

SOFTWARE PROJECT MANAGEMENT

Course Code	22IS51	Course type	HSMS	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 (CLOs)

1.	To understand the importance of software project management and the concept of managerial economics.
3.	To plan stakeholders' needs, interpret objectives into work breakdowns structures.
4.	To devise a schedule monitoring evaluate project for its scope, cost, timing and quality.
5.	To apply the methods to calculate requirements of resources, related expenses & time using project management tools.

Required Knowledge of: Software engineering basics

Unit – I: Introduction and Software Project Planning

Contact Hours = 8 Hours

Introduction: Projects meaning, Comparison of project types, Activities of Project Management, Categorizing software projects, Management concerns in software projects, Management controls, stakeholders, requirement specification, Information, and control in organizations.

Unit – II: Software Project Planning

Contact Hours = 8 Hours

Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan

step-wise project planning: select project, identify the project scope and objectives, identification of project infrastructure, analyze project characteristics, identify the project products and activities, estimate efforts for each activity, identify activity risk, allocation of resources, Review and publicize plan, Plan execution.

Unit – III: Project Evaluation & Approaches

Contact Hours = 8 Hours

Evaluation: Strategic assessment, technical assessment, cost-benefit analysis, cash flow forecasting, cost-benefit evaluation technique, projects risk evaluation.

Approaches: Technical plan contents, choice of technologies, choice of process models: Waterfall model, V-process model, Spiral model, selection of appropriate process model, structured methods.

Unit – IV: Resource Allocation and Risk management

Contact Hours = 8 Hours

Resource: Introduction, Nature of resources and categories, identifying resource requirements, Scheduling resources, creating critical paths, Counting the cost, more specific about availability, criticality, risk, training, team building, publishing the resource schedule, Cost schedules, Scheduling sequence.

Risk Management: The nature of risk, managing the risk, Risk identification: Factors to consider application, staff, project type, methods, hardware/software, changeover, supplier, environment, health & safety, Risk analysis, Reducing the risks, Evaluating the risk to schedule, calculating 'z' values.

Unit –V : MANAGERIAL ECONOMICS	Contact Hours = 8 Hours
<p>Introduction: Nature and Scope of Managerial Economics, Objectives of Business Firms, Some Fundamental Concepts and Business Decision Rules, Basic Tools of Economic Analysis and Optimization Techniques, Method of Estimating a Function: The Regression Technique,</p> <p>Theory of Consumer Demand and Demand Forecasting: Analysis of Consumer Demand, Analysis of Market Demand, Elasticity of Demand, Demand Forecasting.</p>	

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	Comparison between project management and software project management.
2	Use of 'Microsoft Project' application for project management.
3	Distributed Software Development and key roles in development team
4	Importance & classification of project resource management, process, methods and Tools

Books	
	Text Books:
1.	Bob Hughes & Mike Cottrell- Software Project Management 2nd Edition- The McGraw-Hill Publishing Company ISBN 0077095057
2.	D.N. Dwivedi- Managerial Economics, 8/e , Vikas Publishing
	Reference Books:
1.	Newton & Richard-Project management step by step: how to plan and manage a highly successful project: Willy's Publications 2020
2.	Russ J. Martinelli, Dragan Z. Milosevic- Project Management Tool Box: Tools and Techniques for the Practicing Project Manager, 2nd Edition.
3.	S Choudhury- Project Management - Mc Graw Hill Education (India) Pvt. Ltd. New Delhi, 2016
	E-resources:
1.	Project Mgmt. 8 weeks course Link: https://onlinecourses.nptel.ac.in/noc19_mg30/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.	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 the basic concepts of managerial economics	Un	1,12	2,3
2.	Describe the importance of Project Management during different phases of software development and plan the sequence of software project management activities.	Ap	1,11,12	1,2,3
3.	Compare and differentiate organization structures and project structures.	Ap	1,12	1,2,3
4.	Analyze the use cases against a project schedule, expenses and available resources using suitable project management tools also detect & classify the types of risk associated with projects and suggest methods to alleviate using risk break down structure.	An	1,11,12	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:

- 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
- 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	Understand Stakeholders' Requirements	Software Development	Project Manager / Project Executive
2	Counsel project objectives	Business / Commercial domain	Business Development Executive / Team leader
3	Devise project structures and associated activities	Academic / Education	Committee head / Team Leader /counselor / advisor

INTERNET OF THINGS

Course Code	22IS52	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 design embedded system using microcontroller and peripheral circuit
2.	To demonstrate technique of interfacing the sensors and actuators with IoT development boards.

