

Bachelor of Technology (Computer Science & Engineering)										
Credit-Based Scheme of Studies/Examination										
Semester VIII (w.e.f. session 2021-2022)										
S. No	Course Code	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	PE	Elective-VI	3:0:0	3	3	75	25	0	100	3
2	OE	Open Elective-III	2:0:0	2	2	75	25	0	100	3
3	OE	Open Elective-IV	2:0:0	2	2	75	25	0	100	3
4	PROJ-CS-402A	Project-III	0:0:12	12	6	0	40	60	100	3
5	PE-LA	Elective-VI Lab	0:0:4	4	2	0	40	60	100	3
		Total		23	15	225	155	120	500	

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE Elective-VI	
Cloud Computing: PE-CS-A402A	
Computer Graphics: PE-CS-A404A	
Software Reliability: PE-CS-A406A	
Mobile Apps Development: PE-CS-A408A	
OE Elective-III	OE Elective-IV
Cyber Security: OE-CS-402A	Web and Internet Technology: OE-CS-410A
Satellite Communication: OE-CS-404A	Automation in Manufacturing: OE-CS-412A
Social Networks Analysis & Mining: OE-CS-406A	IPR, Bioethics and Biosafety: OE-CS-414A
Agile Software Engineering: OE-CS-408A	Signal & Systems: OE-CS-416A

PE-CS-A402A	Cloud Computing						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	To familiar the concepts of cloud services and storage to deploy various resources and arbitrary software.						
Course Outcomes (CO)							
CO1	Summarize main concepts, key technologies, strengths and limitations of Cloud Computing.						
CO2	Explore various cloud service and deployment models to utilize different cloud services.						
CO3	Interpret various data, scalability & cloud services in order to get efficient database for cloud storage.						
CO4	To deal with various security threats and their controlling mechanism for accessing safe cloud services.						

Unit-I

Overview of Computing Paradigm: Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, evolution of cloud computing, Business driver for adopting cloud computing. Cloud Computing (NIST Model): History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards.

Unit-II

Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Cloud Architecture and open source.

Unit-III

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data- Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing, Cloud management with Puppet.
Case study: Eucalyptus, Microsoft Azure, Amazon EC2.

Unit-IV

Cloud Security: Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage, Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations, DROPS: Division and Replication of data in Cloud for Optimal Performance and Security.

Suggested Books:

- Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
- Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.
- Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.
- Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010.

PE-CS-A404A	Computer Graphics						
Lecture	Tutorial	Practical	Credit	MajorTest	MinorTest	Total	Time
3	0	0	3	75	25	100	3 Hour
Purpose	Introduces Computer Graphics that help in designing different kinds of static and movable objects.						
Course Outcomes							
CO 1	Explore the background and standard line and circle drawing algorithms.						
CO 2	Exposure of various transformation approaches and its comparative analysis.						
CO 3	Illustrate Projection and clipping with explore different techniques.						
CO 4	Apply design principles to create different curves and explore hidden lines and surface techniques.						

Unit-I

Computer Graphics applications, Display Devices, Point & Positioning Devices, Plotting Techniques for point and Line, Line drawing algorithms: DDA, Bresenham's Circle drawing algorithms, Filled area algorithms: Scan line, Polygon filling algorithms, Boundary filled algorithms.

Unit-II

Window to view port transformation, Window to view port mapping, Two Dimensional transformation: translation, scaling, rotation, reflection and Shear, Homogeneous Coordinate system. 3-D transformation: Rotation, Shear, translation, Numerical Problems of transformation viewing pipeline.

Unit-III

Clipping: Point & Line clipping algorithm, 4-bit code algorithm, Cohen-Sutherland Line clipping algorithms, Liang-Barsky line clipping algorithms. Polygon clipping: Sutherland-Hodgeman Polygon clipping algorithm. Curve clipping, Text clipping. Projection: Parallel, Perspective, Vanishing Points.

