Autonomous Program Structure of
Third Year B. Tech. Sixth Semester
(Information Technology)
Academic Year: 2022-2023 Onwards

Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Total Marks	Credit
		Lecture	Tutorial	Practical	In Sem	End Sem	Oral	Practical		
20IT 601	Information Security	3	0	0	50	50	0	0	100	3
20IT 602	Cloud Computing	3	0	0	50	50	0	0	100	3
20IT 603	Object Oriented Software Engineering	3	1	0	50	50	0	0	100	4
20HS 601	Green Computing	3	0	0	50	50	0	0	100	3
20PEIT 601	Programme Elective-III	3	0	0	50	50	0	0	100	3
20OE 601	Open Elective-II	3	0	0	50	50	0	0	100	3
20IT 601L	Information Security Lab	0	0	2	25	0	0	25	50	1
20IT 603L	Object Oriented Software Engineering Lab	0	0	2	25	0	25	0	50	1
20PEIT 601L	Programme Elective Lab-III	0	0	2	25	0	25	0	50	1
20AC 601	Self Expression	0	0	2	0	0	0	0	0	No Credits
	Total	**18**	**1**	**8**	**375**	**300**	**50**	**25**	**750**	**22**
	Grand Total	**27**			**750**					

Programme Elective – III	**Programme Elective – III Lab**
20PEIT 601 A Advanced Computer Network	20PEIT 601L A Advanced Computer Network
20PEIT 601 B Natural Language Processing	20PEIT 601L B Natural Language Processing
20PEIT 601 C Multimedia Techniques	20PEIT 601L C Multimedia Techniques

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20OE601 Open Elective-II			Eligible Departments				
Sr. No.	Course Code	Course Title	EnTC	Comp	IT	Mech	Instru
1	20OE601A	Automation and Control Engineering	Y	Y	Y	Y	Y
2	20OE601B	Automotive Electronics	Y	Y	Y	Y	Y
3	20OE601C	Avionics	Y	Y	Y	Y	Y
4	20OE601D	Bioinformatics	Y	Y	Y	N	Y
5	20OE601E	Computer Vision	Y	Y	Y	Y	Y
6	20OE601F	Design Thinking	Y	Y	Y	Y	Y
7	20OE601G	e-Business	Y	Y	Y	Y	Y
8	20OE601H	Electric Vehicles	Y	Y	Y	Y	Y
9	20OE601I	Gamification	Y	Y	Y	Y	Y
10	20OE601J	Geographical Information Systems	Y	Y	Y	Y	Y
11	20OE601K	Multimedia Systems	Y	Y	Y	N	Y

20IT 601 Information Security

Teaching Scheme:
Lectures: 3
hours/week

Examination Scheme:
In-Semester : 50 Marks
End-Semester: 50 Marks
Credits :3

Prerequisites: Network Fundamentals, Computer Networks

Course Objectives:
Familiarize students with

1. Information Security course surveys central concepts in applied information security and cyber security.
2. Make students aware of the major security risks and attack vectors.
3. Provides tools and practices for building secure systems.
4. Design, develop and support a global security system using the state of mind and reasoning on software systems security.

Course Outcomes:
Students should be able to

1. Apply classical and modern cryptographic techniques to ensure data security.
2. Select appropriate key management and authentication methods to ensure secure communication.
3. Analyze network and transport layer security protocols to find vulnerabilities and recommend countermeasures.
4. Apply cybersecurity techniques to secure communications, detect intrusions, and protect digital systems and transactions.

Unit – I Classical Encryption Techniques 8 Hours

Classical Encryption Techniques, Block Ciphers and DES, Basic Concepts in Number Theory and Finite Fields, Advanced Encryption Standard (AES), Block Ciphers. Operations

Unit – II Modern Cryptographic Techniques 8 Hours

Pseudo Random Number Generation and Stream Ciphers , Public Key Cryptography, Cryptographic Hash Functions Message Authentication Codes

Unit – III Key Management Techniques 9 Hours

Digital Signatures, Public-Key Certificates PKI, PKIX, and X.509, CA Hierarchy , User Authentication Protocols Public-Key Certificates PKI, PKIX, and X.509, CA Hierarchy

Unit – IV Network and Transport Layer Security 8 Hours

IP Security , Transport Level Security (TLS) HTTPS, HTTPS Use, Secure Shell (SSH), SSH Protocol Stack, Wireless Network Security, Wireless Network Threats, Countermeasures

Unit – V Cyber Security 9 Hours

Electronic Mail Security: Email Security Enhancements, Pretty Good Privacy (PGP), S/MIME Intrusion Detection Malicious Software , Code security, Cloud security, IoT security, Advanced
Protocols: Zero knowledge Proofs, Identity based public key, Secure elections, Secure multi- party computation, and Digital cash.

