Graph Theory II: Coloring covering and matching: Chromatic number, chromatic polynomial, uniquely colorable graphs, coloring planar graphs: Five color theorem ,Four color theorem. Covering minimal covering, Matching Halls theorem.

Flipped Classroom Details

Unit No.	**I**	**II**	**III**	**IV**	**V**
No. for Flipped Classroom Sessions	**2**	**2**	**2**	**2**	**2**

Books	
	Text Books:
1.	Kolman, Busby, Ross "Discrete Mathematical Structures", 6th Edition Prentice Hall of India, 2010 onwards
2.	Ralph Grimaldi, "Discrete and Combinatorial Mathematics 4th Edition 2003 onwards
	Reference Books:
1.	Kenneth Rosen "Discrete Mathematics and Its Applications with Combinatorics and Graph Theory (SIE) | 7th Edition onwards
2.	Narsingh Deo ,"Graph theory and its Applications"
	E-resource's:
1.	https://archive.nptel.ac.in/courses/111/106/111106086/(DMS)
2.	https://www.digimat.in/nptel/courses/video/111106102/L19.html(GT)
3	https://www.javatpoint.com/graph-theory-tree-and-forest (GTTrees)

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.	Flipped Classes	3.	Open Book Tests (OBT)/Matlab
4.	Online classes	4.	Course Seminar
		5.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to:		Learning Level	PO(s)	PSO(s)
1.	**Understand** and **Apply** the Logic of mathematics in the field of Computer science.	**Un, Ap**	1	
2.	**Explain** and **Analyze** different Relations and their closures. Posets and lattices.	**Un, Ap**	1	
3.	**Apply** theory of solution of recurrence relations to solve them.	**Un, Ap**	1	
4.	**Apply** the concepts related to graphs their relevant applications.	**Un,Ap**	1	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments (Open/Industry /Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

- Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

- Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
- Lack of minimum score in IA test will make the student Not Eligible for SEE
- Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration.
2.	**Minimum marks required in SEE to pass:** Score should be ≥ 35%, however overall score of CIE + SEE should be ≥ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓												✓		
2	✓												✓		
3	✓												✓		
4	✓												✓		

WEB PROGRAMMING – A PRACTICAL APPROACH

Course Code:	**22IS442**	**Course type**	**ESC**	**Credits L-T-P**	2 –0– 1
Hours/week: L-T-P	**2– 0 – 2 (Project Based)**			**Total credits**	**3**
Total Contact Hours	L = 30 Hrs; T =0Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	To learn the basics of web development and develop basic web applications using HTML5, CSS3 and JavaScript
2.	To develop advanced web applications using Tailwind and JavaScript frameworks
3.	To understand and implement the concepts of responsive design and retina ready websites
4.	To deploy applications on AWS and generate static websites
5.	To understand the working of web APIs and use them in building web applications

Prerequisites: Basic Programming knowledge and basics of computer science

Unit – I	**Contact Hours = 8 Hours**

HTML and AWS

Writing HTML code using Header Tags, Paragraphs, Ordered and Unordered lists, Forms, Links and Tables, Iframes and Images, Text Formatting, Image Maps, Creating an Amazon Web Services ,AWS) account and how to deploy a static website to AWS Simple Storage Service ,S3

Working Encoding URL, Introduction to XHTML, Using HTML5 introduced features, Handling of multiple file upload using multiple attribute, HTML5 Local Storage, HTML5 form validate /novalidate, HTML5 canvas, embedding audio and video in a webpage, Drag and drop, HTML5 web workers and server sent events Introduction to Figma, Working with UI- Design , Components , Mobile App design

Unit – II	**Contact Hours = 8 Hours**

CSS3

Styling of HTML elements-text; Links, lists and tables; Different ways to write CSS e.g. external, internal, inline; Creating Navigation Bars; Writing Media Rules; Hide visibility of an element; CSS Image Sprites and Gradients; CSS Pseudo Classes and Pseudo Elements

CSS3 Text Effects using different text fonts; Creating 2D and 3D transformations; Applying animations and transitions to HTML elements; CSS3 resize UI and multiple columns feature

Unit – III	Contact Hours = 8 Hours

Tailwind CSS and JavaScript

What is Tailwind CSS? advantages of tailwind CSS, comparison of tailwind CSS and bootstrap, getting started with tailwind, colors, element sizing, flexbox and grid, padding and margins, styling text, typography, borders and shadows.