Required Knowledge of: Programming Knowledge

Unit – I	Contact Hours = 8 Hours
Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process. Instruction Sets, CPUs: Preliminaries, ARM Processor - Introduction, Preliminaries.	

Unit – II	Contact Hours = 8 Hours
Introduction to Internet of Things: Definition and Characteristics of IoT, physical design of IoT, IoT Protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.	

Unit – III	Contact Hours = 8 Hours
Prototyping IoT: IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices, Standard Devices. Software, Technology & Protocols. Domain Specific IoTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	

Unit – IV	Contact Hours = 8 Hours
IoT Architecture and Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model. Protocols- 6LowPAN, RPL, CoAP, MQTT.	

Unit – V	Contact Hours = 8 Hours
Case Study: smart home, smart office, medicines, sports, transportation, Agriculture IoT, Architecture	

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
I	2	Blinking LED / LEDs Controlling electromagnetic relay / relays
II	2	Temperature sensor. Humidity sensor.
III.	2	PIR Human Motion Detection. Ultrasound distance Measurement
IV	1	Bluetooth module – wireless connectivity.
V	1	Device and web / cloud connectivity.

Unit No.	Self-Study Topics
1	IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices, Standard Devices. Software.
2	CPU Power Consumption.
3	Basics of Sensors and actuators.
4	Device Discovery capabilities – Registering a device, De-register a device, Querying for devices, Intel IoTivity, XMPP Discovery extension.

Books	
	Text Books:
1.	Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008 onwards.
2.	Arshdeep Bahga, Vijay Madiseti, “Internet of Things (A Hands-on-Approach)” , 1st Edition, VPT, 2014 onwards.
3.	Internet of Things Quick Guide – PDF https://www.tutorialspoint.com/internet_of_things/internet_of_things_quick_guide.htm
	Reference Books:
1.	Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012 onwards.
2.	Marco Schwartz, “Internet of Things with Arduino: Build Internet of Things Projects With the Arduino Platform”, [publisher]
	E-resources:
1.	https://blp.ieee.org/courses/sensor-networks-for-internet-of-things/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Assignment (OA)/ Lab Project/ Industry assignment/Certification/ Course project
3.	Flipped Classes	3.	Lab Test
4.	Practice session/Demonstrations in Labs	4.	Semester End Examination
5.	Virtual Labs		

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 fundamental principles and methodologies of IoT.	Un, Ap	2,3	1
2.	Analyze IoT protocols and communication models to ensure efficient IoT systems.	Un, An	2,3,5	1
3.	Evaluate hardware and software solutions for IoT applications, considering domain-specific requirements.	Ev	2,3,5,10	2
4.	Apply the learnings through a course activity.	Ap	9,10	1

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 $\geq 40\%$.
3.	Question paper contains three parts A, B and C . Students have to answer <ol style="list-style-type: none"> 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									✓	✓			✓		

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Communication	Telecommunication	Project manager
2	Networking	Automobiles	Network Designer

COMPUTER NETWORKS AND SECURITY

Course Code	22IS53	Course type	PCC	Credits L-T-P	4 – 0 - 0
Hours/week: L - T- P	4 – 0 – 0			Total credits	4
Total Contact Hours	L = 40 Hrs; T = 0 Hrs; P = 0 Hrs Total = 40 Hrs			CIE Marks	100
Flipped Classes content	5 Hours			SEE Marks	100

Course Learning Objectives	
1.	To understand the concept of application layer protocols.
2.	To discuss transport layer services and understand UDP and TCP protocols.
3.	To explain the concept of routers, IP and Routing Algorithms in network layer.
4.	To demonstrate the error detection and correction at link layer.

Pre-requisites: Fundamentals of basic mathematics, Data Structures and algorithms, Operating systems.

Unit – I	Contact Hours = 8 Hours
Introduction to Computer Networks and the Internet: What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models	

Unit – II	Contact Hours = 8 Hours
Application Layer and Network Security: Principles of Network Applications, Cookies, Web Caches, File Transfer: FTP Commands and Replies, Electronic Mail in the Internet, DNS Name Resolution, DNS Records, Peer-to-Peer Applications-Bit Torrent File distribution protocol. The RSA algorithm: Description of the algorithm, The security of RSA, Deffie Heillman Key Exchange Algorithm.	

Unit – III	Contact Hours = 8 Hours
Transport Layer and Public-Key Cryptography: Introduction and Transport-Layer Services, Connectionless Transport: UDP, Principles of Reliable Data Transfer: Go Back-N and Selective Repeat, Connection-Oriented Transport: TCP. Principles of public-key cryptosystems. Public key cryptosystems. Applications for public-key cryptosystems, Requirements for public key cryptography.	