Text Books

1. William Stallings, "Cryptography and Network Security: Principles and Practice," 6th Edition, Pearson.

Reference Books

1. D. R. Stinson: Cryptography: Theory and Practice (Discrete Mathematics and Its Applications), 3e, CRC Press.
2. B. Schneier: Applied cryptography: protocols, algorithms, and source code in C, 2e, John Wiley & Sons.
3. Bernard Menezes: Network Security & Cryptography, 1st Edition, Cengage Learning, Delhi, 2011.

20IT 602 Cloud Computing

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester: 50 marks
End-Semester: 50 marks
Credits: 3

Prerequisites: Operating Systems and Computer Networks

Course Objectives:

Familiarize students with

1. Distributed Systems and its ecosystem.
2. Basics of virtualization and its importance.
3. In-depth analysis of cloud computing capabilities.
4. Overview of cloud programming and services.

Course Outcomes:

Students should be able to

1. Identify the need for cloud-based solutions in various domains
2. Explain the significance and advantages of distributed systems in modern computing.
3. Apply effective techniques to develop cloud-based applications and services.
4. Explain current challenges, trade-offs, and emerging trends in cloud computing

Unit – I Introduction to Distributed Systems **7 Hours**

Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security, and Energy Efficiency

Unit – II Computer Clusters for Scalable Parallel Computing **7 Hours**

Clustering for Massive Parallelism, Computer Clusters and MPP Architectures, Design Principles of Computer Clusters, Cluster Job and Resource Management, Case Study: Top Supercomputer Systems

Unit – III Virtual Machines and Virtualization of Clusters and Data Centers **7 Hours**

Implementation Levels of Virtualization, Virtualization Structures/Tools: Hypervisors and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation

Unit – IV Cloud Platform Architecture over Virtualized Data Centers **7 Hours**

Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management, Private and Hybrid Cloud.

Unit – V Cloud Programming and Software Environments **7 Hours**

Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments,

Unit – VI Advancements in Grid, Cloud, and IoT Computing **7 Hours**

Grid Architecture and Service Modeling, Grid Projects and Grid Systems Built, Peer-to-Peer Computing Systems, Cloud Trends in Supporting Ubiquitous Computing, Enabling Technologies for the Internet of Things, Data Sovereignty, General Data Protection Regulation

Text Books

1. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", Elsevier, First Edition

Reference Books

1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, "Cloud Computing: Concepts, Technology & Architecture", Pearson, First Edition
2. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing: Foundations and Applications Programming", McGraw Hill, First Edition
3. A. Srinivasan, J. Suresh, "Cloud Computing: A practical approach for learning and implementation", Pearson, First Edition
4. Anthony T. Velte, "Cloud Computing: Practical Approach", McGraw Hill, First Edition
5. Ronald L. Krutz and Russell D. Vines, "Cloud Security: A Comprehensive guide to Secure Cloud Computing", Wiley, First Edition

20IT 603 Object Oriented Software Engineering

Teaching Scheme:
Lectures: 3 hours/week
Tutorial: 1 hour/week

Examination Scheme: In-Semester: 50 marks
End-Semester: 50 marks
Credits: 4

Prerequisites: Object oriented analysis and design laboratory

Course Objectives:

Familiarize students with

1. Basic concepts of object-oriented software engineering and process models.
2. Requirements elicitation and analysis activities.
3. Concepts of system and object design.
4. Software coding and testing techniques.

Course Outcomes:

Students should be able to

1. Choose appropriate software development process models for real life projects.
2. Analyze requirements with use cases.
3. Develop design models using UML notations.
4. Apply appropriate coding and testing methods according to requirements.