Java Script datatypes; Variables and arrays; Creating loops and writing if-else decision-making statements; Defining and calling JavaScript functions on events; Manipulating DOM elements

Unit – IV	Contact Hours = 8 Hours

Twitter Bootstrap

Getting started with Twitter Bootstrap 3; Bootstrap features like fixed drop-down menu; Carousel, text and image grids; Custom Thumbnails; Bootstrap modal; Using Font Awesome Icons

Building a real-world website using Twitter; Bootstrap 3 features like bootstrap fixed dropdown menu; Carousel; Bootstrap modal; Font awesome icons; custom Thumbnails; Text and Image grids; Accordions; Signin/Signup form and Jumbotron

Unit – V	Contact Hours = 8 Hours

Web APIs, Ajax

Bootstrap ScrollSpy AJAX XML; Http Request object; Making an AJAX call and retrieving the response; Working with Google APIs Adding social plugins on your web page provided by LinkedIn, Facebook, Quora and Twitter, Web APIs, Introduction to CI/CD, Using git- commands and concepts,

hosting a static website on GitHub Pages

List of Experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	2	Figma, HTML5, and AWS
2	2	CSS transformations, UI and multi column features
3	2	Tailwind and JavaScript
4	2	Twitter Bootstrap, Jumbotron
5	2	Git and AJAX

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Robert Sebesta, Programming the World wide web, 6th Edition
2.	Jennifer Robbins, Learning Web Design, 5th Edtion, 2018
3.	Noel Rappin, Modern CSS with Tailwind: flexible styling without the fuss, programmatic bookshelf, 2021
	Reference Books:
1.	DarioCalonaci, Designing user interfaces, BB publications, 2021
2.	David Cochran, Twitter Bootstrap Web development-How to, packt publishing, 2012
	E-resources:
1.	Responsive Web Design https://www.freecodecamp.org/learn/2022/responsive-web-design/
2.	Front End Development Libraries https://www.freecodecamp.org/learn/front-end-development-libraries

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Enquiry Based Learning		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to:		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Explain** the basic concepts of frontend web development using HTML5, CSS3 and other libraries	**Un**	1	1
2.	**Understand** the real world problem and **Create** a wireframe model of the application	**Cr**	1, 3, 5, 9 , 10, 12	1,2,3
3.	**Demonstrate** the use of concepts learnt and integrate them to build real world applications	**Ap**	1, 3, 5, 9 , 10, 12	1,2,3
4.	**Develop** and Deploy the application on hosting services	**Ap**	5	2

Scheme of Continuous Internal Evaluation (CIE):
For integrated courses, a lab test also will be conducted at the end of the semester. The lab test (COMPULSORY) will be part of the CIE. No SEE for Lab.

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test (Theory)	**IA test (Lab)**	**Project Phase 1**	**Project Phase 2**	**Project report**	
25 marks	**15 marks**	**25 marks**	**25 marks**	**10 marks**	**100 marks**
-Theory IA test should be of one-hour duration. -Lab IA test should be of two/three-hour duration. -Project batch will ideally consist of 2 students (maximum of 3). -Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester. -Submission of Project report is compulsory.					
Eligibility for SEE: **1.** 40% and above (16 marks and above) in theory component 2. 40% and above (24 marks and above) in project component 3. Not eligible in any one of the two components will make the student Not Eligible for SEE					

Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 3 hours duration.		
2.	Lab Open ended program/problem/experiment Write-up & execution (1 open ended expt)- (20 marks write-up + 20 marks algorithm/flowchart + 10 marks execution)	50 marks	**100 marks**
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome b. Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project. c. Viva-voce	10 marks 30 marks 10 marks	
3.	Minimum marks required in SEE to pass: Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by Internal & External examiners together.		

