

# **Syllabus 3rd Semester**

**Guru Nanak Dev Engineering College, Ludhiana**  
**Department of Information Technology**  
**Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** PCIT-101

**Subject Name:** Data Structures

<b>Programme: B.Tech. (IT)</b>	<b>L: 3 T: 0 P: 0</b>
<b>Semester: 3</b>	<b>Teaching Hours: 40</b>
<b>Theory/Practical: Theory</b>	<b>Credits: 3</b>
<b>Internal Marks: 40</b>	<b>Percentage of Numerical/Design Problems: 30%</b>
<b>External Marks: 60</b>	<b>Duration of End Semester Exam(ESE): 3hr</b>
<b>Total Marks: 100</b>	<b>Elective Status: Compulsory</b>

**Prerequisites:** Knowledge of Programming for Problem Solving

**Additional Material Allowed in ESE: NIL**

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Analyze and compare algorithms for efficiency using Big-O notation.
CO2	Create and evaluate new algorithms to solve complex engineering problems.
CO3	Illustrate various data structures to solve multi-disciplinary projects.
CO4	Utilize the templates for modularity.
CO5	Compare and classify various data structures
CO6	Demonstrate the reusability of data structures for implementing complex iterative problems.

### **Detailed Contents**

#### **Part-A**

**Introduction to Algorithms:** Definition and brief description of various data structures, operations on data structures, Algorithm development, Complexity analysis, Big O notation, Time space trade-off. **[2 Hours]**

**Arrays, Stacks and Queues:** Linear and Multi-dimensional arrays and their representation, operations on arrays, Linear Search, Binary Search, Sparse matrices and their storage. Stacks: Array Representation and Implementation of Stacks, Operations on Stacks, Application of stacks: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack, Balanced parenthesis checking. Recursion, Tower of Hanoi Problem. Queues: Sequential representation of queue, linear queue, circular queue, operations on linear and circular queue, dequeue, priority queue. **[12 Hours]**

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**Linked Lists:** Linear linked list, operations on linear linked list, doubly linked list, operations on doubly linked list, Circular Linked list, Garbage collection and Compaction, linked representation of Stack, Linked representation of a Queue, Skip List, Operation done in skip list, Implementing the skip list. **[8 Hours]**

**Part-B**

**Trees and Graphs:** Basic terminology of Trees, sequential and linked representations of trees, traversing a binary tree, brief introduction to threaded binary trees, AVL trees and B-trees, Heap Trees. Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm. Basic terminology of graphs, representation of graphs (adjacency matrix, adjacency list), traversal of a graph (breadth - first search and depth - first search). **[10 Hours]**

**Sorting and Hashing Techniques:** Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Shell sort. Complexity. Hashing: Hashing Functions, Collision, Resolution Techniques, Rehashing, Double hashing.**[8 Hours]**

**Text Books**

1. Seymour Lipschitz, “Data Structures”, Schaum’s Outline series, Tata McGraw Hill, 2015
2. Y. Langsam, M. J. Augenstein, A. M. Tanenbaum, “Data Structures using C and C++”, PrenticeHall of India.2016
3. Sartaj Sahni, “Data Structures, Algorithms and Applications in C++”, Tata McGraw Hill. 2008

**Reference Books:**

1. Michael T. Goodrich, Roberto Tamassia, David Mount, “Data Structures and Algorithms in C++”, Wiley India,2011
2. Mark A. Weiss, Algorithms, “Data Structures, and Problem Solving with C++”, Pearson Education. 1995
3. Reema Thareja, “Data Structures using C”, Qxford Higher Education.2014

**E-Books and online learning material**

1. Handbook of Algorithms and Data Structures by Gaston H. Gonnet, Ricardo Baeza-Yates  
<https://users.dcc.uchile.cl/~rbaeza/handbook/hbook.html> Accessed on Feb 24, 2019
2. Martin Gonzalez Rodriguez, “ Data Structures: Graphs”, e Book Accessed on Feb 24, 2019
3. Algorithms and Data Structures Lecture Materials by Douglas Wilhelm Harder  
<http://www.freebookcentre.net/CompuScience/free-computer-algorithm-books.html> ,

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Accessed on Feb 24, 2019

4. Notes on Data Structures and Programming Techniques by James Aspnes

<http://www.cs.yale.edu/homes/aspnes/classes/223/notes.pdf> Accessed on Feb 24, 2019

5. Skip List <https://courses.csail.mit.edu/6.046/spring04/handouts/skiplists.pdf> Accessed on Feb 24, 2019

### **Online Courses and Video Lectures**

1. <http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html>

2. [https://www.youtube.com/watch?v=S47aSEqm\\_0I&index=1&list=PLgj\\_VZKxRKrxgFyOutPJpolFBaQMOpK-](https://www.youtube.com/watch?v=S47aSEqm_0I&index=1&list=PLgj_VZKxRKrxgFyOutPJpolFBaQMOpK-) Accessed on Feb 24, 2019

3. <https://www.cs.utexas.edu/users/novak/cs315contents.html> Accessed on Feb 24, 2019

4. <https://lecturenotes.in/subject/81/data-structure-using-c-ds> Accessed on Feb 24, 2019

5. <https://www.youtube.com/channel/UCMNkvKnD3mo3Jj9eTwJllWw>

6. <https://www.sanfoundry.com/1000-data-structure-questions-answers/> Accessed on Feb 24, 2019

7. <https://freevideolectures.com/subject/data-structures/> Accessed on Feb 24, 2019

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**Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** PCIT-102

**Subject Name:** Object Oriented Programming using C++

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 3	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 50%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Programming for problem solving.

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Understand the basic concepts of classes, objects and methods as well as basic principles of object-oriented programming.
CO2	Create object oriented design based on the characteristics of an object-oriented programming language: data abstraction and information hiding, overloading and dynamic binding of the messages to the methods.
CO3	Apply the concepts of inheritance and relationship among different objects to generate the hierarchies like generalization and aggregation.
CO4	Investigate the concept of strings, File Handling and Exception handling of Specific Programming Problem
CO5	Function on Multi-disciplinary team by using OOPs experiments and Projects.
CO6	Demonstrate real world applications based on the concepts of OOP in C++..

**Part-A**

**Fundamental Concepts of a Programming Language:** basic structure of a program, character set, tokens, keywords and identifiers, constant and variables, data types and sizes, operators and expressions, operator precedence, promotion and type conversion, Control flow (if, if-else,

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nested if-else, for, while, do-while, break, switch, continue and goto statements), arrays and strings. **[8 Hours]**

**Object Oriented Paradigm:** need of object oriented programming, comparison of structured and object oriented development, elements of object oriented programming, encapsulation and data abstraction, inheritance, polymorphism, inheritance, dynamic binding and message communication. **[3 Hours]**

**Classes and Objects:** introduction to classes and objects, class specification, defining member functions, reference and instance variables, scope resolution operator, objects as arguments and returning object. **[3 Hours]**

**Object Initialization and Cleanup :** access specifiers, pass by reference, need for constructors and destructors, parameterized constructors, copy constructor, dynamic constructor, destructors, static data and member functions. **[3 Hours]**

**Overloading and Inheritance:** unary and binary operator overloading, function overloading. Inheritance – need of inheritance, forms of inheritance, inheritance and member accessibility, generalization and aggregation, object composition and delegation, super keyword, overriding. **[3 Hours]**

### **Part-B**

**Pointers and Run Time Polymorphism:** Abstract classes, need of pointers, pointer to objects, this keyword, pointer to derived classes, friend functions, virtual functions and pure virtual functions. **[5 Hours]**

**Exception Handling:** error handling, exception handling model, try, throw, catch and multiple catch, nested try, handler throwing the same exception again, handling uncaught exception and user defined exceptions, rules for handling exceptions successfully. **[5 Hours]**

**String Handling:** creating string objects, extracting characters of a string, string handling functions, streams in C++, formatted and unformatted I/O, formatting using manipulators.

**[5 Hours]**

**File Handling and Templates:** file streams, opening and closing a file, reading and writing a file, error handling during file operations, templates, class and function templates. **[5 Hours]**

### **Text Books**

1. K R Venugopal, Rajkumar Buyya and T Ravishankar, “Mastering C++”, 2<sup>nd</sup> Edition, Tata McGraw Hill Publishing Company Ltd, 1999.
2. E. Balagurusamy, “Object Oriented Programming with C++”, 7<sup>th</sup> Edition, McGraw Hill, 2017

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3. Kanetkar P. Yashavant, "Let Us C++", BPB Publications, 2<sup>nd</sup> Edition, 2003.
4. Bjarne Stroustrup, "The C++ Programming Language", 4<sup>th</sup> Edition , Addison Wesley, 2013.

**Reference Books**

1. Dietel, H.M. and Dietel, P.J., "C++ How to Program", 6<sup>th</sup> Edition, Prentice Hall, 2008.
2. Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design. Tata McGraw Hill, 3<sup>rd</sup> Edition. 2003.
3. Herbert Schildt, C++: The Complete Reference, 4<sup>th</sup> Edition, McGraw - Hill Education, 2017

**E-Books and online learning material**

1. Tutorials Point (C++ Object Oriented)  
[https://www.tutorialspoint.com/cplusplus/cpp\\_object\\_oriented.htm](https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm) Accessed on Feb 21, 2019
2. C++ Tutorials (Object Oriented Programming)  
<https://www.studytonight.com/cpp/cpp-and-oops-concepts.php> Accessed on Feb 21, 2019
3. GeeksforGeeks (A computer science portal for geeks)  
<https://www.geeksforgeeks.org/basic-concepts-of-object-oriented-programming-using-c/>  
Accessed on Feb 21, 2019
4. LearnCpp.com (Tutorial to help you master C++ and Object Oriented Programming)  
<https://www.learncpp.com/> Accessed on Feb 21, 2019

**Online Courses and Video Lectures**

1. <http://www.cplusplus.com/> Accessed on Feb 21, 2019
2. <https://nptel.ac.in/courses/106105151> Accessed on Feb 21, 2019

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**Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** ESIT-101

**Subject Name:** Digital Circuits and Logic Design

<b>Programme: B.Tech. (IT)</b>	<b>L: 3 T: 0 P: 0</b>
<b>Semester: 3</b>	<b>Teaching Hours: 40</b>
<b>Theory/Practical: Theory</b>	<b>Credits: 3</b>
<b>Internal Marks: 40</b>	<b>Percentage of Numerical/Design Problems: 40%</b>
<b>External Marks: 60</b>	<b>Duration of End Semester Exam(ESE): 3hr</b>
<b>Total Marks: 100</b>	<b>Elective Status: Compulsory</b>

**Prerequisites:** Knowledge of basic Electronics and Number Systems

**Additional Material Allowed in ESE: NIL**

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	To understand and examine the structure of various number systems and its application in digital design
CO2	Utilize knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits
CO3	Formulate and employ a Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms
CO4	Identify concepts and terminology of digital logic circuits
CO5	Ability to understand, analyze and design various combinational and sequential circuits.
CO6	To develop skill to build, and troubleshoot digital circuit

**Part-A**

**Number Systems:** Binary, Octal, Decimal, and Hexadecimal. Number base conversions, 1's, 2's, n's complements, signed Binary numbers. Binary Arithmetic, Binary codes: Weighted BCD, Gray code, Excess 3 code, ASCII – conversion from one code to another. [5 Hours]

**Boolean Algebra:** Boolean postulates and laws – De-Morgan's Theorem, Principle of Duality, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms,

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Conversion between canonical forms, Karnaugh map Minimization, Quine-McCluskey method - Don't care conditions **[5 Hours]**

**Logic GATES:** AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations. Study of logic families like RTL, DTL, DCTL, TTL, MOS, CMOS, ECL and their characteristics. **[7 Hours]**

### **Part-B**

**Combinational Circuits:** Design procedure – Adders, Subtractors, Serial adder/Subtractor, Parallel adder/ Subtractor Carry look ahead adder, BCD adder, Magnitude Comparator, Multiplexer/Demultiplexer, encoder/decoder, parity checker, code converters. Implementation of combinational logic using MUX. **[6 Hours]**

**Sequential Circuits:** Flip flops SR, JK, T, D and Master slave, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops. Asynchronous/Ripple counters, Synchronous counters, Modulo-n counter, Ring Counters. Classification of sequential circuits-Moore and Mealy, Design of Synchronous counters: state diagram, Circuit implementation. Shift registers **[8 Hours]**

**Signal Conversions:** Analog & Digital signals. A/D and D/A conversion techniques (Weighted type, R-2R Ladder type, counters Type, Dual Slope type, Successive Approximation type). **[4 Hours]**

**Introduction to VHDL :**Introduction, Behavioral, Data flow, Structural Models, Simulation Cycles, Process Concurrent Statements, Sequential Statements, Loops, Functions and Procedures, Tools used for Simulation of VHDL.**[5 Hours]**

### **Text Books**

1. Morris Mano M, Michael D. Ciletti, "Digital Design", Pearson Education, 4th Edition, 2007.
2. Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage
3. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2007.

### **Reference Books**

1. Donald P Leach, Albert Paul Malvino, GoutamSaha, "Digital Principles and Applications", Tata McGraw Hill, 6th Edition, 2008
2. William H. Gothmann, "Digital Electronics", 2nd Edition, PHI.
3. Anand Kumar, "Fundamental of Digital Circuits" 3rd Edition, PHI, 2014

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**E-Books and online learning material**

1. Digital Logic and Computer Design by Morris Mano

<https://www.pdfdrive.com/digital-logic-and-computer-design-by-m-morris-mano-d34332016.html> Accessed on Feb 21, 2019

2. Digital Circuits and Systems by NEPTEL

<http://www.freebookcentre.net/electronics-ebooks-download/Digital-Circuits-and-Systems.html>  
Accessed on Feb 21, 2019

**Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/117106086/> 1 Accessed on Feb 21, 2019

2. <https://freevideolectures.com/course/3164/digital-electronics> Accessed on Feb 21, 2019

3. <http://www.nptelvideos.in/2012/12/digital-circuits-and-systems.html> Accessed on Feb 21, 2019

4. <https://swayam.gov.in/courses/4860-july-2018-digital-circuits> Accessed on Feb 20, 2019

**Guru Nanak Dev Engineering College, Ludhiana****Department of Information Technology****Syllabus of B. Tech (IT) Scheme 2018****Subject Code:** PCIT-103**Subject Name:** Data Communication and Computer Networks

<b>Programme: B.Tech. (IT)</b>	L: 3 T: 0 P: 0
<b>Semester:</b> 3	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Programming for Problem Solving.**Additional Material Allowed in ESE:** Nil**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Understand Network essentials, Network Architecture, TCP/IP and OSI model. . .
CO2	Analyze and solve networking problems in the area of guided and unguided transmission media.
CO3	Illustrate multi - channel access protocols and IEEE 802standards for LAN and MAN.
CO4	Contrast the design issues and working of protocols at different layers of TCP/IP and OSI models.
CO5	Formulate the various congestion and routing algorithms
CO6	Implement the concepts of N/W security and protocols such as HTTP, FTP, Telnet, DNS.

**Detailed Contents****Part-A**

**Introduction to Computer Networks:** Introduction to Computer Networks Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model. [6 Hours ]

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**Physical Layer:** Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits : Nyquist formula, Shannon Formula, Multiplexing : Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media : Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching ,Packet Switching & their comparisons. **[7 Hours ]**

**Data Link Layer:** Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP. **[7 Hours]**

### **Part-B**

**Medium Access Sub-Layer:** Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm. **[6 Hours]**

**Network Layer:** Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms. **[6 Hours]**

**Transport Layer:** Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, introduction to TCP/UDP protocols and their comparison **[3 Hours]**

**Application Layer:** World Wide Web (WWW), Domain Name System (DNS), E-mail (SMTP, POP3, IMAP, MIME) **[2 Hours]**

### **Text Books**

1. Forouzan, B.A., “Data communication and Networking”, McGraw Hill , 4th edition , 2006.
2. Tanenbaum , A.S., “Computer Networks”, Prentice Hall , 5th edition ,2010.
3. Stallings, W., “Computer Networking with Internet Protocols and Tech”, Prentice Hall of India , 9th edition, 2010.

### **Reference Books**

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India ,5th edition, 2005

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- 2 Narasimha Karumanchi, Elements of Computer Networking: An Integrated Approach (Concepts, Problems and Interview Questions) CareerMonk Publication, 1st Edition , 2014.
3. Norman F. Schneidewind, Computer, Network, Software, and Hardware Engineering with Applications, Wiley-IEEE Press
4. Victor Olifer , Computer Networks: Principles, Technologies and Protocols for Network Design Paperback , Wiley 2006

**E-Books and online learning material**

1. Computer networks book (Forouzan)

<https://doc.lagout.org/network/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf> Accessed on Feb 20, 2019

2. Computer networks book(Tanenbaum)

<http://iips.icci.edu.iq/images/exam/Computer-Networks---A-Tanenbaum---5th-edition.pdf>  
Accessed on Feb 20, 2019

**Online Courses and Video Lectures**

- 1.[https://www.tutorialspoint.com/computer\\_fundamentals/computer\\_networking.htm](https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm)

Accessed on Feb 20, 2019

2. <https://www.geeksforgeeks.org/basics-computer-networking/> Accessed on Feb 20, 2019

3. <https://www.studytonight.com/computer-networks/> Accessed on Feb 20, 2019

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**Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** HSMIT-101

**Subject Name:** Professional Practice, Laws and Ethics for IT Engineers

<b>Programme: B.Tech. (IT)</b>	<b>L: 3 T: 0 P: 0</b>
<b>Semester: 3</b>	<b>Teaching Hours: 40</b>
<b>Theory/Practical:</b> Theory	<b>Credits: 3</b>
<b>Internal Marks: 40</b>	<b>Percentage of Numerical/Design Problems: NA</b>
<b>External Marks: 60</b>	<b>Duration of End Semester Exam(ESE): 3hr</b>
<b>Total Marks: 100</b>	<b>Elective Status: Compulsory</b>

**Prerequisites:** Nil

**Additional Material Allowed in ESE:** Nil

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Critically analyze and discuss key characteristics and emerging issues of Professional practice and ethics.
CO2	Articulate and reflect on the industry expectations of competence and conduct in IT related professions.
CO3	Awareness of types of ethical challenges and dilemmas confronting in IT field.
CO4	Ability to relate ethical concepts and materials to ethical problems in specific professions and professionalism.
CO5	Interpret and understand the various chapters and sections under Indian IT Act 2000.
CO6	Reckon out the need of Intellectual property rights and copyrights.

**Detailed Contents**

**Part-A**

**Professional Practice:** Definition of Professional practice, What constitutes a profession, Professional relationships, Principles of professional practice, Nature of Professionalism and its place in the field of Information Technology, are IT workers professionals, Industry code of

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practice, Benefits of an industry code of practice, Writing a code of conduct, Implementing and review of code of conduct. [3 Hours]

**Teamwork and conflict management:** Skills required for functioning effectively in a team environment, Methods how industry approaches towards a common goal, Methods for conflict management in building stronger teams. [3 Hours]

**Professional Ethics:** Definition of Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Importance of Integrity, Difference between moral ethics and laws, Ethics in Business world, Contrast ethical and legal issues as related to Information Technology, How IT uses or benefits from social and professional issues. [3 Hours]

**Ethics for IT workers and Green IT:** Significance of social context of IT and adherence to ethical code of conduct, IT, IEEE Code of Ethics, Developing green IT policies, Standards and learn to identify green IT, Evaluate green computing performance metrics, recycling practice, energy uses , Incentives at workplace for implementing green computing, management of computer hazardous material [4 Hours]

**Risk Identification and evaluation:** Analyze the role of risk to an organization, Risk Assessment and appropriate actions, Establishing a security policy, Prevention, Detection , response, Information Privacy, Privacy laws, application and court rulings, Identity theft, Consumer profiling, Treating customer data responsibly, Workplace monitoring [4 Hours]

**Freedom of Expression:** First Amendment rights, controlling access to information on internet, defamation and hate speech, Anonymity on internet, corporate blogging, Social Networking: Social networking ethical issue, Cyber bullying, cyber stalking, uploading of inappropriate materials, Crime in virtual worlds. [5 Hours]

### **Part-B**

**Laws, IT Act 2000, Intellectual Property and Copyrights:** Computer Misuse Act 1990, Overview of IT Act 2000, definition, chapters, Jurisdiction, Penalties, Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products,

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Patent protection for computer programs, Process of obtaining patent, Rights and obligations of patentee, Duration of patents law and policy considerations, Infringement and related remedies.

**[10 Hours]**

**Industry standards and careers in IT:** Evaluate skills sets essential to a career in IT, Elements of successful technical resume, significant elements needed for a strong interview for an IT position. Information technology standards, standards organizations, Coding Standards, DBMS standards, Network Standards **[4Hours]**

**Plagiarism:** Introduction to Plagiarism, Types of Plagiarism, taking the Plauge out of Plagiarism, Copies (and Robberies), Shades of Gray: Reason for Students towards Plagiarism, Reducing the Sentence: Responding to Plagiarism, Acting, and Not Reacting: Giving, Tools to Avoid Plagiarism. **[4 Hours]**

#### **Text Books**

1. Ethics in information Technology, 4<sup>th</sup> Edition, George W Reynoldss, Cengage Learning, 2012.
2. Professional issues in IT, Frank Bott, British Computer Society, UK, 2014.
3. Information Technology law and practice, 3<sup>rd</sup> Edition, Vakul Sharma, Universal Publisher, 2018.