Unit-IV

Representation of 3-D Curves and Surfaces: interpolation and approximation alphas, parametric conditions, Geometric continuity conditions, Bezier curves and surfaces: properties of beizer curves, beizer surfaces.

Hidden Surfaces removal: Hidden surface elimination, depth buffer algorithm, scan line coherence and area coherence algorithm, painter's algorithm

Suggested Books:

- Donald Hearn & M.Pauline Baker, Computer Graphics, 2nd Edition, Pearson Education.
- William M. Newmann & Robert F. Sproull, Principles of Interactive Computer Graphics, Tata McGraw-Hill Second Edition, New Delhi, India.
- Zhigang Xiang & Roy A Plastock , Computer Graphics, Second Edition, Schaum's Outline, Tata McGraw Hill Education Private Limited, New Delhi, India.
- Foley, van Dam, Feiner, and Hughes. Computer Graphics: Principles and Practice, 3rd edition in C.
- Hearn, D. Basker, Computer Graphics, Prentice Hall

PE-CS-A406A	Software Reliability						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	In this course the student will understand the working of software reliability models and reliability prediction models, and able to design and develop reliability models.						
Course Outcomes(CO)							
CO1	Develop reliable software systems.						
CO2	Understand the fault handling and failure forecasting techniques in software systems.						
CO3	To learn different time dependent and time independent software reliability models and design reliability models for software systems.						
CO4	Design reliability models for software systems.						

UNIT I

Basic Ideas of Software Reliability, Hardware reliability vs. Software reliability, Reliability metrics, Failure and Faults – Prevention, Removal, Tolerance, Forecast, Dependability Concept – Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk.

UNIT II

Computation of software reliability, Functional and Operational Profile, Operational Profiles – Difficulties, Customer Type, User Type, System Mode, Test Selection - Selecting Operations, Regression Test.

UNIT III

Classes of software reliability Models, Time Dependent Software Reliability Models: Time between failure reliability Models, Fault Counting Reliability Models. Time Independent Software Reliability Models: Fault injection model of Software Reliability, Input Domain Reliability Model, Orthogonal defect classification, Software availability Models. Software Reliability Modeling: A general procedure for reliability modeling.

UNIT IV

Short and Long Term Prediction, Model Accuracy, Analysing Predictive Accuracy – Outcomes, PLR, U and Y Plot, Errors and Inaccuracy, Recalibration – Detecting Bias, Different Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements.

Suggested Books

1. J.D. Musa, *Software Reliability Engineering*, McGraw Hill, New York , 2004
2. H. Pham, *Software Reliability*, Springer Verlag, New York , 2000
3. Patric D. T.O Connor, *Practical Reliability Engineering, 4th Edition*, John Wesley & Sons , 2003
4. D. Reled, *Software Reliability Methods*, Springer Verlag, New York , 2001

PE-CS-A408A	Mobile Apps Development						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	To introduce the concepts of developing the mobile applications.						
Course Outcomes (CO)							
CO1	Be exposed to technology and Mobile apps development aspects.						
CO2	Be competent with the characterization and architecture of mobile applications.						
CO3	Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.						
CO4	Perform testing, signing, packaging and distribution of mobile apps.						

Unit I

Introduction to Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the Mobile App Development environment along with an Emulator.App User Interface Designing – Mobile UI resources (Layout, UI elements, Drawable, Menu).

Unit II

Building blocks of Mobile Apps: Activity- States and Life Cycle, Interaction amongst Activities. App functionality beyond user interface - Threads, Async task, Services – States and Life Cycle, Intents: concept, types, Use of Intents to transfer various type of data, Notifications, Broadcast receivers, Content provider.

Unit III

Sprucing up Mobile Apps: Fragments: Concept, Use of fragments in Android Apps, Nested Fragments, Graphics and animation – Custom views, Canvas, Animation APIs, Multimedia – Audio/Video playback and record, Location awareness. Native data handling–file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet).