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓		✓		✓				✓	✓		✓	✓		
2	✓		✓		✓				✓	✓		✓	✓	✓	✓
3	✓		✓		✓				✓	✓		✓	✓	✓	✓
4	✓		✓		✓				✓	✓		✓		✓	

Sl No	Skill & competence enhanced afterundergoing the course	Applicable Industry Sectors& domains	Job roles students can take up after undergoing the course
1	Website Development	IT Sector	Web Developer
2	Ajax programmer		Developer

DIGITAL ELECTRONICS

Course Code:	**22IS443**	**Course type**	**ESC**	**Credits L-T-P**	2 –0– 1
Hours/week: L-T-P	**2– 0 – 2 (Project based)**			**Total credits**	**3**
Total Contact Hours	L = 30 Hrs; T =0Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	Understand the basics of Digital Electronics.
2.	Comprehend the knowledge of digital circuits to construct combinational and sequential sub-systems useful for digital system designs.
3.	Implement digital circuits for a particular application using simulation and Virtual Lab platform.
4.	Analyze digital circuits and systems to model using Verilog HDL.

Pre-requisites: Basic Electronics

Unit – I	**Contact Hours = 8 Hours**
Introduction: Revision of Logic gates and Boolean algebra, Simplification of Boolean functions using Basic Logic gates, Universal Gates, SOP, POS form, K-Map Simplification (up to 4 variables), Don't-care Condition.	

Unit – II	**Contact Hours = 8 Hours**
Data Processing Circuits: Multiplexers, De-multiplexers, Decoder, Encoders and implementation of Boolean functions using multiplexer and Decoders, Magnitude Comparators (1 bit and 2 bit).	

Unit – III	**Contact Hours = 8 Hours**
Clocks and Flip Flops: Clock waveforms, TTL clock, RS Flip Flops, Gated flip-flops, Edge triggered RSFlip-Flops, Edge triggered D Flip-Flops, and Edge triggered JK Flip-Flops, JK master slave Flip Flops, various representations of Flip Flops.	

Unit – IV	**Contact Hours = 8 Hours**
Analysis of Sequential Circuits: Conversion of flip flops: A synthesis example, Types of ShiftRegister, SISO, SIPO, PISO and PIPO, Applications of Shift Registers as Ring Counter, Johnson Counter, Serial Adder. **Counters:** Asynchronous counters (4 bit), Synchronous Counters (4 bit), changing the counter Modulus.	

Unit – V	**Contact Hours = 8 Hours**
Introduction to HDL: Types of Model, Syntax for Data Flow model	

Flipped Classroom details:

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
	2	Construction of half and full adder using XOR and NAND gates and verification of its operation.
	3	Realization of logic functions with the help of Universal Gates (NAND, NOR).
	4	Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
2	5	To Study and Verify Half and Full Subtractor.
	6	Implementation and verification of decoder or de-multiplexer and encoder using logic gates.
	7	Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
	8	Verify the truth table of one bit and two bit comparator using logic gates.
3	9	Construction of a NOR gate latch and verification of its operation.
	10	Verify the truth table of RS, JK, T and D flip-flops using NAND and NOR gates.
4	11	Design and Verify the 4-Bit Serial In - Parallel Out Shift Registers.
	12	Design and verify the 4- Bit Synchronous or Asynchronous Counter using JK Flip Flop.
5	13	Develop HDL (Verilog) code to implement simple SOP equation.
	14	Develop HDL (Verilog) code to implement Multiplexer.
	15	Develop HDL (Verilog) code to implement Adder.

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Donald P Leach, Albert Paul Malvino and Goutam Saha: Digital Principles and Applications, 7th Edition and onwards, Tata McGraw Hill, 2011.
	Reference Books:
1.	Donald Givone: Digital Principles and Design, Palgrave Macmillan, 2003 and onwards.
2.	R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2012 and onwards.
3.	Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007 and onwards.
	E-resources:
1.	**https://nptel.ac.in/courses/117106086/**

Course delivery methods		**Assessment methods**	
1.	Chalk & Talk	1.	IA test
2.	I A Test	2.	Journal writing
3.	Mini Project	3.	Lab project/ Open ended experiment
4.	Periodic Journal Evaluation	4.	Lab Test
5.	Practice session/Demonstrations in Labs	6	Semester End Examination

Course Outcome (COs)