#### **Reference Books**

1. The Complete Guide to Referencing and Avoiding Plagarism (Open Up Study kills) Colin Nevilee, Open University Press; 2007.
2. Professional Ethics, R Subramanian, 2<sup>nd</sup> Edition, Oxford Press, 2017.

#### **Online learning material**

1. Green IT, <https://www-03.ibm.com/press/attachments/GreenIT-final-Mar.4.pdf>, [Accessed on 20 Feb 2019]
2. Carriers in IT, [https://www.microtrain.net/files/career\\_pathways.pdf](https://www.microtrain.net/files/career_pathways.pdf), [Accessed on 20 Feb 2019]
3. Carrier in IT, [https://www.bls.gov/opub\(btn/volume-2/pdf/careers-in-growing-field-of-information-technology-services.pdf](https://www.bls.gov/opub(btn/volume-2/pdf/careers-in-growing-field-of-information-technology-services.pdf), [Accessed on 20 Feb 2019]
4. <https://www.cl.cam.ac.uk/teaching/0910/PPEthics/PPEnotesRJennings.pdf> [Accessed on 20 Feb 2019]
5. IT Act 2000, <https://www.wipo.int/edocs/lexdocs/laws/en/in/in024en.pdf>, The Gazette of

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6. IEEE code of Ethics, <https://www.ieee.org/about/corporate/governance/p7-8.html>  
[Accessed on 20 Feb 2019]
7. Industry Code of Practice, <https://lawpath.com.au/blog/what-is-an-industry-code-of-practice> [Accessed on 20 Feb 2019]
8. IT Standards, <https://www.encyclopedia.com/computing/news-wires-white-papers-and-books/information-technology-standards> [Accessed on 20 Feb 2019]
9. Network Standards: <http://what-when-how.com/data-communications-and-networking/network-standards-data-communications-and-networking/>  
[Accessed on 20 Feb 2019]
10. Computer Misuse act : <https://www.legislation.gov.uk/ukpga/1990/18/contents>  
[Accessed on 20 Feb 2019]
11. Coding Standards,  
[www.cs.nott.ac.uk/~pszcah/G53QAT/Reports09/jjb07u/QAT09Report-jjb07u.doc](http://www.cs.nott.ac.uk/~pszcah/G53QAT/Reports09/jjb07u/QAT09Report-jjb07u.doc)  
[Accessed on 20 Feb 2019]

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**Department of Information Technology**

**Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** LPCIT-101

**Subject Name:** Data Structures Laboratory

<b>Programme: B.Tech. (IT)</b>	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 2
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Fundamentals of Computers.

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Improve practical skills in designing and implementing data structure algorithms
CO2	Compose algorithms to solve complex engineering problems
CO3	Implement the templates for modularity
CO4	Design graphical user interface for better human computer interaction.
CO5	Utilize data structure algorithms in a better way to solve responsibilities relevant to other professional engineering practices
CO6	Execute projects for individual or team based on data structure algorithms.

**Special Instruction related to resources requirement:** Code Block / C or C++

**compiler Sr.No. Name of Practical**

1. Program to insert a new element at end as well as at a given position in an array.
2. Program to delete an element from a given whose value is given or whose position is given.
3. Program to find the location of a given element using Linear Search
4. Program to find the location of a given element using Binary Search
5. Program to implement push and pop operations on a stack using linear array.
6. Program to convert an infix expression to a postfix expression using stacks.
7. Program to evaluate a postfix expression using stacks.
8. Implement recursive function for Tower of Hanoi problem.
9. Program to implement insertion and deletion operations in a queue using linear array.

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10. Program to implement linked list.
11. Program to implement push and pop operations on a stack using linked list.
12. Program to implement push and pop operations on a queue using linked list.
13. Program to sort an array of integers in ascending order using bubble sort.
14. Program to sort an array of integers in ascending order using selection sort.
15. Program to sort an array of integers in ascending order using insertion sort.
16. Program to sort an array of integers in ascending order using quick sort
17. Program to traverse a Binary search tree in Pre-order, In-order and Post-order.
18. Program to traverse graphs using BFS.
19. Program to traverse graphs using DFS.

**Mini Project:** Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same

**Reference Books**

1. Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 2011,AW
2. Data Structures and Program Design in C By Robert Kruse, PHI, 1996
3. Theory & Problems of Data Structures by Jr. Seymour Lipschitz, Schaum's outline by TMH,2003

**Guru Nanak Dev Engineering College, Ludhiana****Department of Information Technology****Syllabus of B. Tech (IT) Scheme 2018****Subject Code:** LPCIT-102**Subject Name:** Object Oriented Programming using C++ Laboratory

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 3	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Programming for Problem Solving.**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Develop the solution to problems demonstrating usage of control and selection structure.
CO2	Learn and develop the solution of real world problems with the practical use of data abstraction and information hiding, constructors and destructors, overloading and dynamic binding of the messages to the methods.
CO3	Implement the inheritance and relationship among different objects based on the concepts of generalization and aggregation.
CO4	Demonstrate various I/O operations and String manipulations.
CO5	Create programs related to exception handling.
CO6	Understand generic programming, template and file handling.

**Special Instruction related to resources requirement:** Any compiler of C++ may be used for the programming, however the use of Open Source Software is recommended such as Code Blocks or Dev C++ .**Sr.No. Name of Practical**

1. Demonstrate the use of data types in C++.
2. Demonstrate the use of unary, binary and special operators in C++.
3. Programming practice on if, if-else, nested if and switch statements in C++.
4. Programming practice on “for”, “do-while”, “while”, “break” and “continue” statements in C++.
5. Demonstrate the use of class, objects, reference variable and scope resolution operator.

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6. Programming practice to use objects as arguments and returning objects from functions.
8. Initialization of the member variables using constructors and illustrate the use of destructors.
9. Demonstrate the concept of default constructor, parameterized constructor and copy constructor.
10. Demonstrate the role of “static” keyword C++..
11. Demonstrate the overloading of unary operators and binary operators of C++.
12. Demonstrate the different types of inheritance and illustrate the concept of overriding.
13. Illustrate the concept of Abstract class and abstract functions.
14. Illustrate the concept of virtual functions and pure virtual functions
15. Demonstrate the use of exception handling in C++.
16. Demonstrate string handling functions of C++.
17. Illustrate the concept of streams and file pointers
18. Perform read and write operations on a file.
19. Demonstrate the concept of Templates

**Mini Project:**

Students are required to prepare a project based on the course contents in a group of two to three students. The usage of concepts like inheritance, exception handling, file handling and string handling for the development of the project is recommended. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

**Text Books**

1. K R Venugopal, Rajkumar Buyya and T Ravishankar, “Mastering C++”, 2<sup>nd</sup> Edition, Tata McGraw Hill Publishing Company Ltd, 1999.
2. E. Balagurusamy, “Object Oriented Programming with C++”, 7<sup>th</sup> Edition, McGraw Hill, 2017
3. Kanetkar P. Yashavant, “Let Us C++”, BPB Publications, 2<sup>nd</sup> Edition, 2003.
4. Bjarne Stroustrup, “The C++ Programming Language”, 4<sup>th</sup> Edition , Addison Wesley, 2013.

**Reference Books**

1. Dietel, H.M. and Dietel, P.J., “C++ How to Program”, 6<sup>th</sup> Edition, Prentice Hall, 2008.

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2. Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design. Tata McGraw Hill, 3<sup>rd</sup> Edition. 2003.
3. Herbert Schildt, C++: The Complete Reference, 4<sup>th</sup> Edition, McGraw - Hill Education, 2017

**E-Books and online learning material**

1. Tutorials Point (C++ Object Oriented)

[https://www.tutorialspoint.com/cplusplus/cpp\\_object\\_oriented.htm](https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm) Accessed on Feb 21, 2019

2. C++ Tutorials (Object Oriented Programming)

<https://www.studytonight.com/cpp/cpp-and-oops-concepts.php> Accessed on Feb 21, 2019

3. GeeksforGeeks (A computer science portal for geeks)

<https://www.geeksforgeeks.org/basic-concepts-of-object-oriented-programming-using-c/>  
Accessed on Feb 21, 2019

4. LearnCpp.com (Tutorial to help you master C++ and Object Oriented Programming)

<https://www.learncpp.com/> Accessed on Feb 21, 2019

**Online Courses and Video Lectures**

1. <http://www.cplusplus.com/> Accessed on Feb 21, 2019

2. <https://nptel.ac.in/courses/106105151> Accessed on Feb 21, 2019

**Guru Nanak Dev Engineering College, Ludhiana****Department of Information Technology****Syllabus of B. Tech (IT) Scheme 2018****Subject Code:** LPCIT-103**Subject Name:** Data Communication and Computer Networks Laboratory

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 3	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Fundamentals of Computers.**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Demonstrate the hardware components, transmission media and tools used in computer networks.
CO2	Implement the LAN based on different topologies.
CO3	Execute various networking commands related to troubleshooting.
CO4	Performing initial switch and router configuration.
CO5	Understanding the network IP.
CO6	Design and execute projects in networking in multi-disciplinary teams.

**Special Instruction related to resources requirement:** Hardware requirement: RJ-

45 connector, twisted pair cable, crimping tool

**Software requirement:** C language, Open Source Simulation Tools, Packet Tracer**Detailed Contents**

Prerequisite: Fundamentals of Computers

1. Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool
2. Study of network devices in detail
3. Study of network IP
4. Connect the computers in Local Area Network
5. Study the basic network commands and network configuration commands
6. Performing an initial switch configuration

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7. Performing an initial routing configuration
8. Configuring and troubleshooting a switched network
9. Mini Project: Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same

**Reference Books**

1. <http://www.rpsinstitutions.org/downloads/lab%20manual/cnlab.pdf>
2. Cisco Learning network <https://learningnetwork.cisco.com/thread/118264>
3. <https://www.experts-exchange.com/questions/24163288/How-to-implement-an-ARQ-stop-and-Wait-Protocol.html>

**Guru Nanak Dev Engineering College, Ludhiana****Department of Information Technology****Syllabus of B. Tech (IT) Scheme 2018**

Subject Code: LESIT-101

Subject Name: Digital Circuits and Logic Design Laboratory

<b>Programme:</b> B.Tech. (IT)	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Knowledge of Basic Electronics Engineering and Basic Programming Languages.

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Demonstrate the logic gates and realization of AND, OR, NOT and XOR functions using universal gates
CO2	Design and implement combinational circuits like half adder/ Full adder, half Subtractor/ Full Subtractor, and, MUX/DEMUX
CO3	Design and implement sequential circuits.
CO4	Compare and contrast the outputs of flip flops and counters using different chips
CO5	Demonstrate the working of Synchronous and Asynchronous Counters.
CO6	Execute the various experiments and projects on individuals and multidisciplinary teams through various logic designs and circuits

**Special Instruction related to resources requirement:** Digital trainer kits and Digital ICs and Programming Language Software

**Sr.No. Name of Practical**

1. Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates (using various IC's and programming languages)
2. Realization of OR, AND, NOT and XOR functions using universal gates IC's 7400 and 7402
3. Half Adder / Full Adder: Realization using basic and XOR gates IC's(also using Programming Languages)
4. Half Subtractor / Full Subtractor: Realization using IC's 7400 and 7402(also using Programming Languages)
5. Realisation of IC7483 as Parallel Adder/Subtractor
6. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using Basic, XOR gates and Universal gates

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7. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips
8. Multiplexer: Truth-table verification and realization of Half adder and Full adder using IC74153 chip
9. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using IC74139 chip
10. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF using IC7476 chip.
11. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 & IC7493 chip.
12. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter using IC74192 & IC74193 chip.

**Mini Project:** Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same

**Reference Books:**

1. Digital Fundamentals, Thomas L. Floyd, Pearson Education, ISBN:9 788131734483
2. Digital Principles and Applications, Malvino and Leach, TMH

# **Guru Nanak Dev Engineering College, Ludhiana**

## **Department of Information Technology**

### **Syllabus of B. Tech (IT) Scheme 2018**

**Subject Code:** MCIT-101

**Subject Name:** Environmental Sciences

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 2 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 0
<b>Internal Marks:</b> 40+10*	<b>Percentage of Numerical/Design Problems:</b> 00%
<b>External Marks:</b> Nil	<b>Duration of End Semester Exam(ESE):</b> 03hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** basics of environment.

**Additional Material Allowed in ESE:** NIL

**\*10 marks will be awarded based upon the performance in debates/seminar/fields study related to the contemporary issues of the subject.**

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Measure environmental variables and interpret results.
CO2	Evaluate local, regional and global environmental topics related to resource use and management.
CO3	Propose solutions to environmental problems related to resource use and management.
CO4	Interpret the results of scientific studies of environmental problems.
CO5	Describe threats to global biodiversity, their implications and potential solutions.

#### **Part-A**

**Natural Resources:** Renewable and non renewable resources: Natural resources and associated problems: Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people [2 Hours]

**Relational Model:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems, Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies, Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification [3 Hours]

**Eco Systems:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers, decomposers, Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids [3 Hours]

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#### **Syllabus of B. Tech (IT) Scheme 2018**

**Environmental Pollution:** Definition, causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards  
**[2 Hours]**

**Impact of Information Technology on Environment and Sustainable Development:** Positive and Negative Impacts of IT for Environment, Mobile Phones and Cell Towers, SAR Levels, Effects of Mobile Radiations, Management and Control, IT Impact in Education-Health-Entertainment-Environment-Business-Society, National Management Information System, Environmental Information System, Geographical Information System, Functions of Remote Sensing, Human Health and Safety **[4 Hours]**

### **Part-B**

**Social issues and the Environment:** Form unsustainable to sustainable development, Water conservation, rain water harvesting, water shed management, Resettlement and rehabilitation of people; its problems and concerns, case studies, Environmental ethics: issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection act, Forest conservation act **[5 Hours]**

**E-Wastage and Green Computing:** Impacts of E-Waste on the Environment, Harmful Effects caused by Improper Computer & Electronic Waste Recycling, Global Trade Issues, Information Security, Recycling, Repair, Electronic Waste Substances, Holistic Approaches and Techniques for Green Computing, Impacts of Green Computing, Green Awareness, Green Initiatives in Information Technology, Green Computing Certifications, Issues & Challenges Ahead **[5 Hours]**

### **Text Books**

1. Textbook of Environmental studies, Erach Bharucha, UGC,2017

Weblink:

<https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>

2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd, 2018
3. Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.2001

### **References Books**

1. Principle of Environment Science by Cunningham, W.P.2009
2. Essentials of Environment Science by Joseph.2006
3. Perspectives in Environmental Studies by Kaushik, A. 2008
4. Elements of Environment Science & Engineering by Meenakshi.2012
5. Elements of Environment Engineering by Duggal.2007

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**Subject Code: PRIT-101**

**Subject Name:** Seminar and Technical Report Writing

<b>Programme: B.Tech. (IT)</b>	<b>L: 0 T: 0 P: 2</b>
<b>Semester: 3</b>	<b>Teaching Hours: 24</b>
<b>Theory/Practical: Theory</b>	<b>Credits: 1</b>
<b>Internal Marks: 50</b>	<b>Percentage of Numerical/Design Problems: 100%</b>
<b>External Marks: Nil</b>	<b>Duration of End Semester Exam (ESE):</b>
<b>Total Marks: 50</b>	<b>Elective Status: Compulsory</b>

**Prerequisites:** Basic writing skills

**Additional Material Allowed in ESE: NIL**

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Define and agree the purpose of the report.
CO2	Have a clear understanding of the needs of your readers.
CO3	Design a document structure to effectively get your message across.
CO4	Identify the necessary content and have an appropriate layout.
CO5	Use a number of readily available tools to assist with report writing.
CO6	Edit more competently and eliminate avoidable mistakes.
CO7	Reference and quote correctly, and not infringe copyright.

**Detailed Contents:**

**Part-A**

**Introduction:** Structure of technical Report, Presentation, Planning the report, Writing the first draft, Revising the first draft, Diagrams, graphs, tables and mathematics, The report layout, Headings, References to diagrams, graphs, tables and equations, Originality and plagiarism, Finalising the report and proofreading, The Summary, Proofreading. **[3 Hours]**

**Presentation Skills:** Different ways to fight anxiety, If you don't have anything to say, If something goes wrong, If you forget something, If you make a mistake. **Voice:** Voice and eye contact, Perfect vs Passionate, Tempo and Time, Gestures, **Contact:** Facial Expression, asking

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questions, Things not to do, Computer does not start, Working with slides. **Q&A :** Recap, Filtering questions, Tough questions, You're uncomfortable with the answer, Difficult situations. **[2 Hours]**

**LaTeX:** TeX, LaTeX, Terms regarding TeX, Custom installation with TeX Live, Tables and graphics tools, Automatic installation, Manual installation, Checking package status, External resources, The LaTeX syntax, Compilation. **[3 Hours]**

**Text Formatting:** Spacing, Hyphenation, Quote-marks, Diacritics and accents, Margin misalignment and interword spacing, Ligatures, Slash marks, Fonts, Formatting macros, Text mode superscript and subscript, Text figures ("old style" numerals), Dashes and hyphens, Ellipsis (...), Ready-made strings **[3 Hours]**

### **Part B**

**Paragraph Formatting:** Paragraph alignment, Paragraph indent and break, \paragraph line break, Line spacing, Manual breaks, Special paragraphs **[3 Hours]**

**Fonts :** Introduction, Font families, Available LaTeX Fonts, emphasizing text, Font encoding, Font styles, Local font selection, Arbitrary font size, finding fonts, Using arbitrary system fonts, PDF fonts and properties, List Structures **[3 Hours]**

**Tables** The *tabular* environment, Row specification, Spanning, controlling table size, Colors, Width and stretching, Table across several pages, Partial vertical lines, vertically centered images, Footnotes in tables, Professional tables, Sideways tables, Table with legend, the *eqparbox* package, Floating with table **[3 Hours]**

**Floats, Figures and Captions:** Floats, keeping floats in their place, Captions, lists of figures and tables, Labels and cross-referencing, Wrapping text around figures, Subfloats, Wide figures in two-column documents, Custom floats, Labels in the figures, Footnotes and Margin Notes **[3 Hours]**

### **Text Books**

1. LaTeX, Wikibook , <http://en.wikibooks.org/wiki/LaTeX> ,en.wikibooks.org, 2016 [Accessed on 23 Feb 2019]
2. Presentation skills: Effective Presentation Delivery (Coursera) [Accessed on 23 Feb 2019]
3. [http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/techreport\\_writing](http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/techreport_writing) [Accessed on 23 Feb 2019]
4. Frank Mittelbach , Michel Goossens, Johannes Braams,David Carlisle, Chris Rowley,

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“The LaTeX Companion (Tools and Techniques for Computer Typesetting)”, 2nd Edition, Addison-Wesley, 2005

5. Stefan Kottwitz, “LaTeX Beginner's Guide”, 1<sup>st</sup> Edition PACKT, 2011

**Reference Books:**

1. Davies J.W., “Communication for Engineering Students”, Longman, 1996
2. Van Emden J., “Effective communication for Science and Technology”, Palgrave 2001
3. Van Emden J., “A Handbook of Writing for Engineers”, 2nd ed. Macmillan 1998
4. Van Emden J. and Easteal J., “Technical Writing and Speaking, an Introduction”, McGraw-Hill 1996.
5. Pfeiffer W.S., “Pocket Guide to Technical Writing”, Prentice Hall 1998.
6. Eisenberg A., “Effective Technical Communication”, McGraw-Hill 1992.

**E-Books and online learning material**

1. AH Basson & TW von Backström , “Guide for Writing Technical Reports”, 3rd Edition, Stellenbosch University”, 2007 Accessed on Feb 23, 2019
2. “Introduction to LaTex”, [http://home.iitk.ac.in/~kalpant/docs/intro\\_latex.pdf](http://home.iitk.ac.in/~kalpant/docs/intro_latex.pdf) Accessed on Feb 23, 2019

**Online Courses and Video Lectures**

1. “Technical Report Writing for engineers”, <https://www.futurelearn.com/courses/technical-report-writing-for-engineers> Accessed on Feb 23, 2019
2. “Academic and Research Report Writing”, <https://swayam.gov.in/courses/4635-academic-and-research-report-writing> Accessed on Feb 23, 2019

## **Syllabus 4th Semester**

**Subject Code:** BSIT-101

**Subject Name:** Probability and Statistics

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 80%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hr
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Mathematics-1 and Mathematics-II

**Additional Material Allowed in ESE:** Scientific Calculator

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Demonstrate the measures of central tendency to analyze the given data set
CO2	Create the histogram for a given data set
CO3	Verify the predicted data sets using Binomial, Poisson and normal distribution
CO4	Select a critical value from a normal, t, chi -square, and f distribution
CO5	Predict the linear regression parameters and correlation coefficient
CO6	Apply probability theory via Bayes' Rule
CO7	Formulate the marginal and conditional distributions of bi-variate random variables

#### **Detailed Contents:**

##### **Part-A**

**Introduction to Statistics:** Meaning, scope, importance and limitations. Analysis of data: source of data, collection, classification, tabulation, depiction of data. Measures of Central tendency: Arithmetic, weighted, geometric mean, median and mode. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation Coefficient of variation, Skewness and Kurtosis. [7 Hours]

**Sampling Distribution & Testing of Hypothesis:** Sampling, Distribution of means and variance , Chi – Square distribution, t – distribution , F – distribution . General concepts of hypothesis, Testing a statistical Hypothesis, One and two tailed tests , critical region , Confidence interval estimation . Single and two sample tests on proportion , mean and variance .