Unit – I: Introduction to Software engineering **7 Hours**

Software life cycle, Processes and activities, Life cycle models: Sequential activity-centered models, Iterative activity-centered models, Entity centered models, Agile Process, Principles, Extreme programming, XP values, XP process, Industrial XP, Scrum

Unit – II: Requirements gathering and analysis **7 Hours**

Requirement elicitation, functional and nonfunctional requirements, Elicitation activities, identifying actors, scenarios, use-cases, refinement, Requirements analysis concept, Analysis Object Models and Dynamic Models, Entity, Boundary, and Control Objects, Generalization and Specialization, Analysis Activities: From Use Cases to Objects, Requirement Analysis document

Unit – III: System Design **7 Hours**

System Design Concept, Subsystem and classes, Services and Subsystem Interfaces, Coupling and Cohesion, Layers and Partitions, Architectural Styles, System Design Activities: From Objects to Subsystems, addressing design goals.

Unit – IV: Object Design **7 Hours**

Reuse concepts: Solution Objects, Inheritance, and Design Patterns, reuse activities: Selecting Design Patterns and Components, managing reuse, Specifying interface, interface specification, interface specification activities, managing object design.

Unit – V: Construction **7 Hours**

Mapping models to code, overview of mapping, mapping concept, Model transformatio Refactoring, Forward and reverse engineering, mapping activities, mapping implementation

Unit – VI: Software Testing **7 Hours**

Overview of testing, testing concepts, Faults, Erroneous States, and Failures, test cases, Test Stubs and Drivers, testing activities, component inspection, usability testing, unit testing, integration testing, system testing, managing testing

Text Books:

1. Bernd Bruegge & Allen H. Dutoit, „Object-Oriented Software Engineering‟, Third edition, Prentice Hall.
2. Roger S. Pressman, „Software Engineering: A practitioner's approach‟, McGraw Hill

Reference Books:

1. Pankaj Jalote, „An integrated approach to Software Engineering‟, Springer/Narosa.
2. Ian Sommerville, „Software Engineering‟, Addison-Wesley.
3. Schwaber, K. and Beedle, M. (2001)., „Agile Software Development with SCRUM‟, New Jersey:Pearson. [ISBN - 9780130676344]

20HS 601 Green Computing

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester : 50 Marks
End-Semester: 50 Marks
Credits :3

Prerequisites: Basic Sciences

Course Objectives:

Familiarize students with

1. Knowledge of green computing practices to minimize negative impacts on the environment.
2. Principles of green computing.
3. Apply green computing techniques like energy efficiency, responsible disposal, and reducing carbon footprints in real-world scenarios
4. Integrate green laws/standards/protocols into the development of applications and services.

Course Outcomes:

Students should be able to

1. Explain the social and cultural impact of green computing to balance sustainability with business goals.
2. Identify green computing practices that support environmental sustainability
3. Apply green computing skills such as energy efficiency, IT assets disposal, carbon footprint estimation, reporting and development of green products.
4. Justify green initiatives while developing applications and services in enterprises.

Unit – I Introduction to Green Computing 7 Hours

Environmental Impacts of IT, Need of green computing, Green IT Standards, Enterprise Green IT Strategy, Hardware: Reuse, Recycle and Dispose, Hardware: Reuse, Recycle and Dispose, present scenario in industry, health issues relevance, Software: Energy-Saving Software Techniques

Unit – II Software Development and Green Data Centers 7 Hours

Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software Methodology, Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics

Unit – III Green Data Storage and Networks 7 Hours

Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management, Objectives of Green Network Protocols, Green Network Protocols and Standards

Unit – IV Enterprise Green IT Strategy 7 Hours

Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business DimensionsforGreen IT Transformation, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Regional/City Level Information

Unit – V Green Computing Services and Roles 7 Hours

Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), Sustainable IT Roadmap, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise

Unit – VI Regulating Green Computing 7 Hours

The Regulatory Environment and IT Manufacturers, Nonregulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Green Data Centres, Social Movements