Learning Levels:
Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1	Apply the knowledge of Digital Electronics to design digital systems.	Ap	1,2,3,5	1,2
2	Design Combinational and Sequential Circuits for digital systems.	Ap	1,2,3,5	1,2
3	Utilize the simulation tool/ Virtual Lab platform to implement the digital circuits.	Ap	1,2,3,5	1,2
4	Analyse the digital circuits developed using HDL Verilog.	An	1,2,3,5	1,2
5	Apply the learnings inculcated throughout the course and develop a course project.	An	1,2,3,5, 9,10,11,12	1,2,3

CO-PO Mapping (planned)													CO-PSO Mapping (planned)		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓	✓	✓		✓								✓	✓	
2	✓	✓	✓		✓								✓	✓	
3	✓	✓	✓		✓								✓	✓	
4	✓	✓	✓		✓								✓	✓	
5	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors & domains**	**Job roles students can take up after undergoing the course**
1	Digital Circuit Design, Logic Design and Analysis	Electronics Industry	Digital Circuit Designer
2	Digital System Simulation	Semiconductor Industry	FPGA Engineer
3	Microcontrollers and Embedded Systems	Embedded Systems	Embedded Systems Engineer

PYTHON PROGRAMMING – A PRACTICAL APPROACH

Course Code	**22IS444**	**Course type**	**ESC**	**Credits L-T-P**	2 - 0 - 1
Hours/week: L - T- P	2 - 0 – 2 (**Project based)**			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 20 Hrs Total = 50 Hrs			**CIE Marks**	100
Flipped Classes content	05 Hours			**SEE Marks**	100

Course Learning Objectives	
1.	Gain knowledge about basic Python language syntax and semantics to write Python programs using the procedure-oriented programming paradigm.
2.	Appreciate the usage of high-level data constructs provided by Python and work with file and exception handling mechanisms.
3.	Write Python applications using the object-oriented programming paradigm.
4.	Become acquainted with the development of database and GUI applications and usage of various packages.

Pre-requisites: Procedure Oriented and Object Oriented Programming Languages

Unit – I	**Contact Hours = 8 Hours**

Python Fundamentals:

An Introduction to Python programming: Introduction to Python, IDLE to develop programs

How to write your first programs: Basic coding skills, data types and variables, numeric data, stringdata, five of the Python functions

Control statements: Boolean expressions, selection structure, iteration structure

Unit – II	**Contact Hours = 8 Hours**

Define and use Functions and Modules: define and use functions, more skills for defining and using functions and modules, create and use modules, standard modules

Higher Data Constructs:

Lists and tuples: Basic skills for working with lists, list of lists, more skills for working with lists, tuples

Dictionaries: get started with dictionaries, more skills for working with dictionaries

Unit – III	**Contact Hours = 8 Hours**

Files, Exception Handling, Database Programming

File I/O: An introduction to file I/O, text files, CSV files, binary files

Exception Handling: handle a single exception, handle multiple exceptions

Work with a database: An introduction to relational databases, SQL statements for datamanipulation, SQLite Manager to work with a database, use Python to work with a database

Unit – IV	Contact Hours = 8 Hours
Object Oriented Programming: **Define and use your own classes:** An introduction to classes and objects, define a class, object composition, encapsulation **Inheritance:** Inheritance, override object methods	

Unit – V	Contact Hours = 8 Hours
Packages: **How to build a GUI Program:** Create a GUI that handles an event **Numpy Basics:** Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes **Getting started with Pandas:** Introduction to Pandas Data Structures, Summarizing and Computing Descriptive Statistics, Handling missing data	

Flipped Classroom Details

Unit No.	I	II	III	IV	V
No. for Flipped Classroom Sessions	1	1	1	1	1

List of Experiments

PART A

Unit No.	No. of Experiments	Topic(s) related to Experiment
2	2	Functions and lists
		Functions and dictionaries
3	2	File I/O and exception handling mechanisms
		Implement a Python program to work with a database
4	2	Object composition and encapsulation
		Inheritance and polymorphism
5	2	GUI application
		NumPy and Pandas packages

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books	
	Text Books:
1.	Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2.	Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012