Unit IV

Testing Mobile Apps: Debugging mobile apps, White box testing, Black box testing, and test automation of Mobile apps, JUnit for Android, Testing tools. Loading data using loaders, permissions, performance & security, firebase and admob and publish.

Suggested Books:

- Dawn Griffiths, David Griffiths, Head First Android Development, 2nd Edition, O'Reilly Media, 2017.
- Barry Burd, Android Application Development All in one for Dummies, Wiley publications, 2nd Edition 2015.
- Android Developer Fundamentals Course– Concepts (Learn to develop Android applications) Concepts Reference Developed by Google Developer Training Team, 2016.
- Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.
- Brian Fling, Mobile Design and Development, O'Reilly Media, 2009.
- Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, 2010.

PE—CS-A402AL	Cloud Computing Lab						
Lecture	Tutorial	Practical	Credit	Minor Test	Practical	Total	Time
-	-	4	2	40	60	100	3hrs
Purpose	Design and Implement various mobile applications using emulators and learn how to Deploy applications to hand-held devices.						
Course Outcomes(CO)							
CO1	Know the components and structure of mobile application development frameworks for Android based mobiles.						
CO2	Understand how to work with various mobile application development frameworks.						
CO3	Learn the basic and important design concepts and issues of development of mobile applications.						
CO4	Understand the capabilities of mobile devices.						

List of Practicals

1. Write a program to use the API's of Hadoop to interact with it.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Show the virtual machine migration based on the certain condition from one node to the other.
6. Write a word count program to demonstrate the use of Map and Reduce tasks.
7. Find procedure to set up the one node Hadoop cluster and run simple applications like word count.

PE—CS-A404AL	Computer Graphics Lab						
Lecture	Tutorial	Practical	Credit	Minor Test	Practical	Total	Time
-	-	4	2	40	60	100	3hrs
Purpose	To Design and implement various Line and Circle Drawing Algorithms.						
Course Outcomes(CO)							
CO1	To Implement basic algorithms related to Line & Circle Drawing.						
CO2	Implement various Line & Circle Drawing Algorithms.						
CO3	Hands on experiments on 2-D transformations.						
CO4	Conceptual implementation of Clipping and other drawing algorithms.						

List of Practicals

1. Write a program to implement DDA line drawing algorithm.
2. Write a program to implement Bresenham's line drawing algorithm.
3. Implement the Bresenham's circle drawing algorithm.
4. Write a program to draw a decagon whose all vertices are connected with every other vertex using lines.
5. Write a program to move an object using the concepts of 2-D transformations.
6. Write a program to implement the midpoint circle drawing algorithm any Object Oriented Programming Language like Python, C++, Java.
7. Implement the line clipping algorithm using any Object Oriented Programming Language like Python, C++, Java.
8. Implement boundary fill algorithm using any Object Oriented Programming Language like Python, C++, Java.
9. Implement the depth buffer algorithm using any Object oriented language like Python, C++, Java.
10. Perform the Polygon Clipping Algorithm using any Object oriented language like Python, C++, Java.
11. Draw a Rectangle using Bresenham's and DDA Algorithm using any Object oriented language like Python, C++, Java.

PE—CS-A406AL	Software Reliability Lab						
Lecture	Tutorial	Practical	Credit	Minor Test	Practical	Total	Time
-	-	4	2	40	60	100	3hrs
Purpose	In this course the student will understand the working of software reliability models and reliability prediction models, and able to design reliability models.						
Course Outcomes(CO)							
CO1	To study the computation method for evaluation of software reliability						
CO2	Understand the mechanisms for Evaluation Testing methods in Software Reliability						
CO3	Understand the working of Software Reliability Models						
CO4	To Study and understand procedure of software Reliability Prediction						