Text Books

1. San Murugesan, G. R. Gangadharan: Harnessing Green IT, WILEY, 1st Edition-2013.

Reference Books

1. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009, WILEY
2. Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011
3. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shroff/IBM redbook, 2011.
4. Jason Harris, "Green Computing and Green IT-Best Practices on regulations & industry", Lulu.com, 2008
5. Carl Speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
6. Wu Chun Feng (Editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

20PEIT 601A Advanced Computer Networks

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester : 50 Marks
End-Semester : 50 Marks
Credits :3

Prerequisites: Network Fundamentals, Computer Networks

Course Objectives:
Familiarize students with

1. Basic functions and concepts of advanced computer networks.
2. Principles of performance modeling.
3. Mechanisms to handle congestion and routing.
4. Introduction to seminal research papers.

Course Outcomes:
Students should be able to

1. Compare resource allocation mechanisms.
2. Evaluate the performance measures in TCP/IP networks.
3. Analyze routing algorithms.
4. Comprehend a few seminal research papers.

Unit – I Internet architecture and performance modeling 7 Hours
Introduction. Course logistics. Goals of Internet design, Layering abstraction and encapsulation. Network architecture and protocols. Performance of networks: delay and throughput, End-to-end delay, Concept of packetization, Circuit switching vs packet switching, Bandwidth-delay product, and Simple results from queuing theory.

Unit – II Applications: architectures and examples 7 Hours
Application layer architectures: client-server vs. P2P, Socket interface: TCP vs. UDP semantics, Application types: elastic vs. real-time, WWW and HTTP. Persistent vs. non-persistent connections, HTTP message formats, headers, Caching, cookies, FTP, SMTP

Unit – III Transport protocols 7 Hours
Basic function of transport - multiplexing and demultiplexing, UDP- simple transport, TCPconnection basics: handshake, reliability, pipelining, congestion control, flow control, Ideal window size and bandwidth delay product, Buffer sizing for TCP, Simple model for TCP throughput, Understanding TCP fairness, RED gateways, Resource allocation, QoS, and fairness, QoS architectures: Intserv and Diffserv, Admission control: Token Bucket Filter

Unit – IV Internet routing 7 Hours
Router scheduling, common router scheduling policies / queuing disciplines Hierarchical (intradomain and interdomain) routing, IPv6, IP-in-IP tunneling, MPLS, BGP and advanced BGP concepts

Unit – V Link layer **7 Hours**

Link layer functions: Link layer addresses, ARP, Shared broadcast, multiple access protocols, the original Ethernet, spanning tree protocol, VLANs, NAT traversal.

Unit – VI Advanced topics **7 Hours**

Networking with virtual machines, software switches, Network Function Virtualization, Network Virtualization, Key ideas of traditional networks vs. SDN, history, Ethane: the motivation, OpenFlow: the interface, Onix: SDN controllers, Applications - B4 by Google, Datacenter networking.

Text Books

1. "Computer Networking, A Top-Down Approach", 6 th edition, James Kurose and Keith Ross, Pearson Publishers.
2. "Computer Networks, A Systems Approach", 5 th edition, Larry Peterson and Bruce Davie, The Morgan Kaufmann series in Networking
3. "Data Networks" 2 nd edition Bertsekas and Gallager, Prentice hall publisher (mainly Chapter 3.3 on basic queuing theory

Reference papers

1. The design philosophy of the DARPA internet protocols, David Clark.
2. Chord: A Scalable Peer-to-peer Lookup Service for Internet Applications, Stoica et al
3. Congestion Avoidance and Control, Jacobson and Karels.
4. Sizing Router Buffers, Appenzeller et al
5. Bufferbloat: Dark Buffers in the Internet, Gettys and Nichols
6. The Macroscopic Behavior of the TCP Congestion Avoidance Algorithm, Mathis et al.
7. Analysis of the Increase and Decrease Algorithms for Congestion Avoidance in Computer Networks, Chiu and Jain.
8. Random Early Detection Gateways for Congestion Avoidance, Floyd and Jacobson

20PEIT 601B Natural Language Processing

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 marks
Credits: 3

Prerequisites: Probability Basics, Automata theory

Course Objectives:

Familiarize students with

1. Core concepts of Natural language processing (NLP)
2. Levels of language analysis
3. Language modeling and Parsing techniques used in natural language processing
4. State of art NLP areas