Unit – IV	Contact Hours = 8 Hours
The Network layer: Introduction, Virtual Circuit and Datagram Networks, What’s Inside a Router? The Internet Protocol (IP): Forwarding and Addressing in the Internet.	

Unit – V	Contact Hours = 8 Hours
The Link Layer: Links, Access Networks, and LANs: Introduction to the Link Layer, Error Detection and Correction Techniques, Multiple Access Links and Protocols, Introduction to Link Virtualization and Data Center Networking.	

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
5	Introduction to Link Virtualization

Books	
	Text Books:
1.	James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .
2.	Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER
3.	William Stallings, Cryptography and Network Security, Pearson 6th edition.
	Reference Books:
1.	Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2.	Andrew S Tanenbaum and David Wetherall, Computer Networks, Fifth Edition Pearson
	E-resources:
1.	https://nptel.ac.in/courses/106105081/

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 Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1	Explain the various application layer protocols, performance parameters and algorithms to provide secure communication.	Un	1,2,10	1,2

2	Apply the principles of reliable data transfer and security mechanisms to ensure data integrity and flow control.	Ap	1,2,10	2
3	Analyze QOS factors that contribute in enhancing the network performance in real time scenario.	An	1,2,10	1,2,3
4	Apply the learning through course activity	Ap	10	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	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	✓	✓								✓			✓	✓	
2	✓	✓								✓				✓	
3	✓	✓								✓			✓	✓	✓
4										✓			✓		

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Analytical Skills	Software Engineer	Network administrator
2	Programming skills	Software Developer	Network architect

DATA MINING AND WAREHOUSING

Course Code	22IS541	Course type	PEC	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.	Define multi-dimensional data models.
2.	Explain rules related to association, classification, and clustering analysis.
3.	Compare and contrast between different classification and clustering algorithms.

Pre-requisites: Engineering Mathematics (Statistics), DBMS

Unit – I

Contact Hours =7 Hours

Introduction to Data Mining: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.

Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

Unit – II

Contact Hours = 7 Hours

Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest neighbour Classifiers, Bayesian Classifiers.

Unit – III

Contact Hours = 10 Hours

Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical 8 Hours Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.

Unit – IV

Contact Hours = 8 Hours

Data Warehousing & Modeling: Basic Concepts, Data Warehousing, A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.

Unit – V

Contact Hours = 8 Hours

Data warehouse implementation Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP.

Flipped Classroom Details:

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

Books	
Text Books:	
1.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression, 2014.
2.	Jiawei Han, Micheline Kamber, Jian Pei: Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.
Reference Books:	
1.	Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson, Tenth Impression, 2012.
2.	Michael J. Berry, Gordon S. Linoff: Mastering Data Mining, Wiley Edition, second edition, 2012.
E-resources:	
1.	NPTEL Course: https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2.	Swayam Course: https://onlinecourses.swayam2.ac.in/cec19_cs01/preview

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 Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Identify data mining problems and design data Warehouse Model.	Un,Ap	1,2,3,10	1
2.	Construct association rules for given data patterns.	Un,Ap	1,2,3,10	1
3.	Compare classification and clustering techniques using real world scenarios.	Ap	3,10	2
4.	Design solutions for real-world problems related to the domain of Data Mining and warehousing and present effectively.	Ap	1,3,9,10,12	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:				
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Eligibility for SEE:				
<ul style="list-style-type: none"> - 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. 				

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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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	Design and implementation of efficient Data Warehouse and Data Mining application as per user specifications	IT Sector/Software Industry	Software Engineer/ Data Engineer

OBJECT ORIENTED MODELLING AND DESIGN

Course Code	22IS542	Course type	PEC	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 bring out key features and objectives of object-oriented software development.
2.	To study and understand UML notations as applicable to different software development stages.
3.	To model a system for real world problems using UML diagrams.

Pre-requisites: Knowledge of problem solving and software engineering fundamentals

Unit – I	Contact Hours = 8 Hours
Introduction, Modeling Concepts, Class Modeling: Introduction to Object Orientated (OO) development. OO themes; OO modeling history Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and Inheritance; Advanced object and class concepts; Association ends; N-ary associations; Aggregation.	

Unit – II	Contact Hours = 8 Hours
State Modeling, Advanced State Modeling: State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model;	

Unit – III	Contact Hours = 8 Hours
Interaction Modeling, Advanced interaction Modeling: Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models	

Unit – IV	Contact Hours = 8 Hours
Domain Analysis: Overview of domain analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.	