**[8 Hours]**

**Correlation Analysis:** Significance, types, Methods of correlation analysis: Scatter diagrams, Graphic method, Karl Pearson“s correlation co-efficient, Rank correlation coefficient, Properties of Correlation. Regression analysis: meaning, application of regression analysis, difference between correlation & regression analysis, regression equations, standard error and Regression coefficients. curve fitting. **[7 Hours]**

### **Part-B**

**Theory of Probability:** Definition, basic concepts, events and experiments, random variables, expected value, types of probability, classical approach, relative frequency and subjective approach to probability, theorems of probability, addition, Multiplication and Bays Theorem and its application. **[6 Hours]**

**Probability Distributions:** Difference between frequency and probability distributions, Binomial, Poisson and normal distribution **[6 Hours]**

**Optimization:** Matrix calculus, gradient descent, coordinates descent, introduction to convex optimization. **[6 Hours]**

#### **Text Books**

1. C. B. Gupta, “An Introduction to Statistical Methods”, Vikas Publications House Pvt. Ltd. 2010
2. S. P Gupta, Sultan Chand ,”Statistical Methods”, Publishers Sultan Chand & Sons 2014.
3. E.Kreyszig , “ Advanced Engineering Mathematics” , Wiley International Edition 2006
4. Convex Optimization by Boyd and Vandenberghe

#### **Reference Books**

1. Bali , N.P. , “ A Text Book On Engineering Mathematics” , Luxmi Publications, New Delhi 2010.
2. HosseinPishro-Nik ,”Introduction to Probability, Statistics, and Random Processes”, Kappa Research, LLC , 2014
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint)

4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

#### **E-Books and online learning material**

1. Convex Optimization by Boyd and Vandenberghe [http://stanford.edu/~boyd/cvxbook/bv\\_cvxslides.pdf](http://stanford.edu/~boyd/cvxbook/bv_cvxslides.pdf) Accessed on Feb 21, 2019
2. Probability and Statistics by Prasanna Sahoo <http://www.math.louisville.edu/~pkshah01/teaching/Math662TB-09S.pdf> Accessed on Feb 21, 2019

#### **Online Courses and Video Lectures**

1. Probability and Statistics by Nptel <https://nptel.ac.in/courses/111105041/> Accessed on Feb 21, 2019
2. Probability and Statistics by Nptel <https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PLbMVogVj5nJQrzbaWeTVvnH6-vG5A4aN5> Accessed on Feb 21, 2019

**Subject Code:** PCIT-104  
**Subject Name:** Database Management System

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hr
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Knowledge of Programming for Problem Solving

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Apply knowledge of database system, No Sql database, data mining and SQL structure.
CO2	Identify, formulate database design, Functional dependencies and recovery techniques.
CO3	Use the techniques, skills and tools such as query handling, normalized relations.
CO4	Design Physical and object relational database.
CO5	Investigate various case studies using NoSql.
CO6	Apply the Applications of spatial and multimedia databases for real world.

**Detailed Contents:**

**Part-A**

**Introduction to Database System:** Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Components of a Database management Distributed Processing and Client Basic Concepts, Keys, Design Issues, ER Diagrams [5 Hours]

**Relational Model:** Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus. SQL – Basic Structures, Query Handling, Embedded SQL, Triggers, Security and Authorization. [10 Hours]

**Relational Database Design:** Functional Dependencies, Multivalued Dependencies, Normal

Forms ( 1NF ,2NF, 3NF, BCNF, 4NF and 5NF), Decomposition into Normalized Relations. [5 Hours]

### Part-B

**Transaction Management and Concurrency Control:** Transaction Management and Concurrency Control ACID properties, failure and recovery, concurrency control, serializability, two phase locking protocols, Timestamp and Validation based protocols, deadlocks, logs and logging protocol [5 Hours]

**Recovery Systems:** Failure Classification, Recovery and Atomicity, Log Based Recovery, Shadow Paging, Recovery with Concurrent Transactions [4 Hours]

**NoSQL Database:** Introduction to NoSQL Database, NoSQL Database Terms and Terminology, Evaluating NoSQL, Key Value Stores, Case studies of Metlife, Facebook and Google using NoSQL. [5 Hours]

**Advanced Topics:** Introduction to Data Mining, Process of Data Mining, Applications of Data Mining, Data Warehousing, Advantages of Data Warehousing, Data Marts, Introduction and Applications of Spatial and Multimedia Databases. [6 Hours]

#### Text Books:

1. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, “Database System Concepts”, 6th Edition, Tata McGraw - Hill Education, 2011.
2. Shamkant B. Navathe, RamezElmasri, “Fundamentals of Database Systems”, 6th Edition, Addison Wesley Pub Co Inc, 2010.
3. Connolly, “Specifications of Database Systems : A Practical Approach to Design, Implementation and Management”, 4th Edition, Pearson India, 2008.

#### Reference Books:

1. Essentials of Data Base Management System - Alexis Leon and Mathews Leon - Vikas Publishing Limited, Chennai First Edition, 2009
2. SQL and PL/SQL - SharadMaheswariRuchin Jain - Firewall Media New Dehi First Edition 2010

3. Database Management Systems - Ramon a.Mato-Toledo, Pauline K.Cushman - Schaums'Outline series, TMH, New Delhi Special Indian Edition 2007
4. Data Warehousing - BPB Editorial Board - BPB Publications, New Delhi - First Indian Edition 2004, Reprinted 2008
5. Mastering Database Technologies - Ivan Bayross - BPB Publications, New Delhi - First Indian Edition 2006, Reprinted 2011
6. Database Management Systems - SharadMaheswari, Ruchin Jain - Firewall Media, New Delhi - Second Edition Reprint 2010

#### **E-Books and online learning material**

1. Database Management Systems by Ravi Jasuja  
<http://www.aduni.org/courses/databases/index.php?view=cw> Accessed on Feb 20, 2019
2. Database Systems by Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom.  
<http://infolab.stanford.edu/~ullman/dscb.html> Accessed on Feb 20, 2019
3. Database Management System by GaviNarra  
<http://www.freebookcentre.net/database-books-download/Database-Management-System.html> Accessed on Feb 20, 2019

#### **Online Courses and Video Lectures**

1. [https://onlinecourses.nptel.ac.in/noc18\\_cs15/preview](https://onlinecourses.nptel.ac.in/noc18_cs15/preview) Accessed on Feb 20, 2019
2. <https://nptel.ac.in/courses/106105175/2> Accessed on Feb 20, 2019
3. <https://freevideolectures.com/course/2668/database-management-system> Accessed on Feb 20, 2019
4. <https://www.studytonight.com/dbms/er-to-relational-model.php> Accessed on Feb 20, 2019
5. <https://www.studytonight.com/dbms/database-normalization.php> Accessed on Feb 20, 2019

**Subject Code:** PCIT-105

**Subject Name:** Python Programming

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 50%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hr
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Knowledge of Programming for Problem Solving and OOPS

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Familiar with Python environment, data types, operators used in Python.
CO2	Compare and contrast Python with other programming languages..
CO3	Learn the use of control structures and numerous native data types with their methods.
CO4	Design user defined functions, modules, and packages.
CO5	Investigate and implement Graphical User Interfaces based programming
CO6	Create and handle files in Python
CO7	Identify the need of object oriented programming features and implement the same to meet real time requirements.

#### **Detailed Contents:**

##### **Part-A**

**Introduction to Python Programming Language:** History and Origin of Python Language, Python version numbering scheme, Features of Python, Advantages and disadvantages, Major Applications of Python, Installing Python, Setting up Path and Environment Variables, Getting started with Python Programming, Python Interactive Help Feature, Detecting and Correcting syntax errors, Comparison of Python with other languages. **[5 Hours]**

**Software Development, Data types, Operators and Expressions:** The software Development Process, Case study: income tax Calculator, strings, Assignment and Comments, numeric Data

types and Character sets, Operators in Python, Expressions, Precedence, Associativity, Non Associative Operators, using Functions and modules. **[5 Hours]**

**Loops and Selection Statements:** Definite Iteration: The for Loop, Formatting Text for Output, Case Study: An Investment Report, Selection: if and if-else Statements, Conditional Iteration: The while Loop, Case Study: Approximating Square Roots. **[6 Hours]**

**Strings and Text Files:** Accessing Characters and Sub-strings in Strings, Data Encryption, Strings and Number Systems, String Methods, Text Files, Case Study: Text Analysis. **[5 Hours]**

### **Part-B**

**Lists and Dictionaries:** Lists, Defining Simple Functions, Case Study: Generating Sentences, Dictionaries, Case Study: Non-directive Psychotherapy. **[3 Hours]**

**Design with Functions:** Function components, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study: Gathering Information from a File System, Managing a Program's Namespace, Higher-Order Functions. **[4 Hours]**

**Graphical User Interfaces:** The Behavior of Terminal-Based Programs and GUI –Based Programs, Coding Simple GUI-Based Programs, Windows and Window Components, Command Buttons and Responding to Events, Input and Output with Entry Fields, Defining and Using Instance Variables, Case Study: The Guessing Game Revisited, Useful GUI Resources.

**[6 Hours]**

**Design with Classes:** Getting Inside Objects and Classes, Case Study: Playing the Game of Craps, Data-Modeling Examples, Case Study: An ATM, Building a New Data Structure: The Two-Dimensional Grid, Case Study: Data Encryption with a Block Cipher, Structuring Classes with Inheritance and Polymorphism. **[6 Hours]**

### **Text Books**

1. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python First Programs", 2<sup>nd</sup> Edition, Cengage Learning, 2019.
2. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python: First Programs through Data Structures", 1<sup>st</sup> Edition, Cengage Learning, 2010.

### **Reference Books**

1. Martin C. Brown, "Python The complete Reference", McGraw Hill Education.
2. Allen B. Downey, "Think Python", 1<sup>st</sup> Edition, Green Tea Press, 2012.

### **E-Books and online learning material**

Guru Nanak Dev Engineering College, Ludhiana  
Department of Information Technology  
B. Tech (IT) Scheme 2018

1. Fundamentals of Python First Programs by Kenneth A. Lambert  
<https://archive.org/details/FundamentalsOfPythonFirstPrograms2ndEdition> Accessed on Feb. 20, 2019
2. Learning Python by Fabrizio Romano
3. Python Essential Reference by Beazley  
<http://lib.mylibrary.com?id=267855> Accessed on Feb 20, 2019
4. Starting Out with Python by Gaddis  
<http://lib.mylibrary.com?id=265135> Accessed on Feb 20, 2019
5. Beginning Programming with Python For Dummies by John Paul Mueller  
<http://www.allitebooks.com/beginning-programming-with-python-for-dummies-2nd-edition>  
Accessed on Feb 20, 2019

**Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/115104095> Accessed on Feb 20, 2019
2. <https://nptel.ac.in/courses/106106145> Accessed on Feb 20, 2019
3. <https://nptel.ac.in/courses/106106182> Accessed on Feb 20, 2019
4. <https://www.coursera.org/learn/python> Accessed on Feb 20, 2019
5. <https://www.coursera.org/learn/interactive-python-1> Accessed on Feb 20, 2019

**Subject Code:** PCIT-106

**Subject Name:** Operating System

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hr
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Pre-requisites:** Knowledge of Programming for Problem Solving and DCLD.

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1.	Exemplify various types of Operating Systems, deadlocks, Process, File and Memory management.
CO2.	Implement various deadlock scheduling algorithms.
CO3.	Analyze and apply various memory and file management mechanisms.
CO4.	Classify various page replacement algorithms for demand paging.
CO5.	Use different disk scheduling algorithm for better utilization of external memory.
CO6.	Examine the case studies of different Operating Systems to recapitulate the concepts of Operating System.

## Detailed Contents

### Part - A

**Introduction:** Introduction to Operating systems, Different types of operating systems - Batch, Multi-programmed, Time sharing, Real time, Distributed, Parallel. Functions of kernel and shell, General structure of Operating System, O/S services, System calls. **[5 Hours]**

**Process Management:** Concept of processes and threads, Process states, Process control block, Process scheduling, Scheduling Algorithms, Inter Process Communication, Process synchronization – Critical sections, Mutual Exclusion, Semaphores. **[8 Hours]**

**Deadlocks:** Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlock prevention and avoidance, Deadlock detection and recovery. **[5 Hours]**

### Part - B

**Memory Management:** Background, Overlays, Logical versus physical address space, Memory management policies, Fragmentation types, Partitioned memory managements, Paging, Segmentation, Segmentation with paging, Need of Virtual memories, Demand Paging, Page replacement Algorithms – FIFO, Optimal, LRU. Thrashing, Cause of Thrashing, Local and Global page replacement. **[9 Hours]**

**Secondary Storage:** Disk structure, Disk scheduling – FCFS, SSTF, SCAN, C-SCAN, LOOK, CLOOK. Disk Management, Disk Formatting, Boot blocks, Bad blocks. **[4 Hours]**

**File Management:** Concept of files, File types, Access methods, File attributes, File operations, Allocation methods – Contiguous, Linked, Indexed. File System Architecture, Layered Architecture, Protection mechanisms. **[5 Hours]**

**Case Studies:** Windows, UNIX and LINUX. **[4 Hours]**

#### **Text Books**

1. A.Silberschatz and Peter B. Galvin, “Operating System Concepts”, Addison Wesley.
2. Dhamdhere, “Systems Programming & Operating Systems”, Tata McGraw Hill.
3. GaryNutt, “Operating Systems Concepts”, Pearson Education Ltd.

#### **Reference Books**

1. Andrews S. Tanenbaum, “Modern Operating Systems”, Pearson Education (2015) 4th Edition.
2. Pramod Chandra and P. Bhatt, “An introduction to operating systems concepts & Practices”, PHI Publication.
3. Tanenbaum A.S., “Operating System Design & Implementation”, Pearson Education.
4. Pramod Chandra and P. Bhatt, “An introduction to operating systems concepts & Practices”, Prentice Hall of India Publication.
5. Godbole, “Operating systems”, Tata McGraw Hill.

#### **E-Books and online learning material**

1. Operating System Concepts by Silberschatz, Galvin and Gagne  
[http://www.uobabylon.edu.iq/download/M.S%202013-2014/Operating\\_System\\_Concepts,\\_8th\\_Edition%5BA4%5D.pdf](http://www.uobabylon.edu.iq/download/M.S%202013-2014/Operating_System_Concepts,_8th_Edition%5BA4%5D.pdf) Accessed on 20.2.2019
2. Introduction to Operating System  
<https://nptel.ac.in/courses/106108101/> Accessed on 20.2.2019

**Subject Code:** PCIT-107  
**Subject Name:** Web Technologies

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Programming for Problem Solving, Data Communication and Computer Network, Object Oriented Programming using C++.

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Understand the basic tools required for Web designing and applications
CO2	Build HTML5 and CSS3 for designing interactive web pages.
CO3	Analyze the basic operations of an AJAX application
CO4	Develop an interactive website using jQuery.
CO5	Acquire the basic usage of PHP construct and its integration with database for developing web modules like, login module, session authentication
CO6	Create and design dynamic web application using contemporary development tools like, MVC framework.

#### Detailed Contents

##### Part-A

**Introduction to HTML:** Introduction to web browsers, HTML, XML and XHTML, basic page markup, absolute and relative links, ordered and unordered lists, embedding images and controlling appearance, table creation and use, frames, forms. **[6 Hours]**

**Style Sheets:** Introduction to Cascading Style Sheets(CSS), features, core syntax, separating style from structure with style sheets: internal style specifications within HTML, external linked style specification using CSS, page and site design considerations. **[5 Hours]**

**JavaScript, jQuery and AJAX :** Introduction to the JavaScript, Document Object Model, jQuery, including and customization of jQuery, jQuery syntax and selectors, handling events, special effects and manipulating DOM, jQuery without Selectors, plugins, using jQuery for

slider design, concept of AJAX, using XMLHttpRequest, sending and receiving data using GET and POST methods. [9 Hours]

### Part-B

**HTML5 & CSS3:** Introduction to HTML5, the Canvas, audio and video, forms, local storage, web workers, geolocation and GPS Services, advanced CSS with CSS3: CSS3 backgrounds, CSS flexbox, CSS3 borders, multicolumn layout, text effects, web fonts, 3D transformations, transitions, deploying HTML5 and CSS3 using bootstrap framework. [8 Hours]

**PHP5:** Introduction to PHP, basic syntax and variable declaration, expressions and control flow in PHP, PHP array, inbuilt and user defined PHP functions, creating classes, constructors and objects. assessing functions using objects, implementing inheritance, using MySQL with PHP for database related operations, advantages of PHP framework and basic knowledge about industry used frameworks, features of CodeIgniter framework . [12 Hours]

### Text Books

1. Robin Nixon, “Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5”,<sup>th</sup> O’Reilly, 4 Edition, 2015.
2. Kogent Learning Solutions Inc. “HTML5 Black Book: Covers CSS3, Javascript, XML,
3. W. Jason Gilmore, “Beginning PHP and MySQL: From Novice to Professional”, 4 Edition, Dreamtech Press, 2010
4. Richard York, “Beginning Javascript and CSS Development with jQuery”, John Wiley and Sons Inc., 2009.
5. Audra Hendrix, “AJAX and PHP: Building Modern Web Applications”, Shroff/ Packt, 2<sup>nd</sup> Edition, 2015.

### Reference Books

1. Adam Trachtenberg, “PHP Cookbook: Solutions & Examples for PHP Programmers”, 3rd Edition, Shroff/ O’reilly

2. William Sanders, “Learning PHP Design Patterns”, O’Reilly, 1st Edition, 2013
3. Jack Herrington, “PHP Hacks: Tips & Tools for creating for Dynamic Web Sites”, John C.
4. Adam Freeman, “Pro jQuery 2.0”, Apress, 2013.
5. Nicholas C. Zakasm, Jeremy McPeak and Joe Faweett“Professional AJAX”, Wiley India Pvt. Ltd., 2nd edition, 2007.
6. Thomas Mayer, “Professional Codeigniter”, John Wiley and Sons Inc., 2008.

**E-Books and online learning material**

1. Tutorial on HTML,CSS,JQuery,AJAX,PHP

<https://www.w3schools.com/html/default.asp> Accessed on Feb 22, 2019

<https://www.tutorialride.com/web-technologies.htm>

Accessed on Feb 22, 2019

3. Web Tutorials (Web Development Technologies)

[https://www.tutorialspoint.com/web\\_development\\_tutorials.htm](https://www.tutorialspoint.com/web_development_tutorials.htm)

Accessed on Feb 22, 2019

**Subject Code:** PCIT-108  
**Subject Name:** Computer Architecture and Microprocessors

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 4	<b>Teaching Hours:</b> 40
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hr
<b>Total Marks:</b> 100	<b>Elective Status:</b> Compulsory

**Prerequisites:** Digital Circuit and Logic Design

**Additional Material Allowed in ESE:** NIL

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Identify computer systems, memory organization, Microprocessor and assembly language programming
CO2	Clarify instruction formats, RISC and CISC architecture and different addressing modes
CO3	Solve basic binary math operations by using the instructions of microprocessor
CO4	Compare between pipelining and parallelism
CO5	Design structured, well commented, understandable assembly language programs to provide solutions to real-world problems
CO6	Classify the trends and developments of microprocessor technology

### Detailed Contents

#### Part-A

**Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, I/O and Interrupt, Design of Basic Computer, Design of Accumulator Logic [5 Hours]

**Programming the Basic Computer:** Machine Language, Assembly Language, Assembler, Program Loops, Programming Arithmetic and Logic Operations, Subroutines, I/O Programming [4 Hours]

**Central Processing Unit:** General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer, Complex Instruction Set Computer **[5 Hours]**

**Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors **[5 Hours]**

### **Part-B**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware **[5 Hours]**

**Multiprocessors:** Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence **[4 Hours]**

**Microprocessor and Microcontroller:** 8051 Architecture, Pin Diagram of 8051, External Memory Interfacing, Stacks, Interfacing 8051 to LCD, Parallel and Serial ADC, DAC, Stepper Motor Interfacing and DC Motor Interfacing **[8 Hours]**

**Applications and Trends of Microprocessor Technology:** Memory and MPU Design, Development and Troubleshooting Tools, High-End-High-Performance Processors, Embedded Systems **[4 Hours]**

#### **Text Books:**

1. M. Morris Mano, “Computer System Architecture”, 3<sup>rd</sup> Edition, Pearson Education, 2015.
2. William Stallings, “Computer Organization and Architecture”, 9<sup>th</sup> Edition, Pearson Education, 2017.
3. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with 8085”, 6<sup>th</sup> Edition, Penram International Publication, 2015.