Course Outcomes:

Students will be able to:

1. Identify challenges involved in developing natural language processing system
2. Apply natural language processing techniques for NLP tasks
3. Recommend Natural Language Processing techniques for language modeling, syntax and semantic parsing
4. Describe Natural Language Processing systems for different applications

Unit – I Introduction to Natural Language Processing 7 Hours

Introduction: Natural Language Processing (NLP) and Natural Language Understanding (NLU) NLP applications, Brief history of field, Challenges in developing NLP system, Evaluating Natural Language Understanding Systems, The Different Levels of Language Analysis, representation and understanding, NLP tasks in syntax, semantics and pragmatics

Unit – II Syntactic Parsing 7 Hours

Grammar and sentence structure, A Top-Down Parser, A Bottom-Up Chart Parser, Top-Down Chart Parsing, Human Preferences in Parsing, Morphology analysis –survey of English Morphology, Inflectional morphology & Derivational morphology, finite state transducers (FST), Finite state models and Morphological processing

Unit – III Features and Augmented Grammars 7 Hours

Feature Systems and Augmented Grammars : Some Basic Feature Systems for English, Morphological Analysis and the Lexicon , A Simple Grammar Using Features, Parsing with Features, Augmented Transition Networks: Definite Clause Grammars, Generalized Feature Systems and Unification Grammars

Unit – IV Language Modeling 7 Hours

Computational Linguistics - Probability Theory , Estimating Probabilities, Ambiguity and Uncertainty in language, Part-of-Speech Tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Probabilistic language modeling and its applications, Markov models. N-grams. Estimating the probability of a word, and smoothing

Unit – V Semantic Analysis 7 Hours

Semantics and Logical Form :Word Senses and Ambiguity, The Basic Logical Form Language, Encoding Ambiguity in Logical Form ,Verbs and States in Logical Form, Case Relations Lexical Resources: WordNet, Semantic web Ontologies

Unit – VI Future of NLP 7 Hours

Role of Machine learning in NLP applications, Opinion mining, Sentiment Analysis. Machine Translation(MT), MT evaluation tools such as Bleu, WER (Word Error Rate), Information Extraction, Question answering, Automatic speech recognition, Deep Learning for Natural Language Processing

Text Books

1. James Allen, "Natural Language Understanding", Pearson Publication, ISBN: 978-81-317-0895-8 2nd Edition
2. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education, 2002

Reference Books

1. Christopher D. Manning, Hinrich Schutze, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts, 1999.
2. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval
3. Daniel M.Bikel, ImedZitouni, Multilingual Natural Language Processing Applications
4. Abhijit Mishra and Pushpak Bhattacharyya, "Cognitively Inspired Natural Language Processing- An Investigation Based on Eye Tracking", Cognitive Intelligence and Robotics Series, Springer Nature Singapore, ISBN:978-981-13-1515-2, 2018.
5. Niladri Dash, Pushpak Bhattacharyya, Jyoti Pawar (eds.), "WordNets of Indian Languages", Springer, ISBN:978-981-10-1909-8, 2016.

20PEIT 601C Multimedia Techniques

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester:50 Marks
End-Semester: 50 marks
Credits: 3

Prerequisites: Algebra and Geometry

Course Objectives:
Familiarize students with

1. Variety of multimedia data modification algorithms
2. Capturing and using multimedia components for presenting a concept
3. Multimedia data processing for its size reduction
4. Usage of multimedia in variety of domain applications

Course Outcomes:
Students will be able to:

1. Utilize multimedia components effectively for creating multimedia content.
2. Apply data processing techniques for handling multimedia data.
3. Apply compression techniques to optimize multimedia data storage and transmission.
4. Select suitable multimedia components for designing multimedia systems.

Unit – I Multimedia Overview and basics of still Image 7 Hours

Multimedia Overview: Introduction, multimedia presentation and production, characteristics of multimedia presentation, hardware and software requirements, uses of multimedia, analog and digital representation, digitization, Nyquist theorem, quantization error, visual display systems, enterprise data and multimedia component.
Digital Image: Image as data, Image acquisition, types of images.