	Reference Books:
1.	SciPy and NumPy, O`Reilly, 1st Edition, 2012
2.	Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
	E-resources:
1.	The joy of computing using python - https://onlinecourses.nptel.ac.in/noc21_cs32/preview
2.	Programming in python- https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Enquiry Based Learning		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	**Illustrate** basic principles of Python programming and **Demonstrate** programs using the procedure-oriented programming paradigm.	**Ap**	1,3,5	1
2.	**Develop** Python programs for file operations, exception handling, GUI, database operations and **Make use of** different packages for computing and manipulation.	**Ap**	1,3,5	1,2
3.	**Explain** the concepts of object-oriented programming paradigm and **Apply** the same to develop programs.	**Ap**	1,3,5	1,2
4.	**Apply** the learnings inculcated throughout the course by developing a course project.	**Ap**	1,2,3,5, 9,10,11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

For integrated courses, a lab test also will be conducted at the end of the semester. The lab test **(COMPULSORY)** will be part of the CIE. **No SEE for Lab**.

THEORY (40 marks)		PROJECT (60 marks)			Total
IA test (Theory)	**IA test (Lab)**	**Project Phase 1**	**Project Phase 2**	**Project report**	
25 marks	15 marks	25 marks	25 marks	10 marks	100 marks

-Theory IA test should be of one-hour duration.

-Lab IA test should be of two/three-hour duration.

-Project batch will ideally consist of 2 students (maximum of 3).

-Project Phase 1 presentation will be conducted after 6 weeks and Project Phase 2 presentation will be conducted after 13 weeks from the start of the semester.

-Submission of Project report is compulsory.

Eligibility for SEE:

1. 40% and above (16 marks and above) in theory component 2. 40% and above (24 marks and above) in project component 3. Not eligible in any one of the two components will make the student **Not Eligible** for SEE

Semester End Examination (SEE):			
1.	It will be conducted for 100 marks having 3 hours duration.		
2.	**Lab Open ended program/problem/experiment** Write-up & execution (1 open ended expt)- (20 marks write-up + 20 marks algorithm/flowchart + 10 marks execution)	50 marks	100 marks
	Project evaluation a. Initial write up stating the objectives, methodology and the outcome b. Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project. c. Viva-voce	10 marks 30 marks 10 marks	
3.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.		
4.	SEE will be conducted in project batches by **Internal & External examiners** together.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓		✓		✓								✓		
2	✓		✓		✓								✓	✓	
3	✓		✓		✓								✓	✓	
4	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓

Sl No	**Skill & competence enhanced after undergoing the course**	**Applicable Industry Sectors& domains**	**Job roles students can take upafter undergoing the course**
1	Procedure Oriented Programming Using Python	Healthcare, Finance, Retail, Agriculture, Manufacturing Networks, Security, Big Data etc,	Python Developer, Software Developer, Data and Research Analyst, Senior Backend / Software Developer Python, Big Data Developer Python Framework Developer – AI Developer, etc.
2	Object Oriented Programming using Python		
3	Use of various packages		

HEARTFULNESS ENABLED LEADERSHIP MASTER

Course Code	22AECIS451	**Course type**	**AEC**	**Credits L-T-P**	0 - 0- 1
Hours/week: L-T-P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1	To understand the self-core strength and improve decision making skills
2	To get acquainted with key life skills like positive habits, stress management and time management

Required Knowledge of: NIL

Unit – I	**Contact Hours = 5 Hours**
Start Up Connect, Core, Context, Choices, Causality, Community, Intrusion and trust building, self-awareness,Global citizenship, Decision making, creative thinking	

Unit – II	**Contact Hours = 5 Hours**
Discover –1 Heartfulness Enabled Leadership Mastery – An overview, Discovering oneself, Healthy Lifestyle Time Management - 1: Principles of Time, Time Management - 2: Focus, Befriending Stress, PeakPerformance, Situational Awareness, Heartful Conversations, Heartful Relationships, Review of Discover I	

Unit – III	**Contact Hours = 5 Hours**
Discover – 2 Silence is the Language of the Heart, The Science Behind Meditation: Habits and Change, The Art Behind Meditation: Observing and Diary Writing, The Heart Behind Meditation: Experience and Evolution, Live Light, Live Right, The Power of Pause, Designing your Destiny 1, Designing your Destiny2, Practice! Experience!, Review of Discover II	

Books	
	Text Books:
1	Designing destiny, Kamlesh Patel, Heartfulness Organization