Unit – V	Contact Hours = 8 Hours
Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.	

Flipped Classroom Details

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

Books	
	Text Books:
1.	Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, Pearson Education, 2nd Edition and onwards.
2.	Grady Booch, James Rumbaugh, Ivar Jacobson, “Unified Modeling Language User Guide”, Publisher: Addison Wesley.
	Reference Books:
1.	Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3 rd Edition, Pearson Education, 2007 and onwards.
2.	Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009 and onwards.
	E-resources
1.	https://nptel.ac.in/courses/106105153/

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 Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Identify and explain different UML notations for a given problem.	Re, Un	1, 2	1
2.	Explain and Apply UML notation to model real world problems at the different stages of development.	Un, Ap	3, 5	2
3.	Perform a domain and application analysis for given real world problem.	An	3, 4, 5	2, 3

4.	Apply the learnings through a course activity.	Ap	9,10	1
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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:				
<ul style="list-style-type: none"> - 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	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	Apply and adapt agile tools and techniques in the software development lifecycle from product ideation to deployment	IT sector	Software Engineer

UNIX SYSTEM PROGRAMMING

Course Code	22IS543	Course type	PEC	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 Unix and POSIX File System
2.	To develop the ability to handle processes and its related functionalities.
3.	To apply inter process communication using various methods of inter process communication
4.	To give basic knowledge about UNIX signals handling.

Pre-requisites: Operating Systems, Basic Knowledge of data Structure

Unit – I	Contact Hours = 8 Hours
File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.	

Unit – II	Contact Hours = 8 Hours
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, FIFO File APIs. UNIX PROCESSES: UNIX Kernel Support for Processes, Process APIs, Process Attributes, Change Process Attributes, A Minishell Example	

Unit – III	Contact Hours = 8 Hours
Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, waited, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, PROCESS RELATIONSHIPS: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal.	

Unit – IV	Contact Hours = 8 Hours
Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, SignalMask, sigaction, The SIGCHLD Signal and waitpid API, The sigsetjmp and siglongjmp Functions, kill, alarm, Interval Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client Server Model.	

Unit – V	Contact Hours =8 Hours
Inter-process Communication: Introduction, Pipes, popen and pclose Functions, Co processes, FIFOs, Message Queues, Semaphores, Shared Memory. Vulnerabilities in UNIX programming: Understanding Linux Kernel Vulnerabilities, Classification, Vulnerabilities Distribution.	

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
I	Application Program Interface to Files.
III	UNIX Kernel Support for Processes.
V	Socket Descriptors.

Books	
	Text Books:
1.	Terrence Chan: UNIX System Programming Using C++, Prentice Hall India, 1999 and onwards.
2.	W. Richard Stevens, —Advanced Programming in the UNIX Environment , Pearson Education, 2nd Edition and onwards.
	Reference Books:
1.	W. Richard Stevens, Bill Fenner, Andrew M. R., —UNIX® Network Programming The Sockets Networking API , Volume 1, Prentice Hall India, 2nd edition and onwards.
2.	Marc J. Rochkind, Advanced Unix Programming, Pearson Education, 2nd Edition/2005.
	E-resources:
1.	https://www.udemy.com/

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Assignment (OA)/ Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	4.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Describe the need for standardizing the UNIX Environment.	Un	1,2	1
2.	Apply appropriate file API s and signal related API sto solve the given problem.	Ap	1,2,3	1,2
3.	Demonstrate inter-process communication using different IPC structure .	Ap	1,2,3	1
4.	Understand the learnings inculcated throughout the course and present a course seminar or develop a course project.	Re,Un,Ap	1,2,3,9,10,12	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:

- 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
- 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 <ol style="list-style-type: none"> 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)		
C O	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	✓	✓	✓						✓	✓		✓	✓	✓	✓

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Apply appropriate Unix APIs to solve the given problem.	IT Sector/Software Industry	Software Engineer

FORMAL LANGUAGES AND AUTOMATA THEORY

Course Code	22IS544	Course type	PEC	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 study abstract computing machines
2.	To employ finite state machines to solve problems in computing
3.	To discuss the hierarchy of regular languages and expressions arising in the problem statements
4.	To understand Turing theory and its significance

Pre-requisites: Basic knowledge of problem solving and Discrete mathematics

Unit – I	Contact Hours = 8 Hours
Introduction to Finite Automata: Introduction to Finite Automata, Structural Representation. The central concepts of Automata theory – Alphabet, Strings & Languages. Deterministic Finite Automata (DFA), Non-Deterministic and Equivalence of NFA and DFA,	

Unit – II	Contact Hours = 8 Hours
Regular Expressions and languages: Regular Expressions, Finite Automata and Regular Expressions, Properties of Regular Languages (RL): Proving Languages not to be Regular. Equivalence and Minimization of Automata.	