List of Practicals

1. To study the Computation of software reliability
2. To implement software Reliability Evaluation Testing methods
3. To understand the working of Functional and Operational Profiles
4. To understand the concept of Time Dependent Software Reliability Models
5. To understand the concept of Time Independent Software Reliability Models.
6. To study Software Reliability Modeling
7. To identify the role of various phases included in software Reliability Prediction
8. To study software Reliability Analyzing Predictive
9. To study software Reliability Recalibration

PE—CS-A408AL	Mobile Apps Development Lab						
Lecture	Tutorial	Practical	Credit	Minor Test	Practical	Total	Time
-	-	4	2	40	60	100	3hrs
Purpose	To understand the components and structure of mobile application development frameworks for Android based mobiles						
Course Outcomes(CO)							
CO1	To understand the components and structure of mobile application Development frameworks for Android based mobiles.						
CO2	To understand how to work with various mobile application development frameworks.						
CO3	To learn the basic and important design concepts and issues of development of mobile applications.						
CO4	To understand the capabilities and limitations of mobile devices.						

List of Practicals

1. Develop an application that uses GUI components, Font and Colors
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Implement an application that implements Multi threading
6. Develop a native application that uses GPS location information.
7. Implement an application that writes data to the SD card.
8. Implement an application that creates an alert upon receiving a message.
9. Write a mobile application that creates alarm clock.
10. Develop a sign-in page with appropriate validation.
11. Develop a real life application that makes use of database.

OE-CS-402A	Cyber Security						
Lecture	Tutorial	Practical	Credit	MajorTest	MinorTest	Total	Time
2	0	0	2	75	25	100	3 Hour
Purpose	To gain a broad understanding in order to get predictive ways out related to cyber security.						
Course Outcomes							
CO 1	To facilitate the basic knowledge of cyber security.						
CO 2	To explore and sort issues related to different types of activities in cyber crime.						
CO 3	To get enable to fix the various cyber attacks.						
CO 4	To deal with the digital forensics and related scenarios of cyber crimes.						

Unit-I

Introduction: Fundamentals of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: crime against individual, Crime against property, Cyber extortion, Drug trafficking, cyber terrorism.

Cryptanalysis-steganography, stream and block ciphers, modern block ciphers: Block cipher principles, Shannon's theory of confusion and diffusion, fiestal structure, Data Encryption Standard (DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES-AES

Unit-II

Integrity checks and authentication algorithms MD5 message digest algorithm, Secure Hash Algorithm (SHA), Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm, authentication application, Kerberos and X.509, directory authentication service, electronic mail security, pretty good privacy (PGP), S/MIME.

Unit-III

Introduction to cyber attacks: passive attacks, active attacks, Cyber crime prevention methods, Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control, Hardware protection mechanisms, OS Security.

Web Security: Secure socket layer and transport layer security-secure electronic transaction (SET)-system security: Intruders-Viruses and related threats, firewall design principles, trusted systems.

Unit-IV

Digital Forensics: Introduction to Digital Forensics, historical background of digital forensics, Forensic Software and Hardware, need for computer forensics science, special tools and techniques digital forensic life cycle, challenges in digital forensic.

Law Perspective: Introduction to the Legal Perspectives of Cybercrimes and Cyber security, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Cybercrime Scenario in India, Digital Signatures and the Indian IT Act, Cybercrime and Punishment.

IP Security: Architecture-Authentication header-Encapsulating security payloads, combining security associations, key management.

Suggested Books:

- Nelson Phillips and Enfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.
- Robert M Slade,” Software Forensics”, Tata McGraw - Hill, New Delhi, 2005.
- Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd.

OE-CS-404A	Satellite Communication						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hrs.
Purpose	To familiarize the students with the concepts of Satellite communication and various terms, laws and multiple access schemes used in its working.						
	Course Outcomes						
CO1	To understand the concept of basics of satellite communication and various basic laws and terms of satellite communication.						
CO2	To understand the concept and processes of various communication satellites used in satellite communication.						
CO3	To familiarize with the concept and design issues of satellite link design and satellite access.						
CO4	To familiarize with the concepts of Multiple access schemes used in satellite communication.						