#### **Reference Books:**

1. B. Ram, “Microprocessors and Microcomputers”, 4<sup>th</sup> Edition, Dhanpat Rai Publications, 2000.
2. K. Vani, “Computer Architecture with MIPS”, 1<sup>st</sup> Edition, Notion Press, 2017.
3. Sachin Kadam, “Computer Architecture and Maintenance”, 1<sup>st</sup> Edition, Packt Publishers, 2017.
4. Muhammad Ali Muzidi and Janice Gillispie Muzidi, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, 1<sup>st</sup> Edition, Hanel Publishers, 2017.

**E-Books and online learning material**

1. Computer Architecture by Wikipedia

[https://en.wikipedia.org/wiki/Computer\\_architecture](https://en.wikipedia.org/wiki/Computer_architecture) Accessed on Feb 22, 2019

2. Computer Architecture by Princeton University

<https://www.coursera.org/learn/comparch> Accessed on Feb 22, 2019

3. Computer Organization by Study Tonight

<https://www.studytonight.com/computer-architecture/architecture-of-computer-system>

Accessed on Feb 22, 2019

**Online Courses and Video Lectures**

1. <https://www.youtube.com/watch?v=4TzMyXmzL8M>

Accessed on Feb 22, 2019

2. <https://www.youtube.com/watch?v=So9SR3qpWsM>

Accessed on Feb 20, 2019

**Subject Code:** LPCIT-104

**Subject Name:** Database Management System Laboratory

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 4	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Fundamentals of Computers.

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Apply knowledge of SQL and create tables, views.
CO2	Identify, formulate database design using single row function and group function
CO3	Displaying data from multiple tables
CO4	Design single row and multiple row sub queries, advanced sub queries
CO5	Investigate MongoDB using NoSql
CO6	Create an application of DBMS in multidisciplinary environment

**Special Instruction related to resources requirement:** Except practical number 10, any DBMS software like MySQL/Mariadb, Oracle etc. can be used Sr.No. Name of Practical

1. **Creating and Managing Tables:** Create table statement; referencing another user's tables; the DEFAULT option; data types; alter table statement; adding a column; modifying a column; dropping a column; dropping a table; truncating a table.
2. **Writing Basic SQL SELECT Statements :** Basic SELECT Statement; selecting - all columns, specific columns; using arithmetic operators; operator precedence; using parenthesis; defining a NULL Value; using column aliases; concatenation operator; eliminating duplicate rows; displaying table structure.
3. **Restricting and Sorting Data:** Limiting rows using a selection; character strings and dates; comparison conditions; using the BETWEEN condition; IN condition; LIKE condition; NULL conditions; logical conditions- AND, OR and NOT operators; rules of precedence; ORDER BY clause; sorting – ascending, descending order.
4. **Manipulating Data:** Data manipulation language; adding a new row to a table; inserting- new rows, rows with NULL values, specific date values; updating rows in a

- table; updating two columns; updating rows based on another table; removing a row from a table deleting rows from a table; deleting rows based on another table.
5. **Single Row Functions:** Character functions - case manipulation and character manipulation functions; number functions, date functions; using arithmetic operators with dates; date functions, conversion functions.
6. **Displaying Data from Multiple Tables:** Cartesian products; different types of joins specific to the software package; SQL compliant joins
7. **Aggregating Data Using Group Functions:** Group functions for various statistical metrics; creating groups of data by GROUP BY clause; grouping by more than one column; excluding group results- HAVING Clause.
8. **Subqueries:** Single-row subqueries; multiple-row subqueries; using group function in a subquery; HAVING clause with subqueries; usage of operators in multiple-row subqueries
9. **Creating Views:** Simple views and complex views; creating a view; retrieving data from view; querying a view; modifying a view; removing a view; inline views.
10. **Overview of MongoDB: A NoSQL database:** Create and drop-database, collection; data types; insert document; query document; logical operators; update document; delete document; projection; limit records; sort documents.
11. Mini Project By using standard database design rules, database has to be designed for a specific assigned problem to a group of two to three students. ER diagram related to project with an open source database tool like MySQL workbench must also be prepared. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Reference Books:**

1. Introduction to Oracle 9i:SQL by Nancy Greenberg and Priya Nathan , publisher Sheryl Dominigue edition June 2001.
2. SQL, PL/SQL: The Programming Language of Oracle by Ivan Bayross , publisher BPB, edition December 2010

**Subject Code:** LPCIT-105

**Subject Name:** Python Programming Laboratory

<b>Programme: B.Tech. (IT)</b>	<b>L: 0 T: 0 P: 2</b>
<b>Semester: 4</b>	<b>Teaching Hours: 26</b>
<b>Theory/Practical:</b> Practical	<b>Credits: 1</b>
<b>Internal Marks: 30</b>	<b>Percentage of Numerical/Design Problems: 100%</b>
<b>External Marks: 20</b>	<b>Duration of End Semester Exam(ESE): 1.5 hr</b>
<b>Total Marks: 50</b>	<b>Elective Status: Compulsory</b>

**Prerequisites:** Basic knowledge of programming in C, C++.

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Apply knowledge of data types, operators and expression.
CO2	Identify and implement the concept of strings, loops, selection statements.
CO3	Formulate and Identify the use of list and dictionaries.
CO4	Able to solve the problem using the concept functions.
CO5	Investigate and implement Graphical User Interfaces programs
CO6	Create an application using classes for multidisciplinary fields

**Special Instruction related to resources requirement:** The students need to implement any three projects from each of the below mentioned topics.

**Data types, Operators and Expressions:** (Do any three projects from the following)

In each of the projects that follow, you should write a program that contains an introductory docstring. This documentation should describe what the program will do (analysis) and how it will do it (design the program in the form of a pseudo code algorithm). Include suitable prompts for all inputs, and label all outputs appropriately. After you have coded a program, be sure to test it with a reasonable set of legitimate inputs.

1. The tax calculator program of the case study outputs a floating-point number that might show more than two digits of precision. Use the **round** function to modify the program to display at most two digits of precision in the output number.

2. You can calculate the surface area of a cube if you know the length of an edge. Write a program that takes the length of an edge (an integer) as input and prints the cube's surface area as output.
3. Five Star Retro Video rents VHS tapes and DVDs to the same connoisseurs who like to buy LP record albums. The store rents new videos for \$3.00 a night, and oldies for \$2.00 a night. Write a program that the clerks at Five Star Retro Video can use to calculate the total charge for a customer's video rentals. The program should prompt the user for the number of each type of video and output the total
4. Write a program that takes the radius of a sphere (a floating-point number) as input and then outputs the sphere's diameter, circumference, surface area, and volume.
5. An object's momentum is its mass multiplied by its velocity. Write a program that accepts an object's mass (in kilograms) and velocity (in meters per second) as inputs and then outputs its momentum.
6. The kinetic energy of a moving object is given by the formula  $KE = (1 / 2)mv^2$  where m is the object's mass and v is its velocity. Modify the program you created in Project 5 so that it prints the object's kinetic energy as well as its momentum.
7. Write a program that calculates and prints the number of minutes in a year.
8. Light travels at  $3 * 10^8$  meters per second. A light-year is the distance a light beam travels in one year.
9. An employee's total weekly pay equals the hourly wage multiplied by the total number of regular hours plus any overtime pay. Overtime pay equals the total overtime hours multiplied by 1.5 times the hourly wage. Write a program that takes as inputs the hourly wage, total regular hours, and total overtime hours and displays an employee's total weekly pay.
10. Write a program that calculates and displays the value of a light-year. Write a program that takes as input a number of kilometers and prints the corresponding number of nautical miles. Use the following approximations:
  - A kilometer represents 1/10,000 of the distance between the North Pole and the equator.
  - There are 90 degrees, containing 60 minutes of arc each, between the North Pole and the equator.

- A nautical mile is 1 minute of an arc.

**Loops and Selection Statements :**(Do any three projects from the following)

1. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is an equilateral triangle.
2. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle. Recall from the Pythagorean theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides.
3. A standard science experiment is to drop a ball and see how high it bounces. Once the “bounciness” of the ball has been determined, the ratio gives a bounciness index. For example, if a ball dropped from a height of 10 feet bounces 6 feet high, the index is 0.6, and the total distance traveled by the ball is 16 feet after one bounce. If the ball were to continue bouncing, the distance after two bounces would be  $10\text{ ft} + 6\text{ ft} + 6\text{ ft} + 3.6\text{ ft} = 25.6\text{ ft}$ . Note that the distance traveled for each successive bounce is the distance to the floor plus 0.6 of that distance as the ball comes back up. Write a program that lets the user enter the initial height from which the ball is dropped and the number of times the ball is allowed to continue bouncing. Output should be the total distance traveled by the ball.
4. A local biologist needs a program to predict population growth. The inputs would be the initial number of organisms, the rate of growth (a real number greater than 0), the number of hours it takes to achieve this rate, and a number of hours during which the population grows. For example, one might start with a population of 500 organisms, a growth rate of 2, and a growth period to achieve this rate of 6 hours. Assuming that none of the organisms die, this would imply that this population would double in size every 6 hours. Thus, after allowing 6 hours for growth, we would have 1000 organisms, and after 12 hours, we would have 2000 organisms. Write a program that takes these inputs and displays a prediction of the total population.
5. The German mathematician Gottfried Leibniz developed the following method to approximate the value of  $\pi$ :  $\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$

Write a program that allows the user to specify the number of iterations use in this approximation and that displays the resulting value.

6. Teachers in most school districts are paid on a schedule that provides a salary based on their number of years of teaching experience. For example, a beginning teacher in the Lexington School District might be paid \$30,000 the first year. For each year of experience after this first year, up to 10 years, the teacher receives a 2% increase over the preceding value. Write a program that displays a salary schedule, in tabular format, for teachers in a school district. The inputs are the starting salary, the percentage increase, and the number of years in the schedule. Each row in the schedule should contain the year number and the salary for that year.
7. The greatest common divisor of two positive integers, A and B, is the largest number that can be evenly divided into both of them. Euclid's algorithm can be used to find the greatest common divisor (GCD) of two positive integers. You can use this algorithm in the following manner:
  - a. Compute the remainder of dividing the larger number by the smaller number.
  - b. Replace the larger number with the smaller number and the smaller number with the remainder.
  - c. Repeat this process until the smaller number is zero.The larger number at this point is the GCD of A and B. Write a program that lets the user enter two integers and then prints each step in the process of using the Euclidean algorithm to find their GCD.
8. Write a program that receives a series of numbers from the user and allows the user to press the enter key to indicate that he or she is finished providing inputs. After the user presses the enter key, the program should print the sum of the numbers and their average.
9. The credit plan at TidBit Computer Store specifies a 10% down payment and an annual interest rate of 12%. Monthly payments are 5% of the listed purchase price, minus the down payment. Write a program that takes the purchase price as input. The program should display a table, with appropriate headers, of a payment schedule for the lifetime of the loan. Each row of the table should contain the following items:
  - the month number (beginning with 1)

- the current total balance owed
- the interest owed for that month
- the amount of principal owed for that month
- the payment for that month
- the balance remaining after payment

The amount of interest for a month is equal to  $\text{balance} * \text{rate} / 12$ . The amount of principal for a month is equal to the monthly payment minus the interest owed.

10. In the game of Lucky Sevens, the player rolls a pair of dice. If the dots add up to 7, the player wins \$4; otherwise, the player loses \$1. Suppose that, to entice the gullible, a casino tells players that there are lots of ways to win: (1, 6), (2, 5), and so on. A little mathematical analysis reveals that there are not enough ways to win to make the game worthwhile; however, because many people's eyes glaze over at the first mention of mathematics, your challenge is to write a program that demonstrates the futility of playing the game. Your program should take as input the amount of money that the player wants to put into the pot, and play the game until the pot is empty. At that point, the program should print the number of rolls it took to break the player, as well as maximum amount of money in the pot.

**Strings and Text Files:**(Do any three projects from the following)

1. Write a script that inputs a line of plaintext and a distance value and outputs an encrypted text using a Caesar cipher. The script should work for any printable characters.
2. Write a script that inputs a line of encrypted text and a distance value and outputs plaintext using a Caesar cipher. The script should work for any printable characters.
3. Modify the scripts of Projects 1 and 2 to encrypt and decrypt entire files of text.
4. A bit shift is a procedure whereby the bits in a bit string are moved to the left or to the right. For example, we can shift the bits in the string 1011 two places to the left to produce the string 1110. Note that the leftmost two bits are wrapped around to the right side of the string in this operation. Define two scripts, **shiftLeft.py** and **shiftRight.py**, that expect a bit string as an input. The script **shiftLeft** shifts the bits in its input one

place to the left, wrapping the leftmost bitto the rightmost position. The script **shiftRight** performs the inverse operation. Each script prints the resulting string.

5. Write a script named **copyfile.py**. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
6. Write a script named **numberlines.py**. This script creates a program listing from a source program. This script should prompt the user for the names of two files. The input filename could be the name of the script itself, but be careful to use a different output filename! The script copies the lines of text from the input file to the output file, numbering each line as it goes. The line numbers should be right-justified in 4 columns, so that the format of a line in the output file looks like this example:

**I>This is the first line of text.**

7. Write a script named **dif.py**. This script should prompt the user for the names of two text files and compare the contents of the two files to see if they are the same. If they are, the script should simply output "**Yes**". If they are not, the script should output "**No**", followed by the first lines of each file that differ from each other. The input loop should read and compare lines from each file. The loop should break as soon as a pair of different lines is found.
8. Jack just completed the program for the Flesch text analysis from this chapter's case study. His supervisor, Jill, has discovered an error in his code. The error causes the program to count a syllable containing consecutive vowels as multiple syllables. Suggest a solution to this problem in Jack's code and modify the program so that it handles these cases correctly.

9. The Payroll Department keeps a list of employee information for each pay period in a text file. The format of each line of the file is the following:

**<last name><hourly wage><hours worked>**

Write a program that inputs a filename from the user and prints to the terminal a report of the wages paid to the employees for the given period. The report should be in tabular format with the appropriate header. Each line should contain an employee's name, the hours worked, and the wages paid for that period.

**Lists and Dictionaries :**(Do any three projects from the following)

1. Write a program that allows the user to navigate the lines of text in a file. The program should prompt the user for a filename and input the lines of text into a list. The program

then enters a loop in which it prints the number of lines in the file and prompts the user for a line number. Actual line numbers range from 1 to the number of lines in the file. If the input is 0, the program quits. Otherwise, the program prints the line associated with that number.

2. Make the following modifications to the original sentence-generator program:
  - a. The prepositional phrase is optional. (It can appear with a certain probability.)
  - b. A conjunction and a second independent clause are optional: The boy took a drink and the girl played baseball.
  - c. An adjective is optional: The girl kicked the red ball with a sore foot.
3. Define a function **decimalToRept** that returns the representation of an integer in a given base. The two arguments should be the integer and the base. The function should return a string. It should use a lookup table that associates integers with digits. Include a main function that tests the conversion function with numbers in several bases.
4. Write a program that inputs a text file. The program should print the unique words in the file in alphabetical order
5. A file concordance tracks the unique words in a file and their frequencies. Write a program that displays a concordance for a file. The program should output the unique words and their frequencies in alphabetical order. Variations are to track sequences of two words and their frequencies, or n words and their frequencies.
6. Conversations often shift focus to earlier topics. Modify the therapist program to support this capability. Add each patient input to a history list. Then, occasionally choose an element at random from this list, change persons, and prepend (add at the beginning) the qualifier “Earlier you said that” to this reply. Make sure that this option is triggered only after several exchanges have occurred.

**Design with Functions:** (Do any three projects from the following)

1. A list is sorted in ascending order if it is empty or each item except the last one is less than or equal to its successor. Define a predicate **isSorted** that expects a list as an argument and returns True if the list is sorted, or returns False otherwise.  
(Hint: For a list of length 2 or greater, loop through the list and compare pairs of items, from left to right, and return False if the first item in a pair is greater.)
2. Add a command to this chapter’s case study program that allows the user to view the

contents of a file in the current working directory. When the command is selected, the program should display a list of filenames and a prompt for the name of the file to be viewed. Be sure to include error recovery.

3. Write a recursive function that expects a pathname as an argument. The pathname can be either the name of a file or the name of a directory. If the pathname refers to a file, its name is displayed, followed by its contents. Otherwise, if the pathname refers to a directory, the function is applied to each name in the directory. Test this function in a new program.
4. Write a program that computes and prints the average of the numbers in a text file. You should make use of two higher-order functions to simplify the design.
5. Define and test a function myRange. This function should behave like Python's standard range function, with the required and optional arguments, but it should return a list. Do not use the range function in your implementation! (Hints: Study Python's help on range to determine the names, positions, and what to do with your function's parameters. Use a default value of None for the two optional parameters. If these parameters both equal None, then the function has been called with just the stop value. If just the third parameter equals None, then the function has been called with a start value as well. Thus, the first part of the function's code establishes what the values of the parameters are or should be. The rest of the code uses those values to build a list by counting up or down.)
6. Lee has discovered what he thinks is a clever recursive strategy for printing the elements in a sequence (string, tuple, or list). He reasons that he can get at the first element in a sequence using the 0 index, and he can obtain a sequence of the rest of the elements by slicing from index 1. This strategy is realized in a function that expects just the sequence as an argument. If the sequence is not empty, the first element in the sequence is printed and then a recursive call is executed. On each recursive call, the sequence argument is sliced using the range 1:. Here is Lee's function definition:

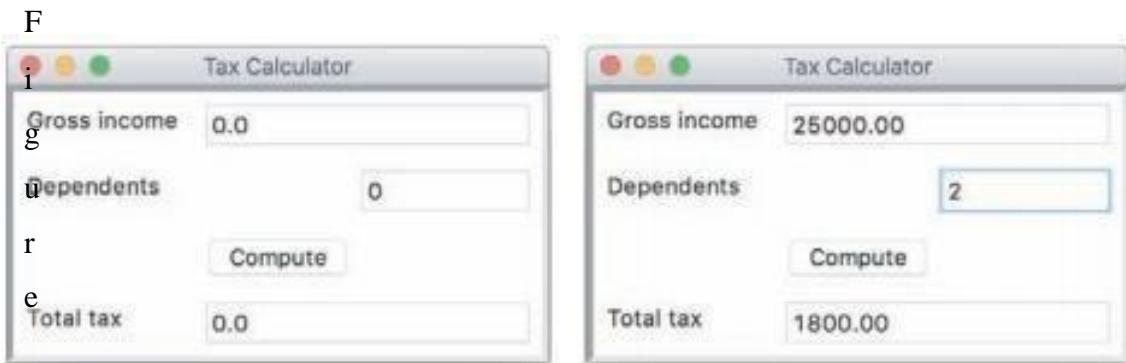
```
defprintAll(seq):
    ifseq:
        print(seq[0])
        printAll(seq[1:])
```

Write a script that tests this function and add code to trace the argument on each call. Does this function work as expected? If so, explain how it actually works, and describe any hidden costs in

running it.

**Graphical User Interfaces:** (Do any three projects from the following)

1. Write GUI-based program that implements the tax calculator program shown in Figure 1.



1

2. Write a GUI-based program that allows the user to convert temperature values between degrees Fahrenheit and degrees Celsius. The interface should have labeled entry fields for these two values. These components should be arranged in a grid where the labels occupy the first row and the corresponding fields occupy the second row. At start-up, the Fahrenheit field should contain 32.0, and the Celsius field should contain 0.0. The third row in the window contains two command buttons, labeled >>> and <<<. When the user presses the first button, the program should use the data in the Fahrenheit field to compute the Celsius value, which should then be output to the Celsius field. The second button should perform the inverse function
3. Modify the temperature conversion program so that it responds to the user's press of the return or enter key. If the user presses this key when the insertion point is in a given field, the action which uses that field for input is triggered
4. Write a GUI-based program that plays a guess-the-number game in which the roles of the computer and the user are the reverse of what they are in the Case Study of this chapter. In this version of the game, the computer guesses a number between 1 and 100 and the user provides the responses. The window should display the computer's guesses with a label. The user enters a hint in response, by selecting one of a set of command buttons labeled Too small, Too large, and Correct. When the game is over, you should disable these buttons and wait for the user to click New game, as before.
5. Add radio button options for filing status to the tax calculator program of Project 1. The user selects one of these options to determine the tax rate. The Single option's rate is 20%. The Married option is 15%. The Divorced option is 10%. The default option is

Single.

6. Write a GUI-based program that allows the user to open, edit, and save text files. The GUI should include a labeled entry field for the filename and a multiline text widget for the text of the file. The user should be able to scroll through the text by manipulating a vertical scrollbar. Include command buttons labeled **Open**, **Save**, and **New** that allow the user to open, save, and create new files. The **New** command should then clear the text widget and the entry widget.
7. Write a GUI-based program that implements an image browser for your computer's file system. The look, feel, and program logic should be like those of the simple text file browser developed in this chapter. The file dialog should filter for GIF image files, and create and open a **PhotoImage** when a file is accessed.