Unit – III	Contact Hours = 8 Hours
Context-Free Grammars (CFG) and Languages (CFL): Context-Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. Normal forms for Context Free Grammar.	

Unit – IV	Contact Hours = 8 Hours
Pushdown Automata (PDA): Definition of Pushdown Automata, The languages of a PDA: Acceptance by Final state & Empty stack.	
Introduction to Turing Machines (TM): Turing Machine model: Definition of Turing Machine, Transition Function, Instantaneous Description & Moves, Programming a Turing Machine, Language recognition by Turing Machine.	

Unit – V	Contact Hours = 8 Hours
LEX and YACC Tools: The Simplest Lex Program, Recognizing Words with Lex. Grammars: Parser- lexer communication, A Yacc Parser, Rules section. Running Lex and Yacc and examples Using Lex: Regular Expressions and examples. Using Yacc: Shift reduce parsing, Arithmetic Expressions and Ambiguity.	

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	FA with Epsilon (ϵ) transitions and Applications of Finite automata
2	Closure properties of Regular Languages and Applications of Regular Expressions
3	Pumping lemma for Context Free Languages.

Books	
	Text Books:
1.	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 2021.
	Reference Books:
1.	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman , “Compilers Principles, Techniques and Tools”, Pearson Education , 2 / E, 2021
	E-resources:
1.	https://archive.nptel.ac.in/courses/106/106/106106049/
2.	https://nptel.ac.in/courses/106105196

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 Assignment (OA)/ Certification
4.	Online classes	4.	Course Project
		5.	Semester End Examination

Course Outcome (COs)				
At the end of the course, the student will be able to				
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create		Learning Level	PO(s)	PSO(s)
1.	Elaborate on concept of abstract automata machines to recognize the given language.	Un	1,2, 10	1
2.	Design the Automata to recognize the input concerned with grammar and language statements.	An	1,2,10	1

3.	Design the programs to implement lexical analyzer and parser associate the same with automata machines.	Un, Ap	1,2,3, 5,10	1,2
4.	Utilize Automata theory and Formal languages to build an application considering real world problem.	Ap	1,2,3,5,10	1,2

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:

- 10 marks questions in Part A of IA question paper should include an OBE related question (max 2 marks).
- 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 <ol style="list-style-type: none"> 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	✓	✓	✓		✓					✓			✓	✓	

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Communication, Design skills, usage of Tools	System Software, Tools operations	Software Design

ADVANCED JAVA

Course Code	22IS545	Course type	PEC	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 = Hrs; P = 20 Hrs Total = 50 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives

1.	To introduce different ways of handling streams related with file input and output.
2.	To provide knowledge of multithreaded concepts and its applications.
3.	To familiarize JDBC to interact with applications.
4.	To demonstrate fundamental concepts of swing applications.

Required Knowledge of : Java programming concepts

Unit – I

Contact Hours = 8 Hours

Java I/O: Byte streams and Character streams, The Byte Stream classes, The Character Stream classes, Predefined streams, Using Java's Type Wrappers to Convert Numeric Strings.

Unit – II

Contact Hours = 8 Hours

File I/O: Reading and Writing Files using Byte Streams, Automatically closing a file, Reading and Writing Binary data, Random-Access Files, Using Java's Character-based Streams

Unit – III

Contact Hours = 8 Hours

Multithreaded Programming: Multithreading Fundamentals, The Thread class and Runnable interface, Creating a thread, Creating multiple threads, Determining when a thread ends, Thread Priorities, Synchronization, Using Synchronized Methods, The synchronized statement, Thread communication using notify(), wait() and notifyall(), Suspending,

Unit – IV

Contact Hours = 8 Hours

JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing - commit(), rollback(), SavePoint.

Unit – V

Contact Hours = 8 Hours

Introducing Swing: The Origin of Swing, Swing Is Built on AWT, Two Key Swing Features, The MVC Connection, Components and Containers, The Swing Packages, A Simple Swing Application, Event Handling, Painting in Swing, Exploring Swing : JLabel and ImageIcon, JTextField, The Swing Buttons- JButton, JToggleButton, CheckBoxes, Radio Buttons

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	Stream classes in Java, type wrappers
2	2	Reading and writing binary operations in Java, File I/O operations in Java.
3	2	Multithreading, Synchronization in Java
4	1	JDBC packages in Java.
5	1	Java Swings.