Unit I

Satellite Orbits: Orbital Mechanics- Kepler's laws ,locating the satellite in the Orbit, locating the satellite with respect to the earth, Orbital elements, look angle determination, Sub satellite point, Azimuth and elevation angle calculation, Orbital perturbations, Longitudinal and Inclination changes; Launches and launch vehicles-ELV's, Placing the satellite into geostationary orbit, Doppler shift, range variations, solar eclipse, sun transit outage.

Unit II

Communication Satellites: Satellite Subsystems, Attitude and Orbit Control system(AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems-description, Transponders, satellite antennas-basic antenna types, basic antennas in practice.

Unit III

Satellite Link Design and Satellite Access: Basic transmission theory, system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit IV

Multiple Access Schemes: FDMA, TDMA, CDMA, DAMA; VSAT systems-basic techniques, VSAT earth station engineering, system design; DBS systems-C-band and Ku band home TV, digital DBS; satellite mobile systems; GPS

Suggested Books:

- Timothy Pratt, Satellite Communications, Wiley India edition
- Anil K Maini, Satellite Communication, Wiley India edition

OE-CS-406 A		Social Networks Analysis & Mining					
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hrs.
Program Objective (PO)	This emerging and innovative field will provide the insight into latest communication techniques used in the online social networks for identifying and representing the relationships and link prediction via the effective combination of graph theory, matrix, clustering, and equivalence between users.						
Course Outcomes (CO)							
CO1	To understand the essentials of social networks by learning link prediction, clustering, community detection and structural relationships among the nodes to determine their relative importance.						
CO2	To explore the detailed explanation of homophily, selection, closure, segregation, relationships and graph creation in an efficient distribution.						
CO3	To analyze the social networks using betweenness, centrality, equivalence relation, centralization, clustering coefficient and structural cohesion, page rank and random graph models to generate visualizations and to perform empirical investigations of network data.						
CO4	To interpret and synthesize the results with respect to modeling epidemics, experimental and generative models and the basic of collated datasets by using equivalence concepts for interpreting complex data to execute better recommendation.						

Unit-I

Introduction to Social Networks, Google Page Rank, Link Prediction, Importance of Acquaintances, Web Graph, Introduction: Emergence of Connectedness, Granovetter's Strength of weak ties, Triads, clustering coefficient and neighborhood overlap, Structure of weak ties, bridges, and local bridges, Emeddedness, Betweenness Measures and Graph Partitioning, Finding Communities in a graph (Brute Force Method), Community Detection Using Girvan Newman Algorithm, Strong and Weak Relationship

Unit-II

Introduction to Homophily, Selection and Social Influence, Foci Closure and Membership Closure, Introduction to Fatman Evolutionary model, Triadic Closure, Spatial Segregation: An Introduction, Schelling Model Implementation, Positive and Negative Relationships – Introduction, Structural Balance, Creating graph, displaying it and counting unstable triangles, Equal Coin Distribution, Random Walk Coin Distribution.

Unit-III

Metrics in social network analysis (Betweenness, Centrality, Equivalence relation, Centralization, Clustering coefficient and Structural cohesion), Diffusion in Networks, Impact of Communities on Diffusion, Cascade and Clusters, Introduction to Hubs and Authorities, Hubs and Authorities, PageRank as a Matrix Operation, Introduction to Power Law, Rich Get Richer Phenomenon, Implementing a Random Graph (Erdos-Renyi Model)

Unit-IV

Rich Get Richer - The Long Tail, Epidemics- An Introduction, Simple Branching Process for Modeling Epidemics, Basic reproductive number, SIR and SIS spreading models, Percolation model, Milgram's Experiment, The Generative Model, Decentralized Search, Basic of Equivalence concepts in Social Networks.