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)				
Learning levels: **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate;Cr - Create**				
At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Understand their self-core awareness and improve their critical thinking ability	Un, Ap, An	6,8,9	1
2.	Apply the skills of time management ans stress management in the real time situations	Un, AP	6,8,9,10, 12	1

Scheme of Continuous Internal Evaluation (CIE):				
Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks
Conduct of Lab: 1. Conduction of the experiment: 15 marks + Viva voce: 5 marks 2. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks 3. Lab project/ Open ended expt: 10 marks **Lab Test:** 15 marks				
Eligibility for SEE: 1. 40% and above (20 marks and above) 2. Lab test is COMPULSORY				

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1						✓		✓	✓				✓		
2						✓		✓	✓	✓		✓	✓		

MICROSOFT OFFICE ESSENTIALS

Course Code	22AECIS452	**Course type**	**AEC**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1.	To understand the essentials of Microsoft office for effective report writing, presentations and data handling

Required Knowledge of: Basics of Computers

Unit – I	**Contact Hours = 5 Hours**

MS Word –

- MS Word interface
- Working with styles for professional looking documents
- Create Headers and Footers and numbered pages
- Create and control columns
- Insert illustrations, pictures, charts, icons, shapes, Smartart, and 3D graphics
- Create tables to organize text
- Create standardized and consistent styling
- Create numbered and bulleted lists
- Working with Mail Merge
- Creating styles
- Inserting Table of Contents
- Inserting captions, Table of figures,
- Working with Citation and Bibliography

Unit – II	**Contact Hours = 5 Hours**

MS Power Point-

- Master the Basic Features of PowerPoint
- Build Effective PowerPoint Presentations
- Enhance PowerPoint Presentations with Graphical Elements
- Levarage Advanced Text Editing Operations with PowerPoint
- Prepare to Deliver a PowerPoint Presentation

Unit – III	**Contact Hours = 5 Hours**

MS Excel –

- Working with controls in Excel and how to perform basic data entry with Excel spreadsheets
- Performing calculations using functions
- Find data with Filter and Sort
- Retrieve and change data using Find and Replace
- Using Conditional Formatting to highlight specific data
- Creating various charts

List of Experiments

Unit No.	No. of Experiments	Topic(s) related to Experiment
1	1	MS word – report and journal paper writing
2	1	MS Power point- Effective power point presentations
3	1	MS Excel- Data handling

Unit No.	Self-Study Topics
1	Shortcuts used to handle MS Word
2	Shortcuts used to handle MS Power Point
3	Shortcuts used to handle MS Excel

Books	
	Text Books:
1.	Online materials
2.	
3.	
4.	
	Reference Books:
1.	Online materials
2.	
	E-resources:
1.	
2.	

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		Learning Level	PO(s)	PSO(s)
1.	To create an effective project reports and journal papers	Ap	1,5,6,10,12	1,2,3
2.	To create an effective presentation for various purposes	Ap	1,5,6,10,12	1,2,3
3.	To handle and visualize the data effectively	Ap	1,2,5,6,10,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):				
Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks
Conduct of Lab: 4. Conduction of the experiment: 15 marks + Viva voce: 5 marks 5. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks 6. Lab project/ Open ended expt: 10 marks **Lab Test:** 15 marks				
Eligibility for SEE: 1. 40% and above (20 marks and above) 2. Lab test is COMPULSORY				

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓				✓	✓				✓		✓	✓	✓	✓
2	✓				✓	✓				✓		✓	✓	✓	✓
3	✓	✓			✓	✓				✓		✓	✓	✓	✓

COMPUTER AND NETWORK MAINTENANCE

Course Code	22AECIS453	**Course type**	**AEC**	**Credits L-T-P**	0 - 0 - 1
Hours/week: L - T- P	0 - 0 – 2			**Total credits**	1
Total Contact Hours	15			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives	
1.	To understand the working of computer with respect to installations of OS and software.
2.	To handle and troubleshoot various hardware devices, network components and printers

Required Knowledge of : Nil

Unit – I	**Contact Hours = 5 Hours**
Introduction to Computer Hardware Components, Assembling and Disassembling, Installation of OS, Virtual OS installation, Understanding BIOS, Understanding DLL, API, Installation and Removal of Software, Partitioning the HDD.	

