

**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
	<b>Total</b>	<b>18</b>	<b>1</b>	<b>8</b>	<b>375</b>	<b>300</b>	<b>50</b>	<b>25</b>	<b>750</b>	<b>22</b>
	<b>Grand Total</b>	<b>27</b>			<b>750</b>					

**Programme Elective – III**

20PEIT 601 A Advanced Computer Network  
20PEIT 601 B Natural Language Processing  
20PEIT 601 C Multimedia Techniques

**Programme Elective – III Lab**

20PEIT 601L A Advanced Computer Network  
20PEIT 601L B Natural Language Processing  
20PEIT 601L C Multimedia Techniques

**APPROVED BY**  
Department of Information Technology  
**Secretary Governing Body**  
MKSSS's Cummins College of Engineering  
For Women, Pune-411052



**APPROVED BY**  
**Chairman Governing Body**  
MKSSS's Cummins College of Engineering  
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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 knowledge of mathematical background and different cryptographic techniques to provide security in the computer networks.
2. Apply the knowledge to draft the security goals clearly in the networks.
3. Apply the concept of end-to-end security.
4. To compare merits and demerits of different cryptographic techniques/protocols and take decisions while securing a network.

### 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

**Tutorial:** -

### 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. Recognize need of cloud based solutions.
2. Justify the importance of distributed systems.
3. Determine effective techniques to program cloud systems.
4. Evaluate current challenges and trade-offs 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 Grids, P2P, and the Future Internet**

**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 the 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 transformation 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. Green Computing and how it can help improve environmental sustainability.
4. Green Computing in enterprises and its impact.

### Course Outcomes:

Students should be able to

1. Relate to the socio-cultural aspects of green computing.
2. Create awareness about green computing and promote a green agenda in their working environments leading to the green movement.
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 Dimensions for Green 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

Tutorial:-

### 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
3. Recommend Natural Language Processing techniques for language modeling, syntax and semantic parsing
4. Analyze 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. Apply multimedia components in multimedia production.
2. Apply data processing techniques on multimedia data
3. Apply compression techniques on multimedia data
4. Choose different multimedia components for multimedia system design

### 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 2<sup>nd</sup> 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

Tutorial: -

### 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 of 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 to reduce risks and accelerate organizational learning

### Unit – I: Design and Design Problems

8 Hours

What is Design? The components of design problems; measurement, criteria and judgement in design

A model of design problems – Defining problems: Selecting goals and diverse teams, creating a unified vision and scope, mapping stakeholders and personas; Analysing design problems, generators of design problems, roles of generators, design constraints

### Unit II: Design Solutions

8 Hours

Solutions to Design Problems: Designer's response: procrastination, non-committal design and throw away design, design problems and solutions

Design Process: define, search, ideate, prototype, select, implement, learn, Refresher and restate the challenge, getting inspiration, understanding innovation ambition, Solution ideation, Narrowing solution choice, Solution evaluation, Road map

### Unit III: Design Thinking

9 Hours

Types and Styles of Thinking – theories of design, types of thinking; creative thinking - what is creativity? creativity in design, Principles of design thinking

**Unit IV: Design Philosophies and Strategies**

**9 Hours**

Theory and practice, three early phases of working on the same problem

Prototype Creation: Choosing a prototype approach, user interface prototypes, applications vs custom build, reference architectures, prototype and solution evaluation

**Unit V: Design Tactics and Traps**

**8 Hours**

Methods and Tactics, understanding the problem, the model of problems, One or many solutions? Common traps and ways of avoiding them

**Text Books:**

1. Bryan Lawson, "How designers think: The design process demystified", 2<sup>nd</sup> 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
1. Susan Weins Chenk, "Hundred things every designer needs to know about people", New Riders Publication
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", Wiley Publication
3. Roger L. Martin, "Design of Business: Why Design Thinking is the Next Competitive Advantage" Harvard Business Press
4. Karl Ulrich, "Design: Creation of Artifacts in Society" - 2011
5. Bala Ramadurai, "Karmic Design Thinking"
6. T. Amabile, "How to kill creativity", SAGE Publication - 2006
7. William Lidwell, Kritina Holden, Jill Butler, "Universal principles of Design ", Rockport Publishers
8. Bella Martin, Bruce Hanington, Bruce M Hanington "Universal methods of design", Rockport Publishers - 2012
9. Roman Kizanie, "Empathy: Why it matters, how to get it", TarcherPerigee Publishers
10. 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 the cipher techniques
2. Analyse the security algorithms and protocols
3. Use different open source tools for network security and analysis
4. A mini project implementation

### Suggested list of laboratory assignments:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts (any 2) :

- a. Caesar Cipher
- b. Playfair Cipher
- c. Hill Cipher
- d. Vigenere Cipher
- e. Rail fence – row & Column Transformation

2. Implement the following algorithms (any 3)

- a. DES
- b. RSA Algorithm
- c. Diffie-Hellman
- d. MD5
- e. SHA-1

3. Implement the Digital Signature Scheme

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

5. Analysis of the Security Vulnerabilities of E-commerce services. / Analysis of the security vulnerabilities of E-Mail Application

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

7. Study assignment: (any 1)
  - A. Study of different wireless network components and features of any one of the Mobile Security Apps.
  - B. Study of the features of firewall in providing network security and to set Firewall Security in windows.
  - C. Study of different types of vulnerabilities for hacking websites / Web Applications.
8. Implementation of a mini-project (Case study on college network for security).

### **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

**Tutorial:** -

### 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 various NLP techniques
2. Apply various library functions to develop NLP applications
3. Choose NLP techniques for language modeling, syntax and semantic parsing
4. Develop NLP system for different applications

### 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. Implement various Image processing techniques
2. Implement various Audio processing techniques
3. Implement various Video processing techniques
4. Develop Multimedia system for different applications

### 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 2<sup>nd</sup> 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