Suggested Books:

1. David Easley and Jon Kleinberg, "Networks, Crowds and Markets", Cambridge University Press.
2. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press.
3. Matthew A. Russell, "Mining the Social Web", O'Reilly and SPD, Second edition New Delhi.

4. Hanneman, R. A., & Riddle, M., "Introduction to social network methods, Riverside, California: University of California, Riverside. Retrieved from <http://faculty.ucr.edu/~hanneman/nettext/>.
5. "Social network analysis: Theory and applications". A free, Wiki Book available at: http://train.ed.psu.edu/WFED-543/SocNet_TheoryApp.pdf.
6. John Scott, Peter J. Carrington, "Social Network Analysis", SAGE Publishing Ltd.

OE-CS-408A	Agile Software Engineering						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hrs.
Purpose	Introduces the business value of adopting Agile approaches and provide complete understanding of the Agile development practices						
Course Outcomes (CO)							
CO1	Understand the background and driving forces for taking an Agile approach to software development.						
CO2	Understand the business value of adopting Agile approaches.						
CO3	Drive development with unit tests using Test Driven Development.						
CO4	Apply design principles and refactoring to achieve Agility.						

Unit I

Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

Unit II

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

Unit III

Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Unit IV

Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

Suggested Books:

- Ken Schawber, Mike Beedle, *Agile Software Development with Scrum*, Pearson publications.
- Robert C. Martin, *Agile Software Development, Principles, Patterns and Practices*, Prentice Hall.
- Lisa Crispin, Janet Gregory, *Agile Testing: A Practical Guide for Testers and Agile Teams*, Addison Wesley.
- Alistair Cockburn, *Agile Software Development: The Cooperative Game*, Addison Wesley.
- Mike Cohn, *User Stories Applied: For Agile Software*, Addison Wesley.

OE-CS-410A	Web and Internet Technology						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hour
Purpose	To learn the architecture and programming of Internet and study of scripting language :Python						
Course Outcomes							
CO 1	To Learn the basic concepts of internet and its connectivity						
CO 2	To Learn about the services of internet , designing and its architecture						
CO 3	To Learn the basic concepts of Python and its applications in information industry						
CO 4	To Acquaint the knowledge of latest programming language for the implementation of object based and procedure based applications using Python.						

Unit-I: Introduction to Internet

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet, The role of Information Architect, Collaboration and communication, Organizing information, Organizing web sites and Intranets, Creating cohesive organization systems, designing navigation systems, types of navigation systems, Integrated navigation elements, Searching systems, Searching your web site, designing the search interface.

Unit-II: Internet Services and Web Publishing

Setting up a connection: Hardware requirement, Selection of a Modem, Software Requirement, Modem Configuration, Common terminologies: Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Servers, Clients, Communication Media, Service options – E-mail, News Firewall, etc.
Introduction to XHTML and HTML5: Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms in HTML, Syntactic Differences between HTML5 and XHTML, Cascading Style Sheets: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, Alignment of Text, Box Model, Background Images.

Unit –III: Introduction of Scripting Language: Python

Introduction to Python: Applications of Python in information industry, Introduction to Python, Data Types, Branching Programs, Control Structures, Array and Input, Iteration. Functions and Scoping: Functions and scoping, Recursion and Global variables. Creation, insertion and deletion of items: Strings, Tuples, Lists and Dictionaries.

Unit –IV: Advanced Python

Classes and Object-Oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding. File Handling, Exceptions Handling, Data base (MySQLdb) operation: file check, table creation, insertion and deletion of data, Regular Expressions – REs in Python and Plotting.