Unit – II	**Contact Hours = 5 Hours**
Troubleshooting Hardware Devices, Introduction to Various types of Computer Network Devices, Handling the Network Devices, Implementing of LAN and Sharing, Troubleshooting the network	

Unit – III	**Contact Hours = 5 Hours**
Configuring Internet, Understanding Client server Protocols, Installation and troubleshooting of Printers and Network Printers	

List of Experiments

Unit No.	**No. of Experiments**	**Topic(s) related to Experiment**
1	**2**	Assembling and Disassembling, Installation of OS, Virtual OS installation, Understanding BIOS, Partitioning
2	**2**	Handling the Network Devices, Implementing of LAN and Sharing, Troubleshooting the network
3	**2**	Configuring Internet, Installation and troubleshooting of Printers and Network Printers

Unit No.	**Self-Study Topics**
1	**Exploring Linux OS**

Books	
	Text Books:
1.	Online materials
2.	
3.	
4.	
	Reference Books:
1.	Online materials
2.	
	E-resources:
1.	
2.	

Course delivery methods		**Assessment methods**	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Book Assignments (OBA)/ Lab Project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs (if present)		

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr – Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	To Assemble the Computer system, install the OS and troubleshoot the hardware devices.	Ap	6,7,9,12	3
2.	To understand the network components, LAN and Internet	Re,Un	6,7,9,12	3
3.	To install and troubleshoot the printers	Ap	6,7,9,12	3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments & viva-voce	**Journal**	**Lab project/ Open ended expt**	**Lab Test**	**Total**
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

4. Conduction of the experiment: 15 marks + Viva voce: 5 marks
5. Calculations, results, graph, conclusion, and Outcome recorded in Journal: 5 marks
6. Lab project/ Open ended expt: 10 marks

Lab Test: 15 marks

Eligibility for SEE:

1. 40% and above (20 marks and above)
2. Lab test is COMPULSORY

Scheme of Semester End Examination (SEE):

1.	It will be conducted for 50 marks of 2/3 hours duration.

2.	**Minimum marks required in SEE to pass:** Score should be ≥35%, however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1						✓	✓		✓			✓			✓
2						✓	✓		✓			✓			✓
3						✓	✓		✓			✓			✓

BIOLOGY FOR ENGINEERS

Course Code	22IS46	**Course type**	BSC	**Credits L-T-P**	3-0-0
Hours/week: L - T- P	3-0-0			**Total credits**	3
Total Contact Hours	L = 30 Hrs; T = 0 Hrs; P = 0 Hrs Total = 30 Hrs			**CIE Marks**	100
Flipped Classes content	-			**SEE Marks**	100

Course Learning Objectives	
1.	To familiarize the students with the basic biological concepts and their engineering applications.
2.	To enable the students with an understanding of bio design principles to create novel devices and structures
3.	To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems
4.	To motivate the students, develop the interdisciplinary vision of biological engineering

Unit – I	**Contact Hours = 6 Hours**
BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).	

Unit – II	**Contact Hours = 6 Hours**
HUMAN ORGAN SYSTEMS AND BIO DESIGNS - 1 (QUALITATIVE): Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye).Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).	

Unit – III	**Contact Hours = 6 Hours**
HUMAN ORGAN SYSTEMS AND BIO-DESIGNS - 2 (QUALITATIVE): Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine).Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems). Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis)	

Unit – IV	Contact Hours = 6 Hours
NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (QUALITATIVE): Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs)	

Unit – V	Contact Hours = 6 Hours
TRENDS IN BIOENGINEERING (QUALITATIVE): Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Self healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic)	

Books	
Text Books:	
1.	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022 S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
2.	Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi
3.	Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4.	Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5.	Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6.	Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
7.	Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
8.	Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
9.	3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
10.	Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016
11.	Blood Substitutes, Robert Winslow, Elsevier, 2005
E-resources:	
1	VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
2	https://nptel.ac.in/courses/121106008
3	https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
4	https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring 2009
5	https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
6	https://www.coursera.org/courses?query=biology
7	https://onlinecourses.nptel.ac.in/noc19_ge31/preview

8	https://www.classcentral.com/subject/biology
9	https://www.futurelearn.com/courses/biology-basic-concepts