Unit No.	Self-Study Topics
1	Using Byte Streams
2	File I/O using Character Streams,

Books	
	Text Books:
1.	Herbert Schildt and Dale Skrien, "Java Fundamentals A Comprehensive Introduction", TMH. Special Indian edition.
	Reference Books:
1.	Y. Daniel Liang , "Introduction to JAVA Programming", Pearson's , Seventh Edition
	E-resources:
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests- Theory & Lab based
2.	PPT and Videos	2.	Project phase 1 & 2
3.	Flipped Classes	3.	SEE- Project evaluation
4.	Practice session/Demonstrations in Labs	4.	SEE- Solving an Open-ended problem
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.	Interpret the need for Advanced Java concept of streams to provide modular and efficient applications.	Un	1,3	1
2.	Build multi-threaded applications and synchronize them.	Un, Ap	1,3	1
3.	Apply JDBC concepts and utilize swings to provide better GUI.	Ap	1,3,5,10	1
4.	Model the use of object oriented application considering real world problem.	Ap	1,3,5,10	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	10 marks			
	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.	30 marks			
	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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	✓		✓										✓		
2	✓		✓										✓		
3	✓		✓		✓					✓			✓		
4	✓		✓		✓					✓			✓	✓	

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Communication, Design skills, usage of Tools.	Software, Tools operations.	Application development

RESEARCH METHODOLOGY AND IPR

Course Code	22IS56	Course type	AEC	Credits L-T-P	2-0-0
Hours/week: L-T-P	2-0-0			Total credits	2
Total Contact Hours	L = 30 Hrs; Total = 30 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives

1.	Understand the basic concepts of research and its methodologies
2.	Identify and select the appropriate research.
3.	Understand the basic concepts & types of hypotheses.
4.	Create the awareness about Intellectual Property Rights for the protection of inventions.

Required Knowledge of: --

Unit – I

Contact Hours = 5 Hours

Research Methodology: Introduction

Meaning, Objectives, types, Research Approaches. Significance of Research, Research Methods versus Methodology, Research and scientific method, research Process, Criteria of good research, Problems encountered by researchers.

Unit – II

Contact Hours = 6 Hours

Research Problem: Defining a research problem, selecting a research problem, necessity and techniques involved in defining the research problem.

Data Collection Methods: Collection of Primary Data, Observation Method, Interview Method, Questionnaires, Schedules, Collection of Secondary Data, Case study method.

Unit – III

Contact Hours = 9 Hours

Processing and Analysis of Data

Processing operations, Elements/ types of analysis, Statistics in research- measures of central tendency or statistical averages, measures of dispersion, measures of asymmetry (skewness), measures of relationship.

Testing of hypothesis 1

Definition, basic concepts, procedure, flow diagram, measuring the power of hypothesis tests, tests of hypothesis.

Chi-square test

Chi-square as a test for comparing variance, steps involved in applying chi-square test.

Unit – IV

Contact Hours = 5 Hours

Intellectual Property Rights – IPR- Invention and Creativity- Intellectual Property-Importance and Protection of Intellectual Property Rights (IPRs)- A brief summary of: Patents, Copyrights,

Trademarks, Industrial Designs- Integrated Circuits-Geographical Indications-Establishment of WIPO-Application and Procedures. Research ethics, Plagiarism, Prior art search.

Unit – V	Contact Hours = 5 Hours
Interpretation and Report Writing: Meaning of interpretation, Why interpretation, Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Mechanics of writing research report.	

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	Significance of Research Methodology.
2	Limitations of test of hypothesis.
3	Other measures-Index numbers, Time series analysis.

Books	
	Text Books:
1	C R. Kothari, “ Research Methodology ”, New Age International Publishers, 2 nd edition, 2007.
2	Dr. B.L. Wadhwa, “ Intellectual Property Rights ”, Universal Law Publishing Co. Ltd.. 2002
	Reference Books:
1	Panneer Selvam, “ Research Methodology ”, PHI Learning Pvt. Ltd., 2007.
	E-resources:
1	https://onlinecourses.swayam2.ac.in/cec20_ge37

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Open Assignments (OA)
3.	Flipped Classes	3.	Case studies
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 select an appropriate methodology for research.	Un	1,2,9,10	1
2	Analyze and interpret data collected.	Ap	1,2,9,10	1
3	Analyze the significance of hypothesis testing.	An	1,2,9,10	1