**Design with Classes:**(Do any three projects from the following)

1. Add three methods to the **Student** class that compare two **Student** objects. One method should test for equality. A second method should test for less than. The third method should test for greater than or equal to. In each case, the method returns the result of the comparison of the two students' names. Include a main function that tests all of the comparison operators.
2. This project assumes that you have completed Project 1. Place several **Student** objects into a list and shuffle it. Then run the **sort** method with this list and display all of the students' information.
3. The **str** method of the **Bank** class returns a string containing the accounts in random order. Design and implement a change that causes the accounts to be placed in the string by order of name. (Hint: You will also have to define some methods in the **SavingsAccount** class.)
4. The ATM program allows a user an indefinite number of attempts to log in. Fix the program so that it displays a popup message that the police will be called after a user has had three successive failures. The program should also disable the login button when this happens.
5. The **play** method in the **Player** class of the craps game plays an entire game without interaction with the user. Revise the **Player** class so that its user can make individual rolls of the dice and view the results after each roll. The **Player** class no longer accumulates a list of rolls, but saves the string representation of each roll after it is made. Add new methods **rollDice**, **getRollsCount**, **isWinner**, and **isLoser** to the **Player** class. The last

three methods allow the user to obtain the number of rolls and to determine whether there is a winner or a loser. The last two methods are associated with new Boolean instance variables. Two other instance variables track the number of rolls and the string representation of the most recent roll. Another instance variable tracks whether or not the first roll has occurred. At instantiation, the **roll**, **rollsCount**, **atStartup**, **winner**, and **loser** variables are set to their appropriate initial values. All game logic is now in the **rollDice** method. This method rolls the dice once, updates the state of the Player object, and returns a tuple of the values of the dice for that roll. Include in the module the **playOneGame** and **playManyGames** functions, suitably updated for the new interface to the **Player** class.

6. In many card games, cards are either face up or face down. Add a new instance variable named **faceup** to the **Card** class to track this attribute of a card. Its default value is **False**. Then add a **turn** method to turn the card over. This method resets the **faceup** variable to its logical negation.
7. Convert the **DiceDemo** program discussed in this chapter to a completed craps game application, using the **Player** data model class you developed in Project 6. A screen shot of a possible window is shown in Figure 2.

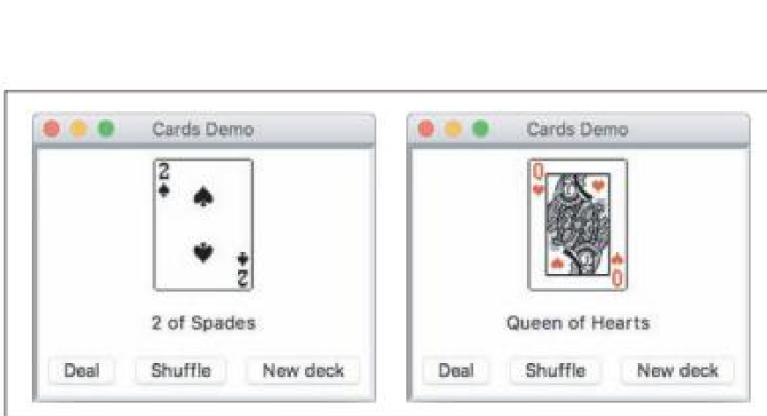


Figure 1.

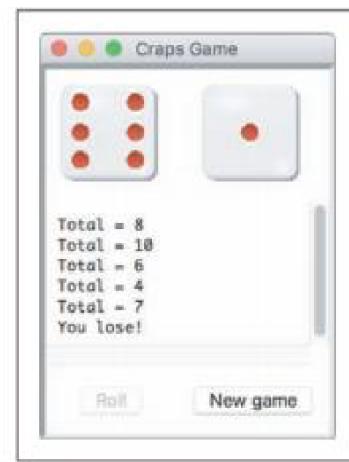


Figure 2.

8. Computer card games are more fun if you can see the images of the cards in a window, as shown in the screen shot in Figure 3. Assume that the 52 images for a deck of cards are in a DECK folder, with the file naming scheme <rank number><suit letter>.gif. Thus, for example, the image for the Ace of Hearts is in a file named **1h.gif**, and the image for the

King of Spades is in a file named **13s.gif**. Furthermore, there is an image file named **b.gif** for the backside image of all the cards. This will be the card's image if its faceup variable is **False**. Using the **DiceDemo** program as a role model, write a GUI program that allows you to deal and view cards from a deck. Be sure to define a helper method that takes a **Card** object as an argument and returns its associated image, and remember to turn the cards as you deal them.

9. Geometric shapes can be modeled as classes. Develop classes for line segments, circles, and rectangles. Each shape object should contain a **Turtle** object and a color that allow the shape to be drawn in a Turtle graphics window . Factor the code for these features (instance variables and methods) into an abstract **Shape** class. The **Circle**, **Rectangle**, and **Line** classes are all subclasses of **Shape**. These subclasses include other information about the specific types of shapes, such as a radius or a corner point and a **draw** method. Write a script that uses several instances of the different shape classes to draw a house and a stick figure.

**Reference Books:**

1. Kenneth A. Lambert, Martin Osborne, “Fundamentals of Python First Programs”, 2<sup>nd</sup> Edition, Cengage Learning, 2019.
2. Kenneth A. Lambert, Martin Osborne, “Fundamentals of Python: First Programs through Data Structures”, 1<sup>st</sup> Edition, Cengage Learning, 2010.

**Subject Code:** LPCIT-106

**Subject Name:** Operating System and Microprocessors Lab

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 4	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 2 hr
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisite:** Fundamentals of Computer with any basic programming language

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Carry out the installation of UNIX, LINUX and Windows Operating System.
CO2	Analyze the concept of Virtual Machine and install Operating System through it.
CO3	Implement shell programming and using vi editor.
CO4	Solve basic binary math operations using the instructions of microprocessor
CO5	Construct code and debugs Assembly Language programs to implement simple programs.
CO6	Perform various operations using the microcontroller.

**Special Instruction related to resources requirement:** For practical numbers 7-11, microprocessors/ GNUSim8085 software etc. can be used. For practical numbers 12 EdSim51 software or other microcontroller etc. can be used.

- | Sr No. | Name of Practical   |
|--------|---|
| 1.     | Installation Process of various Operating Systems.  |
| 2.     | Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine. |
| 3.     | Basics of Shell programming and various types of shells.  |
| 4.     | Implementation of shell variables and shell keywords.   |
| 5.     | Implement conditional statements, looping statement and case statement in Shell programming.                      |
| 6.     | Study and usage of vi Editor.   |
| 7.     | To learn and Perform addition operation for two 8-bit; sum is 8-bit and 16 bit respectively                       |
| 8.     | Perform subtraction operation of two 8-bit and 16-bit numbers.  |

9. Find 1's complement of 8 bit and 16 bit number.
10. Find 2's complement of 8 bit and 16 bit number.
11. Find sum of series of 8 bit numbers
12. Addition and subtraction of 8-bit number using 8051

**Reference Books:**

1. Das Sumithbha, “ UNIX CONCEPTS AND APPLICATIONS”, 4<sup>th</sup> Edition, Tata McGraw Hill, 2017.

2. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with 8085”, 6<sup>th</sup> Edition, Penram International Publication, 2015.

3. Muhammad Ali Muzidi and Janice Gillispie Muzidi, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, 1<sup>st</sup> Edition, Hanel Publishers, 2017.

**Subject Code:** LPCIT-107

**Subject Name:** Web Technologies Laboratory

<b>Programme:</b> B.Tech. (IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 4	<b>Teaching Hours:</b> 26
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Compulsory

**Prerequisites:** Programming for Problem Solving, Data Communication and Computer Network, Object Oriented Programming using C++.

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcome
CO1	Design and Construct Static Web Pages using Basic HTML Tags and CSS for varied application areas.
CO2	Implement HTML5 and CSS3 using Bootstrap Framework.
CO3	Creating Web pages integrating with database for developing web modules like, login module, session authentication.
CO4	Use CodeIgniter Framework to create a unique theme and/or child theme.
CO5	Create and design dynamic web application using contemporary development tools like, MVC framework.
CO6	Function on diverse teams to identify, formulate and design web based project using PHP script in multi-disciplinary environment

**Special Instruction related to resources requirement:** Use of Open Source Software is recommended.

**Sr.No. Name of Practical**

1. Create a simple web page by writing HTML using a simple text editor, Notepad.

Demonstrate the following components of the web page:

Page titles and Headings

Paragraphs and Inline images

\*\*\*\*Note: Validation of your HTML can be done at: <http://validator.w3.org/>

2. Demonstrate the use of Links, Lists and Tables in HTML. You should be able to link

separate pages and create named links within a document, using them to build a “table of contents”.

3. Create simple Forms in HTML and demonstrate the use of various form elements like input box, textarea, submit and radio buttons etc.
4. Demonstrate the use of cascading style sheets (CSS) (inline, internal and external) to specify various aspects of style, such as colours and text fonts and sizes, in HTML document.
5. Create an html file to implement the concept of document object model, different operations and event handling using JavaScript.
6. Demonstrate the use of various selectors, filters and event handling in jQuery.
7. Demonstrate the use of AJAX to retrieve and manipulate the web page content
8. Demonstrate the use of GET and POST methods of AJAX.
9. Creation of Web pages using HTML5 and CSS3.
10. Demonstrate the use of Bootstrap Framework.
11. Setup of development server like XAMP/ WAMP in Windows and Linux.
12. Creating web pages using PHP.
13. Handling database queries with PHP.
14. Setup of CodeIgniter framework and to study its different components.
15. **Mini Project:** Students are required to prepare a web based project on the course contents in a group of two to three students. The usage of concepts like authentication, sessions and database oriented web pages for the development of the project is recommended. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

### **Text Books**

1. Robin Nixon, “Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5”, O’Reilly, 4th Edition, 2015.
2. Kogent Learning Solutions Inc. “HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and jQuery”, Dreamtech Press, 2011.

3. W. Jason Gilmore, “Beginning PHP and MySQL: From Novice to Professional”, 4<sup>th</sup> Edition, Dreamtech Press, 2010
  4. Richard York, “Beginning Javascript and CSS Development with jQuery”, John Wiley and Sons Inc., 2009.
  5. Audra Hendrix, “AJAX and PHP: Building Modern Web Applications”, Shroff/ Packt, 2<sup>nd</sup> Edition, 2015.

## **Reference Books**

1. Adam Trachtenberg, “PHP Cookbook: Solutions & Examples for PHP Programmers”, 3rd Edition, Shroff/ O’reilly
  2. William Sanders, “Learning PHP Design Patterns”, O’Reilly, 1st Edition, 2013
  3. Jack Herrington, “PHP Hacks: Tips & Tools for creating for Dynamic Web Sites”, John C.
  4. Adam Freeman, “Pro jQuery 2.0”, Apress, 2013.
  5. Nicholas C. Zakasm, Jeremy McPeak and Joe Faweett“Professional AJAX”, Wiley India Pvt.
  6. Thomas Mayer, “Professional Codeigniter”, John Wiley and Sons Inc., 2008.
  7. Brad Williams, David Damstra and Hal Stern, “Professional Wordpress: Design and Development”, Wiley India Private Ltd., 2nd edition, 2013.

#### **E-Books and online learning material**

- ## 1. Tutorial on HTML,CSS,JQuery,AJAX,PHP

<https://www.w3schools.com/html/default.asp> Accessed on Feb 22, 2019 2. Tutorial on Web Technologies

<https://www.tutorialride.com/web-technologies.htm>

Accessed on Feb 22, 2019

- ### 3. Web Tutorials (Web Development Technologies)

[https://www.tutorialspoint.com/web\\_development\\_tutorials.htm](https://www.tutorialspoint.com/web_development_tutorials.htm) Accessed on Feb 22, 2019

Guru Nanak Dev Engineering College, Ludhiana  
Department of Information Technology  
B. Tech (IT) Scheme 2018

**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**5<sup>TH</sup> SEMESTER**

**Subject Code:** PCIT-109  
**Subject Name:** Programming in Java

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 50%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1.	Use primitive data types, operators and control statements to develop programs.
2.	Discuss methods and arrays along-with basic object oriented principles.
3.	Implement exception handling, multithreading, string handling, packages and interfaces.
4.	Develop event handling based components for interaction of the user with a GUI.
5.	Create logic based application by the use of strings.
6.	Identify and solve complex problems in the environment of Java programming.

**Prerequisites:** Object Oriented Programming

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### Detailed Contents:

#### Part-A

##### **Overview of Java:**

History and Evolution, Byte Code, Buzzwords, Object Oriented Programming-Two Paradigms, Abstraction, Principles of Object Oriented Programming, Structure of Java Program, Java Typical Environment. [4L]

##### **Date Types, Operators and Control Statements:**

Data Types in Java, Literals, Variables, Type Casting, Arrays, Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators, The Conditional Operator, Operator Precedence, Selection Statements, Control Statements, Recursion V/S Iteration. [8L]

##### **Classes, Objects and Methods:**

Class Fundamentals, Declaring Object, Assigning Object Reference Variable, Methods, Constructors, Overloading Methods, Objects as Parameters, Returning Objects, Overloading Constructors, This Keyword, Garbage Collection, Finalize () Method, Access Specifiers, Static , Final, Command Line Arguments. [8L]

##### **Inheritance:**

Inheritance Basics, Using Super, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using Final with Inheritance, Constructor in a Derived Class, Object Class. [4L]

#### Part-B

##### **Package and Interfaces:**

Introducing Package, Package Access Protection, Importing Packages, Interfaces - Defining, Implementing, Nesting, Extending, Default Interface Methods. [4L]

##### **Exception Handling:**

Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Try And Catch, Multiple Catch Clauses, Nested Try Statements, Throw, Finally, Built-In Exceptions, Creating Your Own Exception, Chained Exceptions. [4L]

**Multithreaded Programming:**

The Java Thread Model, Life Cycle Of Thread, The Main Thread, Creating Thread, Creating Multiple Threads, Using Isalive() And Join(), Thread Priorities, Thread Synchronization, Inter Thread Communications, Suspending, Resuming & Stopping Threads. [4L]

**I/O, Applets and Event Handling:**

I/O Basics, Reading Console Input, Writing Console Output, Printwriter Class, Reading From and Writing to a File, Introduction to Applet, Applet V/S Application Program, Applet Life Cycle, Two Event Handling Mechanisms, Delegation Event Model, Event Classes, Keyevent Class, Sources of Events, Event Listener Interfaces. [8L]

**String Handling:**

The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching String, Modifying String, Data Conversion, Changing the Case of Characters, StringBuffer. [4L]

**Text Books:**

1. Herbert Schildt, “The Complete Reference”, McGraw-Hill, 2015.
2. Joseph O’Neil, “Teach Yourself Java”, McGraw-Hill ,1998.
3. Paul Deitel, Harvey Deitel “Java How To Program”, Prentice Hall, 2011.
4. Balagurusamy, “Programming in Java” Tata McGraw- Hill, 2009.

**Reference Books:**

1. Bruce Eckel, “Thinking in Java”, Pearson, 2008.
2. R. Nageswara Rao, “Core Java: An Integrated Approach”, Wiley India Pvt. Ltd., 2008.

**E-Books and Online Learning Material:**

1. Introduction to Programming Using Java by David J. Eck  
<https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf> Accessed on May 20, 2020
2. The Java Tutorials by Raymond Gallardo  
<https://docs.oracle.com/javase/tutorial/> Accessed on May 20, 2020
3. The Java® Language Specification by James Gosling  
<https://docs.oracle.com/javase/specs/jls/se8/html/index.html> Accessed on May 20, 2020
4. <https://www.javatpoint.com/java-tutorial> Accessed on May 20, 2020
5. <https://www.geeksforgeeks.org/java/> Accessed on May 20, 2020

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/105/106105191/> Accessed on May 20, 2020
2. <https://freevideolectures.com/course/2513/java-programming> Accessed on May 20, 2020

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Department of Information Technology

B. Tech (IT) Scheme 2018

**Subject Code:** LPCIT-109

**Subject Name:** Programming in Java Laboratory

<b>Programme:</b> B. Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 4
<b>Semester:</b> 5	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 2
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Practice primitive data types, variables, and various control and decision structures to write programs
2.	Implement classes, methods and arrays in java programs
3.	Create java programs using exception handling, multithreading, string handling, packages, interfaces and applets.
4.	Generate event handling techniques for interaction of the user with a GUI
5.	Apply the concepts of data structures, digital electronics, operating systems and computer networks without using the inbuilt features of Java programming
6.	Design and execute the projects by using Java programming concepts on multidisciplinary teams.

**Prerequisites:** Fundamentals of Computer Programming and Information Technology.

#### **Detailed Contents:**

Programs to demonstrate

1. Handling various data types
2. Type casting
3. Arrays – 1D and 2 D
4. Various control structures
5. Various decision structures
6. Recursion
7. Method Overloading by passing objects as arguments
8. Constructor Overloading by passing objects as arguments
9. Various access control and usage of static, final and finalize ( )
10. Command line arguments
11. Various types of inheritance by applying various access controls to its data members and methods
12. Method overriding
13. Abstract class
14. Nested class
15. Constructor chaining
16. Importing classes from user defined package and creating packages using access protection
17. Interfaces, nested interfaces and use of extending interfaces
18. Exception Handling - using predefined exception
19. Exception Handling - creating user defined exceptions

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20. Multithreading by extending Thread Class
21. Multithreading by implementing Runnable Interface
22. Thread life cycle
23. Applet life cycle
24. Applet for configuring Applets by passing parameters
25. Event Handling
26. Reading and writing from a particular file
27. Database connectivity for various DDL and DML operations
28. String class and its methods
29. StringBuffer class and its methods

**Mini Project:** By using various concepts of Java, students are required to prepare a project in a group of two to three students. The usage of concepts like applets, multithreading and JDBC for project is to be encouraged. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation on the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 50%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
2.	Use effectively algebraic techniques to analyse basic discrete structures and algorithms.
3.	Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.
4.	Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.
5.	Recognise valid, logical, mathematical arguments and construct valid arguments/proofs

**Prerequisites:** Basic concepts of Set Theory, Graphs and Trees

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### Detailed Contents:

#### **Part -A**

##### **Fundamentals of Sets, Relations and Functions:**

**Sets** – Operations on sets, Subsets, Types of sets, Ordered pairs, Proofs of general identities of sets, Classes of sets and partitions, Inclusion and exclusion principle.

**Relations** – Properties of relations, Types of relations, Composition of relations, Closure properties of relations, Equivalence relations, Compatibility relations, Partial order relations.

**Functions** – Introduction and types of functions, Composition of functions, Invertible function, Hashing functions, Recursively defined functions. [10L]

##### **Prepositional and Predicate Logic:**

Propositional logic, Truth tables, Normal forms (conjunctive and disjunctive), Validity of well-formed formula, Propositional inference rules, Predicate logic, Universal and existential quantifiers. [4L]

##### **Combinatorial Mathematics:**

Basic counting principles, Permutations and combinations, Pigeonhole principle, Recurrence relations – Solving homogeneous and non-homogeneous recurrence relations, Generating function. [10L]

#### **Part-B**

##### **Graph Theory:**

**Graphs-** Graph terminology, Directed and undirected graphs, Eulerian chains and cycles, Hamiltonian chains and cycles, shortest path algorithms – Dijkstra's algorithm, Warshall's algorithm, Graph coloring, Chromatic number, Planar graphs, Euler's Theorem for Planar Graphs, Isomorphic and homomorphic graphs, Applications of graph theory.

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**Trees-** Tree Terminology, Spanning tree algorithms – Kruskal's algorithm, Prim's algorithm. [16L]

**Algebraic Systems:**

Definition and elementary properties of groups, Abelian groups, Semigroups, Monoids, Rings [8L]

**Text Books:**

1. S. Lipschutz, "Discrete Mathematics", Schaum series McGraw Hill, 2007.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.

**Reference Books:**

1. Alan Doerr and Kenneth Leverageur, "Applied Discrete Structures for Computer Science", Pearson Education, Inc., 2013.
- 2 K.H. Rosen, "Discrete Mathematics and its applications", Mc Graw Hill, 2012.
3. C.L. Liu , " Elements of Discrete Mathematics" , Tata McGraw Hill, 2008.