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes (Surprise and Scheduled)
3.		3.	Open Assignment/Seminar
4.		4.	Semester End Examination

Course Outcome (COs)

Learning Levels:
Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to:		Learning Level	PO(s)	PSO(s)
1.	Elucidate the basic biological concepts via relevant industrial applications and case studies.	Un	1	
2.	Evaluate the principles of design and development, for exploring novel bioengineering projects.	Un	1	
3.	Corroborate the concepts of biomimetics for specific requirements.	Un	1	
4.	Think critically towards exploring innovative biobased solutions for socially relevant problems	Ap	1, 7	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Two Assignments (Open/Industry/ Certification etc.)	Course project (CP)/ Case study etc.	Total Marks
Marks	30+30 = 60	10 + 10 = 20	20 marks (with report & presentation)	100

IA Test:

1. 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
2. Remaining 20 marks questions in Part B & C should be descriptive.

- Certification earned by passing the standard Online MOOCs course (1 course of at least 8 hours defined by BOS) can be considered as a Course activity and awarded maximum of 10 marks.

Eligibility for SEE:

- Student should score minimum 40% of 60 marks (i.e. 24 marks) in IA tests.
- Lack of minimum score in IA test will make the student Not Eligible for SEE
- Minimum score in CIE to be eligible for SEE: 40 OUT OF 100.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours' duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	Question paper contains three parts **A,B and C**. Students have to answer 1. From Part A answer any 5 out of 7 questions, each Question Carries 6 Marks. 2. From Part B answer 5 out of 10 questions choosing any one full question from each unit, each Question Carries 10 Marks. 3. From Part C answer 1 out of 2 questions, each Question Carries 20 Marks.

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
1	✓														
2	✓														
3	✓														
4	✓						✓								

UNIVERSAL HUMAN VALUES

Course Code	**22IS47**	**Course type**	**UHV**	**Credits L-T-P**	1 – 0 - 0
Hours/week: L - T- P	1– 0 – 0			**Total credits**	1
Total Contact Hours	L = 16 Hrs; T = 0 Hrs; P = 0 Hrs Total = 16 Hrs			**CIE Marks**	50
				SEE Marks	50

Course Learning Objectives:	
1.	To provide understanding of basic human values
2.	To communicate the need of education for quality life

Required knowledge of: English Language, Social Studies

Unit – I Human Values	**Contact Hours = 8 Hours**
Objectives, Morals , Values, Ethics, Integrity, Work ethics, Service learning, Virtues, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage ,Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place, Spirituality, Yoga for Professional Excellence and Stress Management.	

Unit – II Value Education	**Contact Hours = 8 Hours**
Introduction, Understanding Value Education, Basic Guidelines for Value Education, The content of Value Education, Education for Fulfilling Life, Skill Education, Priority of Values over Skills. The Process of Value Education.	

Activities include - Illustrative case studies and Surveys related to Human values.

Books:	
1.	Nagarazan R.S., Professional Ethics and Human Values, New Age International Publishers Pvt. Ltd. 2006
2	P.R.Gaur, R.Sangal, G.P.Bagaria: A Foundation Course in Human Values and Professional ethics.

Course delivery methods		**Assessment methods**	
1.	Lecture	1.	IA tests
2.	Presentation	2.	Activity
3.	Expert talks	3.	Quiz
4.		4.	Semester End Examination

Course Outcome (COs) **Learning Levels:** **Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create**				
At the end of the course, the student will be able to**:**		**Learning Level**	**PO(s)**	**PSO(s)**
1.	Identify and practice the human values	Un	6	
2.	Understand the human values, work ethics, respect others and stress management.	Un, Ap	8	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Quiz	Activities (Case study & Survey)	Total Marks
Marks	15+15 = 30	10	10	50
Minimum score to be eligible for SEE: 20 OUT OF 50				

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 50 marks of 1-hour duration.
2.	**Minimum marks required in SEE to pass:** Score should be $\geq$ 35%, however overall score of CIE + SEE should be $\geq$ 40%.
3.	The pattern of the **question paper is MCQ** (multiple choice questions).

CO-PO Mapping (Planned)													**CO-PSO Mapping (Planned)**		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
1						✓									
2								✓							