4	Discuss the significance of Intellectual Property Rights & report writing.	Ap	1,2,3,9,10,12	1,2,3
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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: <ul style="list-style-type: none"> - 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 <ol style="list-style-type: none"> 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	✓	✓							✓	✓			✓		
2	✓	✓							✓	✓			✓		
3	✓	✓							✓	✓			✓		
4	✓	✓	✓						✓	✓		✓	✓	✓	✓

EMPLOYABILITY SKILLS - I

Course Code	22AECIS58A	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 = 30 Hrs; T = 0 Hrs; P = 0 Hrs Total = 30 Hrs			CIE Marks	100

Course Learning Objectives	
1.	Skill development is/are personal attributes that influence how well an individual works or interacts with others.
2.	Skill development is/are personal attributes that influence how well an individual works or interacts with others.
3.	In essence, they are essential for individual success in the workplace, their company's success, and their personal life also

Pre-requisites: NA

Unit – I	Contact Hours = 6 Hours
Quantitative Aptitude: Number System (2 Hours), HCF, LCM and Decimal Fractions (1 Hour), Simplification (1 Hour)	
Logical Reasoning: Blood Relations (1 Hour), Direction Sense Test (1 Hour)	

Unit – II	Contact Hours = 6 Hours
Quantitative Aptitude: Percentages (2 Hours), Profit, Loss and Discounts (2 Hours)	
Verbal Ability: Change of Speech and Voice (2 Hours)	

Unit – III	Contact Hours = 6 Hours
Quantitative Aptitude: Simple and Compound Interest (2 Hours)	
Logical Reasoning: Number and Letter Series (2 Hours)	
Verbal Ability: Sentence Correction (2 Hours)	

Unit – IV	Contact Hours = 6 Hours
Quantitative Aptitude: Averages (2 Hours)	
Logical Reasoning: Coding and Decoding (1 Hour), Analogy (1 Hour)	
Soft Skills: Body Language (1 Hour), Grooming and Etiquette (1 Hour)	

Unit – V	Contact Hours = 6 Hours
Quantitative Aptitude: Alligations and Mixtures (2 Hours)	
Verbal Ability: Sentence Completion (2 Hours)	
Soft Skills: Group Discussion and Mock GDs (2 Hours)	

Books	
	Text Books:
1.	The Aptitude Triad , BIZOTIC
2.	How to prepare for Quantitative Aptitude for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 4 th Edition, 2018.
3.	How to prepare for Logical Reasoning for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.
4.	How to prepare for Verbal Ability and Reading Comprehension for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8 th Edition, 2018.
5.	How to prepare for Data Interpretation for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 5 th Edition, 2018.

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Online Quizzes
		3.	Assignments
		4.	Seminar

Course Outcome (COs)			
At the end of the course, the student will be able to (Highlight the action verb representing the learning level.)			
Learning Levels: Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create	Learning Level	PO(s)	PSO (s)
1. Clear the Aptitude round of recruiters during placements	Un	10, 12	
2. Perform confidently during the GD and Interview process	Un	10, 12	
3. Develop behaviors that are appropriate for a professional	Un	10, 12	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Online Quiz	Addition of two Assignments	Total Marks
Marks	30+30 = 60	20	10+10 =20	100
- Writing 2 IA tests are compulsory				
-Student should score minimum 40% of 100 marks to pass the course.				

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										✓		✓			
3										✓		✓			

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Logical Thinking	IT Industry	Software Engineer
2	Problem Solving	Automotive	Developer
3	Communication Skills	Education Sector	Project Manager

ENVIRONMENTAL STUDIES

Course Code	22IS57	Course type	MC	Credits L-T-P	2-0-0
Hours/week: L-T-P	2-0-0			Total credits	2
Total Contact Hours	L = 30 Hrs; Total = 30 Hrs			CIE Marks	100
Flipped Classes content	05 Hours			SEE Marks	100

Course Learning Objectives	
1.	To understand the scope of Environmental Engineering.
2.	Identify the Environmental impact due to Human activities.
3.	Identify the renewable and non-renewable sources of energy.
4.	To understand the concept of Disaster Management.
5.	Identify the various Legal aspects in Environmental Protection.