**E-Books and Online Learning Material:**

1. Discrete Maths by Anil S. Khairnar  
[https://www.researchgate.net/publication/309039733\\_Discrete\\_Mathematics\\_Textbook](https://www.researchgate.net/publication/309039733_Discrete_Mathematics_Textbook)
2. Discrete Maths by Kenneth H. Rosen  
[http://www2.fiit.stuba.sk/~kvasnicka/Mathematics%20for%20Informatics/Rosen\\_Discrete\\_Mathematics\\_and\\_Its\\_Applications\\_7th\\_Edition.pdf](http://www2.fiit.stuba.sk/~kvasnicka/Mathematics%20for%20Informatics/Rosen_Discrete_Mathematics_and_Its_Applications_7th_Edition.pdf)

**Online Courses and Video Lectures:**

1. Discrete Maths by nptel hrd <https://nptel.ac.in/courses/106106094/>
2. Discrete Maths by Gatebook Video Lectures  
[https://www.youtube.com/watch?v=AlxXZ\\_wPkrs&list=PLsFENPUZBqioyqffh3YZ2pKUg4uZFQJUY](https://www.youtube.com/watch?v=AlxXZ_wPkrs&list=PLsFENPUZBqioyqffh3YZ2pKUg4uZFQJUY)
3. Discrete Maths by TheTrevTutor [https://www.youtube.com/watch?v=bZred\\_Ksz2k](https://www.youtube.com/watch?v=bZred_Ksz2k)

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 15%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Analyze IoT in terms of conceptual framework
2.	Illustration of the design principles for connected devices and web connectivity
3.	Discriminate the functionality of IP and MAC addresses along-with the application layer protocols
4.	Outline cloud computing paradigm for data collection, storage and computing services
5.	Elucidate sensor technology for sensing the real world using analog and digital sensors
6.	Outline security tomography of large networks and layered attacker model

**Prerequisites:** Data Communication and Computer Networks, Python Programming.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:****Part-A****Internet of Things (IoT)-An Overview:**

IoT Definition, IoT Vision, Smart and Hyper-connected Devices, Conceptual Framework, Architectural View, Technology behind IoT, Major Components of IoT System, Sources of IoT, Machine-to-Machine (M2M) to IoT, M2M Architecture, Examples of IoT. [4L]

**Design Principles for Connected Devices:**

IoT/M2M Systems, Layers and Designs Standardization, Modified Open System Interconnection (OSI) Model for the IoT/M2M Systems, ITU-T (Telecommunication Standardization Sector of International Telecommunication Union) Reference Model, ETSI (European Telecommunications Standards Institute) M2M Domains and High Level Capabilities, Wired and Wireless Communication Technologies and their Comparison, Data Management and Consolidation Gateway, Device Management Gateway, Ease of Designing and Affordability. [7L]

**Design Principles for Web Connectivity:**

Constrained Application Protocol, Lightweight M2M Communication Protocol, JSON (Java Script Object Notation) Format, Tag Length Value Format, MIME (Multipurpose Internet Mail Extension) Type, Message Communication Protocols for Connected Devices, Web Connectivity for Connected-Devices Network. [5L]

**Internet Connectivity Principles:**

Internet Connectivity, Internet based Communication, Internet Protocols (IPs), IP Addressing in the IoT, Media Access Control, Application Layer Protocols. [2L]

**Part-B**

**Data Collection, Storage and Computing using a Cloud Platform:**

Cloud Computing Paradigm, Cloud Deployment Models, Everything as a Service and Cloud Service Models, IoT Cloud-based Data Collection, Storage, Computing using the Xively and Nimbts. [5L]

**Sensors, Participatory Sensing, RFIDs and Wireless Sensor Networks (WSNs):**

Sensing the real world, Example of Sensors, Industrial IoT, Automotive IoT, Actuator, Sensor Data Communication Protocols, Radio Frequency Identification Technology (RFID) IoT Systems, Electronic Product Code Global Architecture Framework, Web of Things of RFIDs, WSN Concepts, WSN Architecture, WSN Protocols, WSN Infrastructure Establishment, WSN Nodes Secure Communication, WSN IoT Applications. [8L]

**IoT Privacy, Security, Vulnerability Solutions and IoT Case Studies:**

Privacy, Vulnerabilities of IoT, Security Requirements, Threat Analysis, Use and Misuse Cases, Security Tomography, Layered Attacker Model, Identify Management and Establishment, Access Control, Message Integrity, Message Non-Repudiation, Message Availability, Security Protocols, IoT applications for Smart Homes, Cities, Environment-Monitoring and Agriculture. [5L]

**Text Books:**

1. Davis Hanes, Gonzalo Salgueiro, Patrick Grosssetete, Rob Barton, and Jerome Henry, “IoT Fundamentals – Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 5th Impression, CISCO Press, 2020.
2. Mayur Ramgir, “Internet of Things – Architecture, Implementation and Security”, 1st Impression, Pearson India, 2020.
3. Raj Kamal, “Internet of Things – Architecture and Design Principles”, 5th Reprint Edition, McGraw - Hill Education, 2019.

**Reference Books:**

1. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, “Internet of Things with Raspberry Pi and Arduino”, 1st Impression, CRC Press, 2019.
2. Ashwin Pajankar, “Internet of Things with Arduino and Bolt”, 2nd Impression, BPB Publications, 2018.
3. Arsheep Bahga, Vijay Madisetti, “Internet of Things – A Hands-On Approach”, 3rd Impression, Universities Press, 2017.
4. Gaston C. Hillar, “Internet of Things with Python”, 2nd Impression, PACKT Open Source Press, 2016.

**E-Books and Online Learning Material:**

1. Internet of Things – Overview  
[https://www.tutorialspoint.com/internet\\_of\\_things/internet\\_of\\_things\\_overview.htm](https://www.tutorialspoint.com/internet_of_things/internet_of_things_overview.htm) Accessed on May 19, 2020
2. IoT Design : <https://www.seebo.com/iot-design/> Accessed on May 19, 2020
3. Seven Design Principles of IoT:  
<https://futurice.com/blog/7-design-principles-for-iot> Accessed on May 19, 2020

**Online Courses and Video Lectures:**

**Guru Nanak Dev Engineering College, Ludhiana**  
**Department of Information Technology**  
**B. Tech (IT) Scheme 2018**

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|--|--------------------------|
| 1. <a href="https://nptel.ac.in/courses/106/105/106105166/">https://nptel.ac.in/courses/106/105/106105166/</a>   | Accessed on May 21, 2020 |
| 2. <a href="https://www.coursera.org/specializations/internet-of-things">https://www.coursera.org/specializations/internet-of-things</a>   | Accessed on May 21, 2020 |
| 3. <a href="https://www.youtube.com/watch?v=mZ24zRRzlsI&amp;list=PLPN-43XehstOS_3mv9LgFWnVXQE-7PKbF">https://www.youtube.com/watch?v=mZ24zRRzlsI&amp;list=PLPN-43XehstOS_3mv9LgFWnVXQE-7PKbF</a> | Accessed on May 21, 2020 |
| 4. <a href="https://www.udemy.com/topic/internet-of-things/">https://www.udemy.com/topic/internet-of-things/</a>   | Accessed on May 21, 2020 |
| 5. <a href="https://www.edx.org/micromasters/curtinx-internet-of-things-iot">https://www.edx.org/micromasters/curtinx-internet-of-things-iot</a>   | Accessed on May 21, 2020 |
| 6. <a href="https://www.udacity.com/course/intel-edge-ai-for-iot-developers-nanodegree--nd131">https://www.udacity.com/course/intel-edge-ai-for-iot-developers-nanodegree--nd131</a>             | Accessed on May 21, 2020 |
| 7. <a href="https://www.pluralsight.com/courses/security-internet-of-things-big-picture">https://www.pluralsight.com/courses/security-internet-of-things-big-picture</a>                         | Accessed on May 21, 2020 |

<b>Programme:</b> B. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand Internet of Things along-with its hardware and software components
2.	Interface I/O devices, sensors & communication modules
3.	Remotely monitor data and control devices
4.	Analyze and evaluate protocols used in IoT
5.	Analyze and evaluate the data received through sensors in IoT
6.	Develop real-time IoT based projects

**Prerequisites:** Data Communication and Computer Networks, Python Programming.

**Special instructions related to resources requirement:** Arduino/ Raspberry Pi, LEDs, IR Sensor Module, Breadboard, 5V Relay Module, LDR, DHT11 sensor, PIR Sensors, PI Camera, OLED, Micro USB Cables, Jumper/ Connecting Wires, Mouse and Keyboard, HDMI to VGA cables, Monitor, Python, Node MCU V3 Development Board, Micro USB Cable, 1K Resistor, Node MCU Package with driver.

**Detailed Contents:**

1. Familiarization with Arduino/ Raspberry Pi and perform necessary software installation
2. To demonstrate the communication modules like BLE, WIFI, XBEE
3. To find the IP address of Computer/ other devices
4. To interface LED/ Buzzer with Arduino/ Raspberry Pi and write a program to turn ON/OFF LED for specific duration.
5. To interface DHT11/ DHT22 sensor with Arduino/ Raspberry Pi and write a program to print temperature and humidity readings.
6. To interface PIR Sensor with Arduino/ Raspberry Pi and write a program to check the motion of PIR sensor.
7. To interface PI Camera with Arduino/ Raspberry Pi and write a program to start the camera and to place the clicked pictures on the desktop.
8. To transmit and access the sensed data to any cloud platform.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of five students. The students should use Arduino/ Raspberry Pi, LEDs, IR, LDR, DHT11 sensor, PIR Sensors, PI Camera, OLED, Micro USB Cables, Jumper Wires, Mouse and Keyboard, HDMI to VGA cables, Monitor, Python in the design and implementation of the project. The group of students must submit a project report of 8 to 10 pages (approx.) and the team will have to demonstrate the project as well as have to give a presentation of the same.

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**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

**Text Books:**

1. Tim Cox, "Raspberry Pi Cookbook for Python Programmers", 5th Impression, PACKT Publication, 2020.
2. Jeff Cicolani, "Beginning Robotics with Raspberry Pi and Arduino", 1st Impression, Apress, 2018.
3. Kent D. Lee, "Python Programming", 2nd Reprint Edition, Springer, 2018.

**Reference Books:**

1. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, "Internet of Things with Raspberry Pi and Arduino", 1st Impression, CRC Press, 2019.
2. Ashwin Pajankar, "Internet of Things with Arduino and Bolt", 2nd Impression, BPB Publications, 2018.
3. Arsheep Bahga, Vijay Madisetti, "Internet of Things – A Hands-On Approach", 3rd Impression, Universities Press, 2017.
4. Gaston C. Hillar, "Internet of Things with Python", 2nd Impression, PACKT Open Source Press, 2016.

**E-Books and Online Learning Material:**

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|--|--------------------------|
| 1. Internet of Things – Overview:<br><a href="https://www.tutorialspoint.com/internet_of_things/internet_of_things_overview.htm">https://www.tutorialspoint.com/internet_of_things/internet_of_things_overview.htm</a> | Accessed on May 19, 2020 |
| 2. IoT Design:<br><a href="https://www.seebo.com/iot-design/">https://www.seebo.com/iot-design/</a>  | Accessed on May 19, 2020 |
| 3. Seven Design Principles of IoT<br><a href="https://futurice.com/blog/7-design-principles-for-iot">https://futurice.com/blog/7-design-principles-for-iot</a>   | Accessed on May 19, 2020 |

**Online Courses and Video Lectures:**

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|--|--------------------------|
| 1. <a href="https://nptel.ac.in/courses/106/105/106105166/">https://nptel.ac.in/courses/106/105/106105166/</a>   | Accessed on May 21, 2020 |
| 2. <a href="https://www.coursera.org/specializations/internet-of-things">https://www.coursera.org/specializations/internet-of-things</a>   | Accessed on May 21, 2020 |
| 3. <a href="https://www.youtube.com/watch?v=mZ24zRRzlsI&amp;list=PLPN-43XehstOS_3mv9LgFWnVXQE-7PKbF">https://www.youtube.com/watch?v=mZ24zRRzlsI&amp;list=PLPN-43XehstOS_3mv9LgFWnVXQE-7PKbF</a> | Accessed on May 21, 2020 |
| 4. <a href="https://www.udemy.com/topic/internet-of-things/">https://www.udemy.com/topic/internet-of-things/</a>   | Accessed on May 21, 2020 |
| 5. <a href="https://www.edx.org/micromasters/curtinx-internet-of-things-iot">https://www.edx.org/micromasters/curtinx-internet-of-things-iot</a>   | Accessed on May 21, 2020 |
| 6. <a href="https://www.udacity.com/course/intel-edge-ai-for-iot-developers-nanodegree--nd131">https://www.udacity.com/course/intel-edge-ai-for-iot-developers-nanodegree--nd131</a>             | Accessed on May 21, 2020 |
| 7. <a href="https://www.pluralsight.com/courses/security-internet-of-things-big-picture">https://www.pluralsight.com/courses/security-internet-of-things-big-picture</a>                         | Accessed on May 21, 2020 |

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Identify the different concepts in automata theory- deterministic automata, regular expressions, regular languages, context-free grammars, context-free languages and Turing machines
2.	Demonstrate the various categories of languages and grammars in the Chomsky hierarchy
3.	Illustrate the finite automata, regular expressions and context-free grammars accepting or generating a certain language.
4.	Design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
5.	Contrast the computational strengths and weaknesses of these machines
6.	Utilize automata concepts and techniques in designing systems that address real world problems.

**Prerequisites:** Principles of Applied Mathematics and Basics of Set Theory**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)**Detailed Contents:****Part-A****Formal Languages:**

Basics of strings, Alphabets, Formal language, Chomsky Classification of languages, Languages and their relation, Operations on languages, Closure properties of language classes. [5L]

**Finite Automata:**

Deterministic Finite Automata, Acceptance by Finite Automata, Transition systems, Non-Deterministic Finite Automata, Equivalence of DFA and NDFA, Moore and Mealy machines, Equivalence of Moore and Mealy machine, Minimization of Finite Automata, Applications and limitations of Finite Automata. [7L]

**Regular Grammar:**

Regular grammars, Regular expressions, Algebraic method using Arden's theorem, Equivalence of Finite Automata and Regular expressions, Properties of regular languages, Pumping lemma. [6L]

**Context Free Languages:**

Introduction, Leftmost and Rightmost derivation trees, Ambiguity, Simplification of context free grammar, normal forms– Chomsky Normal Form, Greibach Normal Form, Pumping lemma [6L]

**Part-B**

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**Pushdown Automata:**

Description and definition, Acceptance by Push Down Automata, Equivalence of Push Down Automata and context free grammars and languages. [8L]

**Context Sensitive Language:**

Context Sensitive language, Model of linear bounded automata, Relation between linear bounded automata and context sensitive language. [8L]

**Turing Machines:**

Turing Machine: Definition and Model, Representation of Turing Machine, Design of Turing Machine, Variants of Turing Machine, Decidability and recursively enumerable languages, Halting problem, Post correspondence problem. [8L]

**Text Books:**

1. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science, Third Edition", PHI Learning Private Limited, 2011
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education, 2007.
3. K. V. N. Sunitha , N. Kalyani, "Formal Languages and Automata Theory", McGraw-Hill, 2010.

**Reference Books:**

1. JE Hopcroft, R Motwani, JD Ullman, *Automata Theory, Languages, and Computation*, 3rd edition, Addison Wesley 2007.
2. M Huth, M Ryan, *Logic in Computer Science: Modelling and Reasoning about Systems*, Cambridge University Press, 2004.
3. HR Lewis, CH Papadimitriou, *Elements of the Theory of Computation*, Prentice-Hall, 1997
4. Computation: Finite and Infinite: By Marvin L. Minsky, Prentice-Hall, 1967
5. Introduction to formal languages: By G. E. Reevsz, Mc-graw hill.
6. Formal language theory: By M. H. Harrison

**E-Books and Online Learning Material:**

1. Theory of Computation by Dr. Gabriel Robins  
<https://www.freebookcentre.net/ComputerScience-Books-Download/Theory-of-Computation.html>
2. Theory of Computation by Andrea Giordani  
<https://www.scribd.com/audiobook/408789158/Theory-of-Computation>

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/104/106104028/>
2. <https://nptel.ac.in/courses/106105175/2>
3. <https://freevideolectures.com/course/3045/theory-of-computation-i>
4. [https://swayam.gov.in/nd1\\_noc19\\_cs79/preview](https://swayam.gov.in/nd1_noc19_cs79/preview)
5. [https://www.youtube.com/watch?v=XsI8h7cGDs&list=PLxCzCOWd7aiFM9Lj5G9G\\_76adtyb4ef7i](https://www.youtube.com/watch?v=XsI8h7cGDs&list=PLxCzCOWd7aiFM9Lj5G9G_76adtyb4ef7i)

<b>Programme:</b> B. Tech	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Utilize the concept of data warehouse and data mining for solution to primarily business projects which are enabled using information technology.
2.	Analyze and document the complexity of the business information requirement regarding data marts.
3.	Design and develop solutions using OLAP tools
4.	Formulate and investigate the complex data mining problem with the help of modern query languages and data mining tools for interpretation of data and valid conclusions.
5.	Apply Association rules, classification and clustering methods on different datasets based on real world problems like public health, safety etc.
6.	Apply Business intelligence inferences to assess social, health, safety, legal and cultural issues.

**Prerequisites:** Knowledge of Database Management Systems

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### Detailed Contents:

#### Part-A

##### **Introduction:**

Introduction to the multidisciplinary field of data mining and data warehouse, Need of data warehousing and data mining. [2L]

##### **Data Warehousing:**

Evolution of Data Warehousing, Data warehousing Concepts, Benefits of Data Warehousing, Data Warehouse Queries, Problems of Data Warehousing, Architecture of Data Warehouse, Data Warehouse information flow, Data warehouse tools and technologies, Data Marts, Reasons for creating Data Marts, Data Mart issues, Designing Data Warehouse, Dimensionality Modelling, Star Schema, Design methodology for data warehouse. [9L]

##### **Online Analytical Processing:**

Introduction to Online Analytical Processing (OLAP), OLAP Applications, Benefits of OLAP, Representation of Multidimensional Data, OLAP Tools , Basic analytical operations of OLAP, Types of OLAP- Relational OLAP (ROLAP), Multidimensional OLAP (MOLAP), Hybrid OLAP(HOLAP), Desktop OLAP (DOLAP), Difference in OLAP and Online transaction processing (OLTP) [6L]

**Part-B**

**Data Mining:**

Introduction to Data Mining, data mining patterns, applications of Data Mining, Issues in Data Mining. Knowledge Discovery in Database (KDD) process in Data Mining, Data pre-processing: data cleaning, data integration, data reduction and data transformation, Frequent Patterns mining. Associations and Correlations, Frequent Item set Mining Methods, Apriori algorithm. [8L]

**Classification:**

Basic Concepts, Decision Tree Induction, Bayes Classification Methods [3L]

**Clustering:**

Overview of basic Clustering Methods -Partition based clustering, Density based clustering, and Distribution based clustering, Hierarchical clustering, K-Means Clustering Algorithm. [4L]

**Business Intelligence:**

Improvement in Decision Making Process, Need of Business Intelligence Program, Introduction to Business Intelligence, Analytics Spectrum, Value Drivers and information use, Performance metrics and key performance indicators, Horizontal and Vertical Use Case for Business Intelligence (BI), Applications of BI. [4L]

**Text Books:**

1. Database Systems, “A Practical Approach to Design, Implementation, and Management”, Sixth Edition by Pearson
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques,” 1st Edition Indian Reprint 2001, Harcourt India Private Limited, ISBN 1-55860-489-8.
3. Margaret Dunham, “Data Mining: Introductory and Advanced Topics,” 1st Edition, 2003, Prentice Hall (Pearson Publication), ISBN 0-13-088892-3.
4. David Loshin, “Business Intelligence: The Savvy Manager’s Guide”, Series the Savvy Manager’s Guides, 2<sup>nd</sup> Edition, Elsevier, 2013, ISBN 978-0-12-385889-4
5. Arun K Pujari, “Data Mining Techniques” Universities Press Private Limited 2<sup>nd</sup> edition, 2013, eISBN:9788173718533

**Reference Books:**

1. S.M.Weiss and N.Indurkhya, “Predictive Data Mining”, 1998, Morgan Kaufmann.
2. M. Jarke, M. Lenzenri, Y. Vassiliou, and P. Vassiladis, “Fundamentals of Data Warehouses”, 2000, Springer Verlag, ISBN 3-540-65365-1.
3. Margaret H Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2013

**E-Books and Online Learning Material:**

1. Chantal D. Larose, Daniel T. Larose, Data Mining and Predictive Analytics, 2nd Edition, 2015, ISBN-10: 1118116194
2. Nong Ye, Data Mining: Theories, Algorithms, and Examples, 2013, ISBN-10: 1439808384
3. LadjelBellatreche, Data Warehousing and Knowledge Discovery, 2013, ISBN-10: 3642401309
4. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012
5. Anil K. Maheshwari, Business Intelligence and Data Mining, Business Expert Press, 2015

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**Online Courses and Video Lectures:**

1. <https://www.coursera.org/learn/data-patterns?specialization=data-mining>
2. <https://www.coursera.org/specializations/data-warehousing>
3. <https://www.coursera.org/learn/business-intelligence-data-warehousing>
4. <https://www.coursera.org/learn/business-intelligence-tools>
5. <https://nptel.ac.in/courses/106/105/106105174/>
6. <https://nptel.ac.in/courses/110/107/110107092/>

<b>Programme:</b> B. Tech.	<b>L:0 T:0 P:2</b>
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical :</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Conduct Investigation on real world problems using BI tools like QlikView, Google analytics etc.
2.	Exemplify the implementation of data mart.
3.	Apply data mining algorithms like, Apriori etc. for analysis and prediction of data for health , social , cultural issues etc.
4.	Develop solutions for multi-disciplinary dataset by applying different classification and clustering methods using different Data Mining tools
5.	Identify different Business intelligence tools for different applications
6.	Function effectively as individual or as team in multidisciplinary area of engineering practices.