Unit – II Image Processing 7 Hours

Binary image processing, grey scale image processing, colored image processing. Image output on monitors, image output on printers, image file formats both lossless and lossy.

Unit – III Audio data as multimedia component 7 Hours

Introduction, acoustics, sound waves, types and properties of sound, psycho acoustics, components of an audio system, digital audio, synthesizers, MIDI, audio processing.

Unit – IV Audio transmission and broadcasting 7 Hours

Speech, sound card, audio transmission, digital audio broadcasting, surround sound system, audio file formats both lossless and lossy.

Unit – V Video data as multimedia component 7 Hours

Motion video, digital video, digital video processing, video recording and storage formats both lossless and lossy, and video editing concepts.

Unit – VI Data compression **7 Hours**

Image compression technique, audio compression technique, video compression technique.

Text Books

1. Ranjan Parekh: Principles of multimedia, TMH 2nd Edition-2013.
2. Nigel Chapman, Jenny Chapman Peter: Digital Multimedia, John Wiley and sons, Edition 2012.

Reference Books

1. Kimberly N Rosenfield: Digital Multimedia: Concepts, Methodologies, tools and applications, Information Resources Management association 1st Edition-September 2017

20OE 601F Open Elective II: Design Thinking

Teaching Scheme:
Lectures: 3 hours/week

Examination Scheme:
In-Semester: 50 marks
End-Semester: 50 marks
Credits: 3

Prerequisites: -

Course Objectives:

Familiarize students with

1. Design thinking process
2. User centric approach for designing a solution
3. Problem analysis with various methods
4. Applications for Design Thinking

Course Outcomes:

Students should be able to

1. Analyze problems with various methods
2. Recommend a solution based on empathy, ideation, prototyping, and playful testing
3. Apply design thinking methods to generate innovative and user centric solutions
4. Test designed prototypes for risk reduction

Unit – I: Introduction to Design thinking **6 Hours**

Design thinking, Concept of Human Centered Approach vs. System Centered Approach, Features of design thinking, Process of thinking, mental blocks, Creative thinking, Lateral thinking, Thinking hats, Problem solving, Reasoning, Decision making

Unit II: Design Thinking for Strategic Innovation **6 Hours**

Strategic Management, Innovation Management, Types of Innovations, Disruptive vs. Sustaining innovation, Radical vs. incremental innovation, The Innovation Matrix, Architectural vs. Modular Innovation, Features and scope of Strategic Innovation, Practices for Integrating Design Thinking in Strategic Innovation

Unit III: Stages of design thinking **12 Hours**

Empathy: What is en Empathy, Process of Empathy, Difference Between Empathy and Sympathy, Empathy Techniques, *Define*: Identification of Problem, Defining Problem Statement, Techniques of Refining Problem Statement, *Ideate*: Process of Ideation, 5 Thinking Hats, Ideation and Creative Thinking. *Prototype*: Concept of MVP, Prototyping. *Test*: End User Tests, Field Tests, Acceptance Tests, Test Cycles

Unit IV: Tools of design thinking **8 Hours**

Visualization, Journey Mapping, Value Chain Analysis, Mind Mapping, Rapid Concept Development, Assumption Testing, Prototype, Co-Creation, Learning Launches, Story Telling

Unit V: Design Thinking and Its Applications **8 Hours**

Product Development, Process Development, Service Management, Capstone Project

Text Books:

1. Bryan Lawson, "How designers think: The design process demystified", 2nd Edition, Butterworth Architecture
2. Nigel Cross, "Design Thinking", Berg Publishers - 2011

Reference Books:

1. Ben Crothers, "Design Thinking Fundamentals", O'Reily
2. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations", HarperCollins – 2009
3. Susan Weins Chenk, "Hundred things every designer needs to know about people", New Riders Publication
4. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", Wiley Publication
5. Roger L. Martin, "Design of Business: Why Design Thinking is the Next Competitive Advantage" Harvard Business Press
6. Karl Ulrich, "Design: Creation of Artifacts in Society" - 2011
7. Bala Ramadurai, "Karmic Design Thinking"
8. T. Amabile, "How to kill creativity", SAGE Publication - 2006
9. William Lidwell, Kritina Holden, Jill Butler, "Universal principles of Design", Rockport Publishers
10. Bella Martin, Bruce Hanignton, Bruce M Hanington "Universal methods of design", Rockport Publishers - 2012
11. Roman Kizanie, "Empathy: Why it matters, how to get it", TarcherPerigee Publishers
12. Karla McLaren, "The Art of Empathy: A complete Guide to life's most essential skill", Sounds True Publishers