Suggested Books

1. “Information Architecture on the World Wide Web”, By Peter Morville, Louis Rosenfeld, O'Reilly Media, 2006.
2. “Programming The World Wide Web”, By Robert W. Sebesta, 8th Edition, Pearson India, 2015.
3. “The Fundamentals of Python: First Programs”, By Kenneth A. Lambert, 2011, Cengage Learning.
4. “Python: The Complete Reference”, By Martin C. Brown, Paperback March 2018
5. “Core Python Programming”, by R. Nageswara Rao, Dreamtech Publication, 2018

OE-CS-412A	Automation in Manufacturing						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hour
Purpose	The purpose of this course is to impart knowledge of production automation, Robotics, flexible manufacturing, CNC programming, material handling and automated storage systems.						
Course Outcomes							
CO 1	To explain the role of automation in manufacturing and Robotics in industry.						
CO 2	To describe the group technology and flexible manufacturing techniques in the automated production line and manufacturing system.						
CO 3	To explain computer aided process planning and shop floor manufacturing activities.						
CO 4	To develop CNC programs and understand the concept automated guided vehicle and automated storage system in material handling						

Unit I

Introduction: Production system, automation in production system, manual labour in production system, automation principle and strategies, manufacturing industries and products, manufacturing operations, product facilities, product/production relationship, basic elements of an automation system, advance automation function, level of automation.

Industrial Robotics: Robot anatomy and related attributes, joint and links, common robot configuration, joint drive system, sensors in Robotics, robot control system, end effectors, grippers and tools, applications of industrial robots, material handling, processing operation, assembly and inspection, robot programming.

Unit II

Group technology and cellular manufacturing: Part families, part classifications and coding, production flow analysis, cellular manufacturing-composite part concept, machine cell design, applications of group technology, grouping parts and machines by rank order clustering technique, arranging machines in G.T. cell.

Flexible manufacturing: Introduction, FMS components, flexibility in manufacturing-machine, product, routing operation, types of FMS, FMS layouts, FMS planning and control issues, deadlock in FMS, FMS benefits and applications.

Unit III

Process planning: Introduction, manual process planning, computer aided process planning- variant, generative, decision logic decision tables, decision trees, introduction to artificial intelligence.

Shop floor control: Introduction, shop floor control features, major displays, major reports, phases of SFC, order release, order scheduling, order progress, manufacturing control, methodology, applications, shop floor data collections, types of data collection system, data input techniques, automatic data, collection system.

Unit IV

CNC basic and part programming: Introduction, historical, background, basic components of an NC steps in NC, verification of numerical control machine tool programs, classification of NC machine tool, basics of motion control and feedback for NC M/C, NC part programming, part

programming methods, modern machining system, automatically programmed tools, DNC, adaptive control.

Automated Guided Vehicle and Storage System: Functions of AGV, types of AGV, safety consideration for AGV, design of AGV, Introduction to storage system, storage system performance, storage location strategies, conventional storage method and equipment, automated storage system, fixed aisle automated storage/retrieval system, carousel storage system, analysis of storage system, fixed aisle automated storage/retrieval systems, carousel storage system.

Suggested Books

- Automation, production system and computer integrated manufacturing- Mikell P. Groover, Pearson 4th edition.
- CAD/CAM: Computer Aided Design and manufacturing Groover- M.P. and Zimmers E. W., Prentice Hall International, New Delhi 1992
- CAD/CAM/CIM-P. Radhakrishnan, S. Subramanayan and V. Raju, New Age International (P) Ltd., New Delhi
- Computer Integrated Manufacturing- Alavudeen and Venkateswaran, Prentice Hall of India Pvt. Ltd. New Delhi.