**Prerequisites:** Fundamentals of Computer with any basic programming language and knowledge of Database Management Systems.

**Detailed Contents:**

1. Case Study and Design of a Data Mart Application
2. To study different Data Mining tools
3. To Perform Data Cleaning on Data Sets
4. To Perform association rule mining (AprioriAlgorithm ) using any Data Mining tool.
5. To perform classification using Bayes Method using any Data Mining tool.
6. To Perform K-means clustering techniques for data mining on data set using any Data Mining tool.
7. To interpret and visualize the output of data mining using any Data mining tool.

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 60%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Apply the knowledge of HTML5 based Bootstrap framework for web page designing
2.	Create and design web applications using MVC approach and Bootstrap.
3.	Demonstrate the understanding of version control and data repository maintenance using Git
4.	Develop web applications using the PHP framework
5.	Identify, formulate and solve engineering problems in the area of dynamic web applications

**Prerequisites:** Web Technologies**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)**Detailed Contents:****Part-A****HTML5 Framework Bootstrap:**

Introduction to Bootstrap, How to use Bootstrap, Bootstrap file structure, Basic HTML structure for Bootstrap, Typography, Basic HTML elements, Responsive classes, The grid system, Constructing data entry forms. Packaged Components in Bootstrap- Icons, Navigation bar, Badges, Alerts, Toolbars and button groups, Panels, Pagination, Tables. The JavaScript Add-ons in Bootstrap: Custom data attributes, Basic modal window, Tabs, Collapse, Tooltips and popovers, Dropdown Menu, Carousels. [7L]

**MVC Approach for Web Applications:**

Introduction to MVC: Introduction, Popular MVC Framework, Design Patterns, Foundation- Auto loading, Exceptions, Type Methods, Base Class, Configuration of MVC, Caching: Performance Bottlenecks, Routing, Templates. [6L]

**Version Control and Data Repository:**

Introduction and Installation of Git, Setting up account git using SSH, Local Git: Creating a new commit, View history and differences between Git, Remote Git: Adding remote repository, Pushing changes to remote repository, Merging branches, Patches. [5L]

**Part-B****PHP Web development Frameworks:**

**Codeigniter Framework-** Introduction, Installation, Folders overview, Configurations and Naming Conventions: CI directory tree, Controller Usage and Scope: user-defined controller, use cases, CI

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related Libraries: scope and usage, built-in libraries, API wrapper, CI helpers scope and usage, Models: Scope of model, CURD examples, Views: Scope of CI view, Accessing the libraries/helpers. [9L]

**Laravel Framework:**

Introduction, Installation, Setting up environment, Create Laravel project, Route definitions, creating Controllers, views, managing routes, Resourceful Controllers, blade template working with Controllers and Model. Working with models: Custom and Implicit route model binding, Model Relations, Database Migration and Eloquent, Handling User Data and Redirects: Validation, web form fundamentals, model binding. [9L]

**Text Books:**

1. Snig Bhaumik, "Bootstrap Essentials", Packt Publishing, 2015.
2. Chris Pitt, "Pro PHP MVC" Apress, 2012.
3. Eli Orr, Yehuda Zadik, "Programming with CodeIgniter MVC", Packt Publishing, 2013.
4. Sanjib Sinha, "Beginning Laravel", Second Edition, Apress, 2019.
5. Git in Practice, Mike McQuaid, Manning Publication Co., 2015

**Reference Books:**

1. Jörg Krause, "Introducing Bootstrap 4", Apress, 2016.
2. Adam Griffith, "CodeIgniter 1.7 professional development", Packt Publishing, 2018.
3. David Upton, CodeIgniter for Rapid PHP Application Development, Packt Publishing, 2007
4. Martin Bean, "Laravel 5 Essentials", Packt Publishing, 2015.
5. Version Control with Git, Jon Loeliger & Matthew McCullough, O'Reilly, 2015.
6. Pro Git, Ben Straub, Scott Chacon, Apress, 2014

**E-Books and Online Learning Material:**

1. Stack Overflow Documentation, "Learning twitter-bootstrap free PDF", 2019 (<https://www.computer-pdf.com/web-programming/css/896-tutorial-learning-twitter-bootstrap.html>)
2. Stack Overflow Contributors, "Learning Codeignitier free pdf", 2017 (<https://riptutorial.com/Download/codeigniter.pdf>)
3. JackVo, Learning Laravel: The Easiest Way free PDF, 2016 (<https://www.computer-pdf.com/web-programming/php/541-tutorial-learning-laravel-the-easiest-way.html>)

**Online Courses and Video Lectures:**

1. <https://www.coursera.org/learn/bootstrap-4>
2. <https://www.coursera.org/learn/web-development?>
3. <https://www.coursera.org/learn/version-control-with-git?>
4. <https://laracasts.com/series/laravel-6-from-scratch>
5. <https://codeigniter.com/userguide3/tutorial/index.html>
6. <https://www.tutorialspoint.com/codeigniter/index.htm>
7. <https://www.hostinger.in/tutorials/codeigniter-tutorial>

<b>Programme:</b> B. Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Deploy and implementation of HTML5 based Bootstrap framework elements
2.	Design and construct web module using CodeIgniter or Laravel Framework.
3.	Develop web applications using the PHP Frameworks.
4.	Recognize, contrive and build solutions for engineering problems in the area of contemporary web applications
5.	Function on diverse teams through web application designing and development

**Prerequisites:** Web Technologies**Detailed Contents:**

1. To install and setup the HTML5 based Bootstrap framework and to deploy basic HTML elements using Bootstrap CSS.
2. To understand and deploy the multicolumn grid layout of Bootstrap.
3. To deploy different types of buttons, progress bars, modals and navigation bars using Bootstrap.
4. To create and setup the Git repository on Bitbucket or github using SSH.
5. To perform push, clone and patch operation to Git repository.
6. To install and setup the CodeIgniter Framework and to understand its MVC architecture.
7. To construct a simple login page web application to authenticate users using CodeIgniter Framework and also perform CURD operations.
8. To install and setup, configure the Laravel Framework.
9. To construct any simple web application using Laravel Framework.

**Mini Project:** Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Apply techniques and principles of image formation, sampling, quantization, spatial and frequency domain which will allow them to investigate specific image processing techniques.
2.	Identify, formulate, and design algorithms in the area of digital image processing
3.	Use the techniques, skills, and modern engineering tools such as MATLAB and OCTAVE for processing digital images.
4.	Function on multi-disciplinary teams through experiments and projects related to imaging techniques.
5.	Identify potential applications of image processing to advancement of knowledge in sciences and engineering with benefits in, e.g., policing, public safety, and social issues such as privacy
6.	Demonstrate a high level of self-directed learning ability, good oral and written communication skills on technical topics of digital image processing

**Prerequisites:** Computer Fundamentals, Basic Mathematics course**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)**Detailed Contents:****Part -A****Introduction:**

Fundamental steps in digital image processing, Components of an image processing system, Applications of image processing, Sampling, Quantization [4L]

**Digital Image Processing Operations:** Pixel relationships and distance metrics: Image coordinate system, Image topology, Connectivity, Relations, Distance measures, Convolution and Correlation operations. [5L]

**Image Enhancement in Spatial Domain:**

Image enhancement point operations: Linear and non-linear functions, Piecewise linear functions, Histogram processing. Spatial filtering - basics of filtering in the spatial domain, Smoothing linear and non-linear filters, sharpening filters [8L]

**Part -B****Image Enhancement in Frequency Domain:**

Basics of filtering in the frequency domain, Image smoothing and sharpening using frequency domain filters. [4L]

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**Image Compression:**

Image compression model, Compression measures, Compression algorithm and its types (Entropy, Predictive, Transform and layered coding), Types of redundancy (Coding, Inter-pixel, Psycho-visual and Chromatic), Lossless compression algorithms – Run-length, Huffman, Bit-plane, Lossy compression algorithms – Lossy predictive, Block transform coding [6L]

**Image Segmentation:**

Classification of image segmentation algorithms, Point, Line and Edge detection, Global thresholding, Otsu's method, Region-based segmentation [5L]

**Color Image Processing:**

Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship between different models [4L]

**Text Books:**

1. R.C.Gonzalez and R.E.Woods, "Digital Image Processing", Pearson Education, 2013.
2. S. Sridhar, "Digital Image Processing", Oxford University Press, 2011.

**Reference Books:**

1. M.Sonka, V.Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomas Learning, 2007.
2. K. R. Castleman, "Digital Signal Processing", Pearson Education, 2007.

<b>Programme:</b> B. Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Apply knowledge of software tools and techniques with hands-on experience for processing digital images
2.	Design solutions for the understanding of the image enhancement, image compression, image segmentation.
3.	To conduct investigation and develop programming skills in digital image processing related problems
4.	Function on multi-disciplinary teams through experiments and projects related to imaging techniques.
5.	Use the modern engineering tools such as Scilab, MATLAB Octave etc. for solving problems related to image processing.
6.	Predict knowledge and skill base necessary to further explore advanced topics of Digital Image Processing.

**Prerequisites:** Computer Fundamentals, Basic Mathematics course

**Resource requirement:** Any source software like Octave, Scilab, MATLAB with Image Processing Toolbox etc. can be used.

**Detailed Contents:**

1. Introduction about the software tool.
2. Understanding the basic data types and their conversion from one to another.
3. Understanding arrays and vectors.
4. Learning to build functions and scripts.
5. Implementation of various flow control and decision statements.
6. Implementation of various arithmetic, logical, and geometrical operations.
7. Implementation of various image enhancement techniques in the spatial domain.
8. Implementation of various image enhancement techniques in the frequency domain.
9. Implementation of various image compression techniques.
10. Implementation of various image segmentation techniques.
11. Implementation of various colour models and conversion of an image from one model to another.

**Mini- Project:** By using various concepts of image processing, students are required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages

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(approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of practicals. Instructor may also frame additional practical relevant to the course contents (if required).

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**Subject Code:** PEIT-104

**Subject Name:** Software Modelling and Analysis

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Identify and explain contemporary software life cycle processes, activities, and work products.
2.	Elicit, analyze and specify software requirements through a productive working relationship with project stakeholders.
3.	Demonstrate formal correctness of simple procedure.
4.	Implement sequential software systems based on formal models.
5.	Verify attributes of formal models.
6.	Describe the costs and benefits of formal methods.

**Prerequisites:** Programming for problem solving, Data Structures, Discrete Mathematics.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**Software Engineering Fundamentals:**

Introduction to Software Engineering, Software Characteristics, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Engineering Economics for Software – Value Considerations throughout software life cycle, Evaluating Cost-effective solutions, Requirements Analysis and Specifications - Fundamentals. [8L]

**Modeling foundations:**

Modeling principles (e.g., decomposition, abstraction, generalization, projection/views, and use of formal approaches), Preconditions, post conditions, invariants, and design by contract, Introduction to mathematical models and formal notation. [8L]

**Part-B**

**Types of models:**

Information modeling (e.g., entity-relationship modeling and class diagrams), Behavioral modeling (e.g., state diagrams, use case analysis, interaction diagrams, failure modes and effects analysis, and fault tree analysis), Architectural modeling (e.g., architectural patterns and component diagrams), Domain modeling (e.g., domain engineering approaches), Enterprise modeling (e.g., business processes, organizations, goals, and workflow), Modeling embedded systems (e.g., real-time schedule analysis, and interface protocols). [12L]

**Analysis fundamentals:**

Analyzing form (e.g., completeness, consistency, and robustness), Analyzing correctness (e.g., static analysis, simulation, and model checking), Analyzing dependability (e.g., failure mode analysis and fault trees), Formal analysis (e.g., theorem proving). [8L]

**Text Books:**

1. Roger S Pressman, “Software Engineering: A practitioner’s approach”, 7th Edition, McGraw Hill Education, 2010.
2. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson India, 2018.
3. Grady Booch, “Object-Oriented Analysis and Design with Applications”, Pearson India, 3rd Edition, 2015.
4. James Rumbaugh, “Object-Oriented Modeling and Design with UML”, 2nd Edition , Pearson Prentice Hall, 2005.
5. Rajesh Gupta, Paul Le Guernic, Sandeep Kumar Shukla, Jean-Pierre Talpin, “Formal Methods and Models for System Design: A System Level Perspective”, Springer Science & Business Media, 2004

**Reference Books:**

1. Mehdi Khosrow-Pour, “Systems and Software Development, Modeling, and Analysis: New Perspectives and Methodologies”, IGI Global, 2014.
2. Donald W. Boyd, “Systems Analysis and Modeling: A Macro to Micro Approach with Multidisciplinary Applications”, Academic Press, 2001
3. Hassan Gomaa, “Software Modeling and Design: UML, Use Cases, Patterns, and Software Architectures”, Cambridge University Press, 2011.
4. Ned Kock, “Systems Analysis & Design Fundamentals: A Business Process Redesign Approach, SAGE Publications, 2006.
5. Grady Booch, James Rumbaugh, Ivar Jacobson, “Unified Modeling Language User Guide”, 2nd Edition, Addison-Wesley Professional, 2005.

<b>Programme:</b> B. Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Develop software requirements specification of a system in need.
2.	Perform object-oriented analysis of the required software system.
3.	Develop formal models for the required software system.
4.	Test the system for various scenarios.
5.	Perform failure-modes and effect analysis and fault-tree analysis of the software system.
6.	Improve reusability and maintainability of the system.

**Prerequisites:** Programming for problem solving, Data Structures, Discrete Mathematics

**Resource requirement:** Any open source software like AgroUML, StarUML, UML Modeller, OpenFTA, EMFTA, etc can be used.

**Detailed Contents:**

1. Identify a software system that needs to be developed and prepare a software requirement specification for that system.
2. Identify use cases and develop the use-case model for the system.
3. Identify the classes and develop the class diagrams for the system.
4. Find the interactions between the objects and represent those using UML sequence and collaboration diagrams.
5. Draw the relevant state chart diagrams and activity diagrams for the system.
6. Implement the system as per the detailed design by using an object-oriented programming language.
7. Test all the scenario is developed as per the use-case diagram.
8. Perform failure modes and effect analysis and fault-tree analysis of the system.
9. Check the model and improve its reusability and maintainability.
10. Implement the modified system and test it for various scenarios.

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B. Tech.	L:3 T: 0 P: 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design/Programming Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam (ESE):</b> 3 hours
<b>Total Marks:</b> 100	<b>Course Status:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1.	Understand modern concepts related to cryptography and cryptanalysis.
2.	Analyze and use methods for cryptography and reflect about limits and applicability of these methods.
3.	To define the system to protect determines the security properties that are desired for this system identify the possible threats to these security properties, their likelihood of occurrence and consider possible mitigations against these threats.
4.	Describe and implement of some of the prominent techniques for public-key cryptosystems and digital signature schemes (e.g., Rabin, RSA, ElGamal, DSA, Schnorr)
5.	Explain the notions of public-key encryption and digital signatures and sketch their formal security definitions.

**Prerequisites:** Basics of Mathematics, Algorithms.**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)**Detailed Contents:****Part-A****Classical cryptography and overview:**

Classical cryptosystems and their cryptanalysis, Model of secure communication, Security services, Overview of attacks, X.800 Security Architecture for Open System Interconnection (OSI), and cryptanalysis. [3L]

**Cryptographic Techniques:**

Introduction to Substitution Techniques, Transposition Techniques, Encryption and decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size. [5L]

**Mathematical background:**

Introduction to Number theory, Modular arithmetic, prime number generation, GCD, Euclidean Algorithm, Extended Euclidean Algorithm, Fast Exponentiation, Chinese Remainder Theorem, Fermat's and Euler's Theorem [8L]

**Part-B****Private key cryptography:**

Symmetric Encryption, Definitions, Chosen-Plaintext Attack. Chosen-Cipher text Attack, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, Variations on DES - RC4, RC5 and Blowfish, Hash Functions, Message Authentication Codes, Collision-Resistance. [8L]

**Public key cryptography:**

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RSA, ElGamal, DSA, Elliptic curve cryptosystems, Public Key Cryptography standard (PKCS), PKI, Digital Certificates, and Key management techniques. [6L]

**Security Protocols:**

Authentication: Kerberos, X.509 Authentication Service, Secure Socket Layer (SSL), Secure Electronic Transaction(SET), Email security, PGP, S/MIME, IP Security (IPSec) [6L]

**Textbooks:**

1. Behrouz A. Forouzan and D. Mukhopadhyay (2015), Cryptography & Network Security, McGraw Hill, New Delhi.
2. William Stallings (2006), Cryptography and Network Security: Principles and Practice, Prentice Hall

**Reference Books:**

1. Douglas R. Stinson (2018), Cryptography: Theory and Practice, Chapman and Hall
2. J. Katz and Y. Lindell (2014), Introduction to Modern Cryptography, CRC press

**Online Courses and Video Lectures:**

1. NPTEL-SWAYAM: Foundations of Cryptography By Prof. Ashish Choudhury | IIIT Bangalore  
[https://swayam.gov.in/nd1\\_noc20\\_cs02/preview](https://swayam.gov.in/nd1_noc20_cs02/preview)
2. Coursera: Number Theory and Cryptography By Alexander S. Kulikov, Michael Levin, Vladimir Podolskii <https://www.coursera.org/learn/number-theory-cryptography>

<b>Programme:</b> B. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Apply knowledge of software tools and techniques with hands-on experience for cryptographic applications.
2.	Design solutions for the understanding of the Private key , public key cryptography
3.	To conduct investigation and develop programming skills in cryptography related applications.
4.	Use the modern engineering tools/platforms/libraries of Java for solving problems related to Cloud Computing
5.	Function on multi-disciplinary teams through mini projects for exploring applications of cryptography in different sectors

**Prerequisites:** Basic programming skills and computer fundamentals.

**Detailed Contents:**

1. Write a C program that contains a string (char pointer) with a value '\HelloWorld'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value '\HelloWorld'. The program should AND, OR and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms:  
Ceaser Cipher , Substitution Cipher, Hill Cipher.
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the Blow Fish algorithm logic
6. Write a C/JAVA program to implement Euclidean Algorithm
7. Using Java Cryptography, encrypt the text "Hello world" using Blowfish. Create your own key using Java keytool.
8. Write a Java program to implement RSA Algorithm
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the Secure Hash Algorithm (SHA-1)-1 algorithm in JAVA.
11. Calculate the message digest of a text using the Message-Digest algorithm (MD5) algorithm in JAVA

**Mini Project:** By using various concepts of syllabus students required to prepare a project in a group

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of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

**Note:** Other Programming languages can also be used for implementation. It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

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**Subject Code:** PEIT-106

**Subject Name:** Advanced Computer Network

<b>Programme:</b> B. Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 5	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand internetworking, TCP protocols, switching, network routing, adhoc networks, internet layer protocols, host to host layer protocols, application layer protocols, Virtual LAN, Network Routing Protocols, adhoc routing protocols
2.	Implement the switch administrative configurations, routing between different VLANs, router administrative configurations.
3.	Analyze Enhanced IGRP and Open Shortest Path First routing protocols
4.	Compare adhoc networks with cellular networks
5.	Formulate communication between VLANs of different configuration

**Prerequisites:** Data Communication and Computer Networks

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**Internetworking:**

Half and Full Duplex Ethernet, Ethernet at the Data Link Layer, Ethernet at the Physical Link Layer, Ethernet Cabling: Straight-through, Crossover and Rolled Cable, Data Encapsulation, Three-Layer Hierarchical Network Model. TCP Protocols: Internet Layer Protocols: IP, ICMP, ARP, RARP; Host to Host Layer Protocols: TCP, UDP; Application Layer Protocols: Telnet, FTP, TFTP, NFS, SMTP, LPD, X Window, SNMP, DNS, and DHCP. [9L]

**Switching:**

Overview of Switch, Unmanaged and Managed Switches, Switch Administrative Configurations, Viewing, Saving and Erasing Configurations, Spanning Tree Protocol, VLAN Basics, Static VLAN, Dynamic VLAN, Frame Tagging, Trunking Protocol, Routing between VLANs, Configuring VLANs, Configuring VLAN Trunk Ports, Configuring Inter-VLAN Routing. [9L]

**Part-B**

**Network Routing:**

Overview of Router, Static and Dynamic Routing, Introduction to Classless Routing, Distance Vector Routing Protocols, Router Administrative Configurations, Router Interfaces, Viewing, Saving and Erasing Configurations, Routing Information Protocol, Configuration of EIGRP (Enhanced IGRP) and OSPF (Open Shortest Path First). [9L]

**Adhoc Networks:**

Features, Advantages and Applications, Adhoc versus Cellular networks, Network Architecture, Protocols: MAC and Routing Protocols, Technologies, Applications of Mobile Adhoc Networks. [9L]

**Text Books:**

1. Todd Lammle, "Cisco Certified Network Associate Study Guide", 7th Edition, Sybex publishers, 2011.
2. Todd Lammle, "CCNA Routing and Switching Study Guide", 3rd Editon, Wiley India Pvt Ltd, 2013.
3. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri "Wireless and Mobile Networks: Concepts and Protocols", Wiley India Pvt. Ltd., 2013

**Reference Books:**

1. Wendell Odom, "CCNA Exam Certification Guide", 2nd Edition, Cisco Press publication, 2007.
2. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2011.
3. Behrouz A. Forouzan, "Data Communication & Networking", 5th Edition,Tata McGraw Hill, 2014.
4. James F. Kurose and Keith W. Ross, "Computer Networking", 7th Edition, Pearson Education, 2012.
5. Douglas E. Comer, "Internetworking with TCP/IP", Volume-I, Prentice Hall, 6 Edition Pearson Education, 2013
6. W.Stallings, "Data and Computer Communication", Prentice Hall of India, 6th Edition, 2007.