20IT 601L Information Security Laboratory

Teaching Scheme:
Practical: 2 hours/week

Examination Scheme:
In-Semester: 25 Marks
Practical: 25 marks
Credits: 1

Prerequisites: Foundations of Computer Networks, Computer Networks

Course Objectives:

Familiarize students with

1. Learn to implement the algorithms DES, RSA,MD5,SHA-1 etc.
2. Make students aware of the major security risks and attack vectors.
3. Provides tools and practices for building secure systems.
4. Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

Course Outcomes:

Students will be able to:

1. Implement classical cryptographic techniques such as substitution and transposition ciphers to ensure data security.
2. Implement modern cryptographic techniques such as RSA, DES, and hashing algorithms to ensure data security.
3. Analyze security vulnerabilities in web applications, e-commerce services, and email systems.
4. Analyze network security and web browser configurations to identify potential vulnerabilities.

Suggested list of laboratory assignments:

1 Implement the following symmetric & asymmetric key cipher techniques
   A. Playfair Cipher
   B. Hill Cipher
   C. Vigenere Cipher
   D. Rail fence – row & Column Transformation
   E. RSA Algorithm
   F. Diffie-Hellman

2 Implement the following algorithms using APIs
   A. DES
   B. MD5
   C. SHA-1

3 Implement the Digital Signature Scheme

4 Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

5 Study assignment (Any two)
   A. Study of different types of vulnerabilities for hacking websites / Web Applications.
   B. Study of different web browser based vulnerabilities
   C. Study of different wireless network components and features of any one of the Mobile Security Apps.

6. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)

7. Study assignment: (any 1)
   A. Study of the features of firewall in providing network security and to set Firewall Security in windows.
   B. Study of the features of firewall in providing network security and to set Firewall Security in Linux.

Text Books

1 William Stallings, "Cryptography and Network Security: Principles and Practice," 6th Edition, Pearson.

Reference Books

1 B. Schneier: Applied cryptography: protocols, algorithms, and source code in C, 2e, John Wiley & Sons.
2 Bernard Menezes: Network Security & Cryptography, 1st Edition, Cengage Learning, Delhi, 2011.

20IT 603L Object Oriented Software Engineering Laboratory

Teaching Scheme:
Practical: 2 hours/week

Examination Scheme:
In-Semester: 25 marks
Oral: 25 marks
Credits: 1

Prerequisites: Object oriented analysis and design laboratory

Course Objectives:
Familiarize students with

1. Various Object Oriented concepts along with their applicability contexts using agile development approach.
2. Various domain objects, their properties and relationships among them for given problem domain.
3. Modeling techniques to model different perspectives of object-oriented software design (UML)
4. Object oriented design solutions for the recurring problems

Course Outcomes:
Students should be able to

1. Identify use cases from project requirements.
2. Identify potential classes from use case specifications.
3. Design models using the UML notations.
4. Produce industry standard documentation from requirements analysis and design through testing and verification

Software engineering diagrams will be drawn based on some problem statement (Agile Approach)

1. Use-case Diagrams
2. Class Diagrams
3. Sequence Diagram
4. Activity Diagrams
5. Package Diagrams
6. Component Diagrams
7. Deployment diagrams
8. State Machine Diagrams

Text Books:

1. Bernd Bruegge & Allen H. Dutoit, "Object-Oriented Software Engineering", Third edition, Prentice Hall.

Reference Books:

1. Chris Sims and Hillary Louise Johnson, "Scrum: a Breathtakingly Brief and Agile Introduction", Dymaxicon. ISBN-13: 978-1937965044

20PEIT 601L A Advanced Computer Network Laboratory

Teaching Scheme:
Practical: 2 hours/week

Examination Scheme:
In-Semester: 25 Marks
Oral: 25 marks
Credits: 1

Prerequisites: Foundations of Computer Networks, Computer Networks

Course Objectives:
Familiarize students with

1. Basic functions and concepts of advanced computer networks.
2. Principles of performance modeling.
3. Mechanisms to handle congestion and routing.
4. Introduction to seminal research papers.