Required Knowledge of : Nil

Unit – I	Contact Hours = 6 Hours
<p>Definition of Environment, Ecology and Ecosystem, Structure and functions of ecosystem, balanced ecosystem, Introduction to Environmental Impact Assessment</p> <p>Natural Resources: Material Cycles – Oxygen, Carbon, Nitrogen and Hydrological cycle. Importance of water quality, Water borne diseases, Water induced diseases, Significance of Fluoride in drinking water.</p>	

Unit – II	Contact Hours = 6 Hours
<p>Energy – Different types of energy, Conventional and Non – Conventional sources – Advantages and Limitations of Wind Mills, Hydro Electric, Fossil fuel, Nuclear, Solar, Biomass and Biogas, Geothermal energy.</p>	

Unit – III	Contact Hours = 6 Hours
<p>Disasters – Natural Disasters: Meaning and nature of natural disasters, their types and effects (Floods, drought, cyclone, earthquakes, Tsunami). Man Made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution and marine pollution.</p>	

Unit – IV	Contact Hours = 6 Hours
<p>Disaster Management: International strategy for disaster reduction. Concept of disaster management and national disaster management framework.</p>	

Unit – V	Contact Hours = 6 Hours
Environmental Protection: Role of Government, Legal aspects, Initiatives by Non – Governmental Organizations (NGO), Environmental Education, Women Education. E-waste and solid waste management rules.	

Flipped Classroom Details

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

Books	
Text Books:	
1.	Benny Joseph, “ Environmental Studies ”, Tata McGraw – Hill Publishing Company Limited (2005).
2.	Sanjay K. Sharma, “ Environment Engineering and Disaster Management ”, USP (2011).
3.	Harsh K. Gupta, “ Disaster Management ”, Universities Press (India) Pvt. Ltd (2003).
4.	Ranjit Daniels R.J. and Jagdish Krishnaswamy, “ Environmental Studies ”, Wiley India Private Ltd., New Delhi (2009).
Reference Books:	
1.	Meenakshi P., “ Elements of Environmental Science and Engineering ”, Prentice Hall of India Private Limited, New Delhi (2006).
2.	Tyler Miller Jr. G., “ Environmental Science – Working with the Earth ”, Tenth Edition, Thomson Brooks/Cole (2004).

Course delivery methods		Assessment methods	
1.	Chalk and Talk	1.	IA tests
2.	PPT and Videos	2.	Assignment-Open/Industry/Certification
3.	Flipped Classes	3.	Course Project
4.	Online classes	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.	Understand the importance of the Environment and different sources of energy and energy crises.	Un	6,7	1
2.	Understand various environmental disasters and its management.	Ap	6,7	1

3.	Understand the various Legislations related to Environment.	Un	6,7	1
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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1						✓	✓						✓		
2						✓	✓						✓		
3						✓	✓						✓		

COMPUTER NETWORKS LAB

Course Code	22ISL59	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
				SEE Marks	50

Course Learning Objectives	
1.	To understand the concept of application layer protocols.
2.	To discuss transport layer services and understand UDP and TCP protocols.
3.	To implement secure ways to exchange keys
4.	To employ encryption techniques to secure data in transit across data networks

Required Knowledge of: Operating System
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Lab Experiment – 1	Contact Hours = 2 Hours
Introduction to computer networks and physical media	
Lab Experiment – 2	Contact Hours = 2 Hours
Application Network Security	
Lab Experiment – 3	Contact Hours = 2 Hours
Transport Protocol	
Lab Experiment – 4	Contact Hours = 2 Hours
Key Exchange algorithm	
Lab Experiment – 5	Contact Hours = 2 Hours
Congestion control Algorithm	
Lab Experiment – 6	Contact Hours = 2 Hours
Error detection technique.	
Lab Experiment – 7	Contact Hours = 2 Hours
Symmetric Cipher	
Lab Experiment – 8	Contact Hours = 2 Hours
Asymmetric Cipher	

Books	
	Text Books:
1.	James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson, 2017 .
2.	William Stallings, Cryptography and Network Security, Pearson 6th edition.

E-resources	
1.	https://nptel.ac.in/courses/106105031
2.	https://nptel.ac.in/courses/106105081

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.		4.	Lab Test
5.		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.	Differentiate between connection Oriented and Connectionless Service		An	1,2,5,10	1
2.	Compare different types of Encryption Techniques.		Un	1,2,10	1,3
3.	Perform error detection and correction at link layer.		Ap	1,2,10	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 $\geq 35\%$, however overall score of CIE+SEE should be $\geq 40\%$.		
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	✓	✓											✓		
2	✓	✓											✓		✓
3	✓	✓											✓		

SI No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Analytical Skills	Software Engineer	Network administrator
2	Programming skills	Software Developer	Network architect