OE-CS-414A	IPR, Bioethics and Biosafety						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	0	0	2	75	25	100	3 Hour
Purpose	The course concentrates on technology, knowledge and business management aspect of intellectual property, including patenting aspect.						
Course Outcomes							
CO 1	To provide an understanding on biosafety and risk assessment of products, ethical issues in biological research						
CO 2	To introduce about the IPR and its role						
CO 3	To examine the role of Biosafety and bioethics						
CO 4	To know the procedure of applying IPR						

Unit I

Biotechnology and society: Introduction to science, technology and society, issues of access-Case studies/experiences from developing and developed countries. Ownership, monopoly, traditional knowledge, biodiversity, benefit sharing, environmental sustainability, public vs. private funding, biotechnology in international relations, globalization and development divide. Public acceptance issues for biotechnology: Biotechnology and hunger: Challenges for the Indian Biotechnological research and industries

Unit II

Bioethics & legal issues: Principles of bioethics: Legality, morality and ethics, autonomy, human rights, beneficence, privacy, justice, equity etc. Expanding scope of ethics from biomedical practice to biotechnology, bioethics vs. business ethics, ethical dimensions of IPR, technology transfer and other global biotech issues. Legal, institutional and socio-economic impacts of biotechnology; biotechnology and social responsibility, Public education to increase the awareness of bioethics with regard to generating new forms of life for informed decision making-with case studies.

Unit III

Biosafety: Good Lab Practices, Introduction to Biological Safety Cabinets, Primary Containment for Biohazards, Biosafety Levels GMOs and LMOs and their environmental impact, Roles of Institutional Biosafety Committee, RCGM, GEAC etc. For GMO applications in food and agriculture Risk analysis, assessment and management

Bioethics: Bioethical issues related to Healthcare & medicine Food & agriculture Genetic engineering, The Human Genome Project and Genetic Testing Environmental problems

Unit IV

IPR, Patents and Patents Laws: Intellectual property rights-TRIP- GATT International conventions patents, Requirement of patentable novelty Methods of application of patents Legal implications Biodiversity and farmer rights Objectives of the patent system, Basic principles and general requirements of patent law, Biotechnological inventions and patent law. Legal development: Patentable subjects and protection in biotechnology, Patenting of living organisms, procedure for applying for patent Patent Infringement and related case studies Biological Patentability.

IPR and Biotechnology: Biopiracy and Bioprospecting Farmers Rights and Plant breeders rights Biodiversity.

Suggested Books:

- Biosafety in Microbiological and Biomedical Laboratories, (2009) 5th Ed, [www.cdc.gov/ od/ ohs/ biosfty/ bmbl5/ bmbl5toc.html](http://www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.html).
- V. Shree Krishna, (2007), Bioethics and Biosafety in Biotechnology, New Age International Pvt. Ltd. Publishers.
- Deepa Goel, ShominiParashar, (2013), IPR, Biosafety and Bioethics, Pearson.
- R. Ian Freshney, Culture of Animal Cells: a Manual of Basic Technique and Specialized Applications, 6th Ed, John Wiley & Blackwell
- Biotechnology and Safety Assessment Thomas J.A., Fuch R.L Academic Press 3rd Edition 2002
- Biological safety Principles and practices Fleming D.A., Hunt D. ASM Press 3rd. ed. 2000
- Bioethics Ben Mephram Oxford University Press 2008
- Bioethics & Biosafety R Rallapalli&Geetha Bali APH Publication 2007

OE-CS-416A	Signal and Systems						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3 Hrs.
Course Outcomes (CO) At the end of this course, students will demonstrate the ability to							
CO1	Analyze different types of signals.						
CO2	Represent continuous and discrete systems in time and frequency domain using different transforms.						
CO3	Understand sampling theorem and its implications.						

UNIT-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

UNIT-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions. **Linear Time Invariant Systems:** Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations, Concept of impulse response.

UNIT-III

Discretization of Analog Signals: Introduction to sampling, sampling theorem and its proof, effect of undersampling, reconstruction of a signal from sampled signal.

Fourier Series : Continuous time Fourier series (CTFS), Properties of CTFS, Convergence of Fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS , Fourier series and LTI system, Filtering.

UNIT-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations, Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties oflaplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009 Reference Books:

1. Simon Haykins – “Signal & Systems”, Wiley Eastern
2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.
3. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
4. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
5. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.

Note: Question paper template will be provided to the paper setter.