Course Outcomes:
Students should be able to

1. Compare resource allocation mechanisms.
2. Evaluate the performance measures in TCP/IP networks.
3. Analyze routing algorithms.
4. Implement basic functions of SDN

Implementation of a mini-project on any of the following topics (Use NS2/NS3, packet Tracers etc. simulators).

1. BGP implementation
2. VLAN implementation
3. Wireless adhoc networks
4. Evaluate QoS in a network

Text Books

1. "Computer Networking, A Top-Down Approach", 6 th edition, James Kurose and Keith Ross, Pearson Publishers.
2. "Computer Networks, A Systems Approach", 5 th edition, Larry Peterson and Bruce Davie, The Morgan Kaufmann series in Networking
3. "Data Networks" 2 nd edition Bertsekas and Gallager, Prentice hall publisher

20PEIT 601L B Natural Language Processing Laboratory

Teaching Scheme:
Practical: 2 hours/week

Examination Scheme:
In-Semester: 25 Marks
Oral: 25 marks
Credits: 1

Prerequisites: Probability Basics, Automata theory

Course Objectives:
Familiarize students with

1. Implementation of Natural language processing (NLP) techniques
2. Application of various libraries to develop NLP system
3. Language modeling and Parsing techniques used in natural language processing
4. State of art NLP areas

Course Outcomes:
Students will be able to:

1. Implement morphological processing and parsing techniques for analysing sentence structure
2. Apply various library functions to develop language models
3. Implement NLP techniques for ambiguity resolution
4. Develop NLP system project for real world application in team

Assignments:

1. Choose any NLP application and design and implement NLP system for the same. The developed system should demonstrate implementation of following NLP concepts:
    a. Analyse morphological features of a word.
    b. Perform syntactic parsing to check acceptance of a sentence
    c. Calculate bigrams from a given corpus and calculate probability of a sentence.
    d. Perform Part of Speech Tagging
    e. Use lexical resources to implement word sense disambiguation
    f. Integrated NLP application

Text Books

1. James Allen, "Natural Language Understanding", Pearson Publication, ISBN: 978-81-317-0895-8 2nd Edition
2. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education, 2002

Reference Books

1. Christopher D. Manning, HinrichSchutze, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts, 1999.
2. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval
3. Daniel M.Bikel, ImedZitouni, Multilingual Natural Language Processing Applications

20PEIT 601L C Multimedia Techniques laboratory

Teaching Scheme:
Practical: 2 hours/week

Examination Scheme:
In-Semester: 25 Marks
Oral: 25 marks
Credits: 1

Prerequisites: Algebra and Geometry

Course Objectives:

Familiarize students with

1. Implementation of Multimedia techniques
2. Use of multimedia library for Image data
3. Use of multimedia library for Audio data
4. Use of multimedia library for Video data

Course Outcomes:

Students will be able to:

1. Apply image processing techniques for multimedia applications.
2. Implement audio processing techniques for effective multimedia content.
3. Utilize video processing techniques for multimedia systems.
4. Develop Multimedia system for real world applications applications through team work

Assignments:

Design and implement a Multimedia system for the chosen application. The developed system should demonstrate implementation of following

1. Use of text media
2. Image processing techniques such as edge detection, histogram plotting, grey scaling but not limited to using library files
3. Use of Animation media
4. Audio processing techniques such as load, play, crop, rewind, forward but not limited to using library files
5. Video processing techniques such as load, play, crop, rewind, forward but not limited to using library files

Text Books

1. Rajan Parekh: Principles of multimedia, TMH 2nd Edition-2013.
2. Nigel Chapman, Jenny Chapman Peter: Digital Multimedia, John Wiley and sons, Edition 2012.

Reference Books

1. Kimberly N Rosenfield: Digital Multimedia: Concepts, Methodologies, tools and applications, Information Resources Management association 1st Edition-September 2017