**Subject Code:** LPEIT-106

**Subject Name:** Advanced Computer Network Laboratory

<b>Programme:</b> B. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 5	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-I

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Illustrate the working of wireshark in different modes.
2.	Distinguishing the different types of data traffic with the help of wireshark.
3.	Analyze different lower layer protocols
4.	Synthesize and configure the switches, VLANs, Trunk Ports and Routers with the help of packet tracer
5.	Evaluate the working of Network Management Software
6.	Formulate Adhoc Network between different mobile devices

**Prerequisites:** Basic knowledge about Computer Network Components, Devices and Protocols.

### **Detailed Contents:**

1. Installing Wireshark.
2. Packet Capturing with Wireshark.
3. Working with captured packets (Saving, exporting, marking, printing, capture settings, display options using filters)
4. Analyzing lower Layer Protocols ARP, IP, TCP, UDP, ICMP.
5. Configuring different types of switches.
6. Configuring VLANs
7. Configuring Trunk Ports
8. Configuring a Router.
9. Working on Network Management Software (NMS).
10. Configuring Adhoc Network

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

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**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**6<sup>TH</sup> SEMESTER**

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Develop an understanding of time and space complexities of an algorithm.
2.	Explore basic algorithm design techniques like divide and conquer, greedy, dynamic programming.
3.	Explore the various problem solving techniques related to graphs.
4.	Solve problems related to strings by applying various algorithms.
5.	Identify the relationship between P, NP, NP-hard and NP-complete problems.
6.	Understand the importance of approximation algorithms.

**Prerequisites:** Data Structures**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)**Detailed Contents:****Part-A****Introduction:**

Algorithm and its importance, Mathematical foundations – Growth functions, Complexity analysis of algorithms. [4L]

**Divide and Conquer:**

Basic technique and its application on Binary Search, Finding maximum and minimum and on sorting techniques such as merge sort, Quick sort. [4L]

**Greedy Algorithms:**

General method, Using greedy algorithm to solve Knapsack problem, Minimum-cost spanning tree problem, Single source shortest path problem and Travelling salesperson problem. [8L]

**Dynamic Programming:**

Introduction to dynamic programming and application of the algorithm to solve multistage graphs, All pairs shortest path problem and Knapsack problem. [8L]

**Part-B**

**Backtracking:**

General backtracking algorithm, Application of backtracking to 8 Queens' problem, Sum of subsets, Graph coloring, Hamiltonian cycles and Knapsack problem. [8L]

**String Matching Algorithms:**

Introduction, Brute Force algorithm, Rabin-Karp algorithm, KMP algorithm, Boyer-Moore algorithm. [8L]

**NP-completeness and Approximation Algorithms:**

Introduction to P, NP, NP-hard and NP-complete problems, Examples of NP-complete problems, Introduction to approximation algorithms, Absolute approximations, E-approximations [8L]

**Text Books:**

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms" Galgotia Publications.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, "Introduction to Algorithms", MIT Press.
3. Sanjoy Das Gupta, Christos Papadimitriou, and Umesh Vazirani, "Algorithms", McGraw-Hill Education.

**Reference Books:**

1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley.
2. Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
3. John Kleinberg and Eva Tardos, "Algorithm Design", Pearson Education.

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1</b>	Perform time complexity analysis of an algorithm.
<b>2</b>	Apply divide and conquer technique to solve the problem.
<b>3</b>	Implement greedy algorithm design technique.
<b>4</b>	Develop a solution of the problem using dynamic programming technique.
<b>5</b>	Apply backtracking to achieve the solution.
<b>6</b>	Implement string related algorithms.

**Prerequisites:** Data Structures**Detailed Contents:**

1. Implement binary search algorithm and compute its time complexity.
2. Implement merge sort algorithm and demonstrate divide and conquer technique.
3. Analyze the time complexity of Quick-sort algorithm.
4. Solve minimum-cost spanning tree problem using greedy method.
5. Implement greedy algorithm to solve single-source shortest path problem.
6. Use dynamic programming to solve Knapsack problem.
7. Solve all pairs shortest path problem using dynamic programming.
8. Use backtracking to solve 8-queens' problem.
9. Solve sum of subsets problem using backtracking.
10. Implement Boyer-Moore algorithm.

**Mini Project:** Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B.Tech.	<b>L:3 T: 1 P: 0</b>
<b>Semester:</b> 6	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam (ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1	Apply Supervised Learning, Unsupervised learning, Deep Learning, Visualization techniques
2	Recognize and formalize a task as a machine learning problem
3	Interpret and present the predicted model
4	Identify suitable algorithms to tackle different machine learning problems
5	Apply machine learning algorithms to real datasets
6	Make powerful and accurate predictions.

**Pre-requisites:** Basics of Mathematics, AlgorithmsIntro-level algebra, Proficiency in programming basics.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:****Part-A****Introduction to Machine Learning:**

Difference between Machine Learning and traditional programming, Applications of Machine Learning, Why Machine Learning is the Future.

[4L]

**Regression:**

Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Support Vector Regression, Decision Tree Regression, Random Forest Regression.

[10L]

**Classification :**

Linear, Non-linear, Multi-class and Multi-label classification, Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Logistic Regression, K-Nearest Neighbors (K-NN), Support Vector Machine (SVM), Naive Bayes, Decision Tree Classification, Random Forest Classification. [10L]

**Part-B**

**Clustering:**

Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models.

[12L]

**Fuzzy Logic:**

Introduction to Fuzzy Logic, Fuzzy Set, Fuzzification, Membership Functions: trimf, trapmf, gaussmf, gauss2mf, gbellmf, Defuzzification

[12L]

**Textbooks:**

1. Jason Brownlee “Master Machine Learning Algorithms” Edition, v1.13, 2018
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010).
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach “Deep Learning (Adaptive Computation and Machine Learning series)” MIT Press (2017)
4. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Shroff/O'Reilly; First edition (2017)

**Reference Books:**

1. Michie D., Spiegelhalter D. J., Taylor C. C., Machine Learning, Neural and Statistical Classification. Overseas Press (2009).
2. N. J. Nilson, Introduction to Machine Learning, Stanford, Online Link  
<http://robotics.stanford.edu/people/nilsson/mlbook.html> (Accessed on 30 July 2020)

**Online Learning Material:**

1. Machine Learning A-Z™: Hands-On Python & R In Data Science Created by Kirill Eremenko, Hadelin de Ponteves, SuperDataScience Team, SuperDataScience Support  
<https://www.udemy.com/machinelearning/> (Accessed on 30 July 2020)
2. The 5 Clustering Algorithms Data Scientists Need to Know  
<https://towardsdatascience.com> (Accessed on 03 July 2020)
3. Crash Course on Machine Learning by Google  
<https://developers.google.com/machine-learning/crash-course/> (Accessed on 03July 2020)

<b>Programme:</b> B.Tech.	<b>L:0 T: 0 P:2</b>
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam (ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Core Courses

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1	Collect data and apply pre-processing techniques
2	Implement and compare the relevant algorithms
3	Make robust Machine Learning models
4	Use Machine Learning for personal purpose
5	Formulate business problems as Machine Learning problems
6	Make powerful analysis

**Pre-requisites:** Basic programming skills, working of various Gates and computer fundamentals

**Detailed Contents:**

1. Implement Simple Linear Regression.
2. Implement Random Forest Regression.
3. Implement Logistic Regression.
4. Implement Decision Tree classification algorithms.
5. Implement k-nearest neighbours classification algorithms.
6. Implement Naive Bayes classification algorithms.
7. Implement K-means clustering to Find Natural Patterns in Data.
8. Implement K- Mode Clustering.
9. Evaluating Machine Learning algorithm with balanced and unbalanced datasets.
10. Compare various Machine Learning algorithms based on various performance metrics.

**Mini project:** By using various concepts of syllabus students required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

**Some if the projects can be:**

- Implement the classification Machine Learning models on the dataset (Amazon food reviews dataset) using hyper-parameter tuning.
- Implement the clustering algorithm on the dataset using hyper parameter tuning.
- Try to solve the titanic dataset problem which is publically available on Kaggle with the useof the performance metrics (confusion matrix, classification report, AUC Roc curve) alongwith the visualizations.
- Explainable AI (Take a dataset from kaggle.com and implement the Explainable AI using SHAP or LIME).
- Try to implement the some kaggle problem.

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**Note:**

- Any Programming languages can also be used for implementation
- It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester.
- This is only the suggested list of Practical's, Projects Instructor may also frame additional Practical's relevant to the course contents (if required)

**Online Learning Material:**

1. Virtual machine learning labs

[http://vlabs.iitb.ac.in/vlabs-dev/labs/machine\\_learning/labs/index.php](http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php)(Accessed 31 July 2020)

2. Tinker with a Neural Network Right Here in Your Browser

<https://playground.tensorflow.org/> (Accessed 31 July 2020)

3. Machine Learning Playground

<https://ml-playground.com/> (Accessed 31 July 2020)

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 48
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Contrast the various drivers accountable for the surfacing of DevOps
2.	Restate the service delivery process and business benefits
3.	Illustration of most common and popular DevOps tools
4.	Assessment of critical success factors for DevOps implementation
5.	Evaluations of the results with GIT, GITHUB, Jenkins and Dockers
6.	Integration of GITS, Dockers and Jenkins

**Prerequisites:** Operating System.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**DevOps:**

Introduction to DevOps - the pillars of the movement, Various Devops Tools, Introduction to Continuous Integration, Continuous Deployment/ Delivery. [10L]

**GIT:**

GIT Basics, Installing GIT, Working with the Bourne Again Shell (BASH), Using the Graphical User Interface (GUI), GIT Repos, Creating repositories, Staged and unstaged resources, Working with the GIT commit lifecycle, Understanding when to commit, GIT Updates and Tracking, Branching, Working with the Master branch and the HEAD, Working with the commit history, Checking out branches, Building and maintaining new branches, Merging branches, Exploring branch management strategy, Cloning and Remotes, Cloning repositories, Working with remotes, Using GitHub, Pulling and pushing repositories. [14L]

**Part-B**

**Dockers:**

Introduction to containerization, Introduction to Docker, Docker Architecture, Creating your First Container, Checking Connectivity between Containers, Docker Images, Stopping and Removing Containers, Creating Custom Docker Images, Pushing Images to Docker Hub, Using Persistent Storage With Docker, Understanding Docker Networking, Working with Dockerfile, Usage of Docker Compose. [12L]

**Jenkins:**

Introduction to Jenkins, Jenkins Configuration, Using Jenkins to build projects, Linking Jenkins to GIT repositories, Using Jenkins to set off Docker containerization, Deployment of Docker containers.

[12L]

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**Text Books:**

1. Davis Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, and Jerome Henry, “IoT Fundamentals – Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 5th Impression, CISCO Press, 2020.
- 2 Mayur Ramgir, “Internet of Things – Architecture, Implementation and Security”, 1st Impression, Pearson India, 2020.
3. Raj Kamal, “Internet of Things – Architecture and Design Principles”, 5th Reprint Edition, McGraw - Hill Education, 2019.

**Reference Books:**

1. Adrian Mouat, “Using Docker: Developing and Deploying Software with Containers”, 1st Impression, O'Reilly Media, 2016.
  2. Viktor Farcic, “The DevOps 2.1 Toolkit: Docker Swarm”, 2nd Impression, Lean Publishing, 2017.
  3. Russ Kendrick, “Docker Bootcamp”, 1st Impression, Packt Publishing, 2017.
- Ferdinando Santacroce, “Git: Mastering Version Control”, 2nd Impression, Packt Publishing, 2016.

**E-Books and Online Learning Material:**

1. GIT GUI  
<https://git-scm.com/docs/git-gui> Accessed on June 13, 2020
2. DevOps  
[https://developers.redhat.com/products/rhoar/download?sc\\_cid=701f2000000Rm8hAAC&gclid=CjwKCAjwlZf3BRABEiwA8Q0qq7Jpr\\_h4ncsCoF7NmLKSVOV60vrGQNtdt85FdxV5\\_yFqiZWTCdvbxBoC3l8QAvD\\_BwE&gclsrc=aw.ds](https://developers.redhat.com/products/rhoar/download?sc_cid=701f2000000Rm8hAAC&gclid=CjwKCAjwlZf3BRABEiwA8Q0qq7Jpr_h4ncsCoF7NmLKSVOV60vrGQNtdt85FdxV5_yFqiZWTCdvbxBoC3l8QAvD_BwE&gclsrc=aw.ds) Accessed on June 13, 2020

**Online Courses and Video Lectures:**

- 1.<https://www.udemy.com/courses/search/?q=docker>Accessed on June 13, 2020
2. <https://www.udemy.com/courses/search/?q=devops> Accessed on June 13, 2020
3. <https://www.udemy.com/courses/search/?q=git> Accessed on June 13, 2020
4. <https://www.udemy.com/courses/search/?q=jenkins>Accessed on June 13, 2020

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Core Course

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Illustration of GIT and GITHUB
2.	Creating the various repositories
3.	Design and implementation with Jenkins
4.	Design and implementation with Dockers
5.	Formulation of strategies for managing the containers
6.	Integration of GITS, Dockers and Jenkins

**Prerequisites:** Operating System.

**Detailed Contents:**

1. Install GIT
2. Create account on GITHUB
3. Create Repository using GIT/ GITHUB
4. Create/Delete/Merge Branches
5. Install Jenkins
6. Create Jobs on Jenkins
7. Integrate Jenkins with GIT/ GITHUB
8. Install Docker
9. Deploy Nginx Web Server Image on Docker
10. Deploy Apache Web Server Image on Docker
11. Create Custom page using Web Server
12. Create Custom image
13. Push Custom Image to Docker Hub
14. Use Persistent storage with Docker

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. Create custom website code at GITHUB repository. Deploying this code using Jenkins on Docker. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

<b>Programme:</b> B.Tech	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-II

### On Completion of the course, the student will have the ability to:

<b>CO#</b>	<b>Course Outcome</b>
1.	Understand the concept and challenge of big data
2.	Demonstrate hands-on experience on large-scale analytics tools to solve some open big data problems
3.	Examine the impact of big data for business decisions and strategy
4.	Apply the novel architectures and platforms like Hadoop introduced for Big data
5.	Implement the analytics techniques on a variety of complex applications
6.	Apply non-relational databases, for storing and processing large volumes of structured and unstructured data, as well as streaming data

**Prerequisites:** Basic Quantitative skills, including elementary statistics, as well as Basic Programming skills in SQL, CRUD Operations and Basic Operating System Skills Preferably Linux and one Programming Language either Java/Python.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### Detailed Contents:

#### Part-A

##### **Introduction to Big Data:**

Understanding Big Data: Concept and terminologies, datasets, data analysis, data analytics, Big Data characteristics; Types of data: structured, unstructured, semi-structured, metadata, Big Data Applications. [3L]

##### **Big Data Adoption and Planning:**

Data procurement, privacy, security, provenance, performance challenges, governance requirements, methodology; Big data analytics life cycle: data identification, data acquisition and filtering, data extraction, data validation and cleansing, data aggregation and representation, data analysis and visualization. [3L]

##### **Big Data Storage Concepts:**

Clusters, File System and Distributed file system, Sharding and Replication. [2L]

##### **Big Data Processing Concepts:**

Parallel and Distributed data processing, Hadoop: Introduction to Hadoop, Environment Setup, HDFS Overview: Features of HDFS, Architecture of HDFS, HDFS Commands & Operations, Understanding Map Reduce. Apache Spark: Spark Overview, RDD Fundamentals, Spark SQL and Data Frames, Spark Job Execution, Cluster Architectures for Spark, Intro to Spark Streaming, SparkML. [10L]

#### Part-B

##### **Big Data Storage Technologies:**

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On-Disk Storage Devices, RDBMS databases, NoSQL databases: Characteristics, types (Key value, Document, Column-Family, Graph), CAP theorem [5L]

**Big Data Analysis Techniques:**

Quantitative Analysis, Qualitative analysis, Data Mining, Statistical Analysis: A/B testing, Correlation and Regression, Machine Learning: Classification (Supervised learning), Clustering (Unsupervised learning), filtering, visual analysis, semantic analysis. [10L]

**Case studies:**

Case study on big data analytics life cycle, NoSQL, Machine Learning.

[3L]

**Text Books:**

1. Thomas Erl,Wajid Khattak,and Paul Buhler,"Big Data Fundamentals, Concepts, Drivers & Techniques", Prentice Hall, Service Tech Press, edition 2016.
2. Chuck Lam,"Hadoop in Action", Dreamtech Press/Wiley India, 2011
3. Jared Dean,"Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley Publication, 2014 .
4. Eric Siegel, Thomas H. Devanport , "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die ", Willey 2016
5. Holden Karau and Andy Kowinski , "Learning Spark", Kindle Edition2015

**Reference Books:**

1. John W. Foreman,"Data Smart: Using Data Science to Transform Information into Insight" , Wiley Publication, 2013.
2. Benjamin Bengfort and Jenny Kim, "Data Analytics with Hadoop: An Introduction for Data Scientists", Kindle Edition 2016

**E-Books and Online Learning Material:**

- 1.Thomas Erl,Wajid Khattak,and Paul Buhler,"Big Data Fundamentals, Concepts, Drivers & Techniques", Prentice Hall, Service Tech Press, edition 2016.
2. Nong Ye, Data Mining: Theories, Algorithms, and Examples, 2013, ISBN-10: 1439808384

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/104/106104189/>
2. <https://www.coursera.org/specializations/big-data>
3. <https://www.edureka.co/big-data-hadoop-training-certification>
4. <https://www.coursera.org/projects/data-analysis-using-pyspark>
5. <https://www.edx.org/learn/big-data>
6. <https://www.futurelearn.com/programs/big-data-analytics>

**Subject Code:** LPEIT-108  
**Subject Name:** Big Data Analytics Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0T: 0P:2</b>
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical :</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1.	Understand Big Data and Hadoop ecosystem
2.	Detect complex problems and synthesize suitable solutions
3.	Compile collect, manage, store, query, and analyze various form of big data
4.	Formulate balance between algorithmic and systems issues
5.	Construct the Integration of Big Data with traditional data warehouses
6.	Applying machine learning to computing tasks, where designing and programming algorithms with good performance is difficult

**Prerequisites:** Knowledge of Java/Python, SQL

**Detailed Contents:**

1. Refresher on CRUD Operations
  - SQL Operations Lab
  - SQL Operations with Python / Java
  - File I/O with Python / Java
2. Working with Hadoop Ecosystem
  - Hands on HDFS commands
  - HDFS file I/O with Python / Java
  - Understand the basic Data types of MapReduce
  - Programming Paradigm
  - Steps to write a mapreduce program
  - Writing a Program to count number of words in a file.
  - Working with Hive & Pig
3. Working with Apache Spark
  - Writing MapReduce jobs in PySpark / RSpark
  - Working with Spark RDD
  - Hive with Spark ( SparkSQL )
  - Accessing HDFS with PySpark.
4. NoSQL Databases
  - Working with Document Database MongoDB.
  - Working with Wide Column Store HBase
  - Working with Graph Database TitanDB
  - CRUD operations on NoSQL with Python / Java

5. SparkML & R Programming

- Basic constructs of R programming
- Data Analysis in R
- Machine Learning in SparkML
- Data visualization libraries in R

**Mini Project:** By using various concepts of Big Data students are required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of practicals. Instructor may also frame additional practicals relevant to the course contents (if required).

**Subject Code:** PEIT-109

**Subject Name:** MEAN: Full Stack Web Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 60%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Develop web applications using the concept MEAN stack development.
2.	Create and design web applications using Node.js and Express framework.
3.	Apply the knowledge of AngularJS and MongoDB for web page designing.
4.	Identify, formulate and solve engineering problems in the area of dynamic responsive web applications
5.	Function on multi-disciplinary teams through web application creation

**Prerequisites:** Web Technologies

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**Web Development with MEAN full-Stack:**

The trend toward full-stack developing, Benefits of full-stack development, Introduction to MEAN: Node.js - The web Server/Platform, Express - The framework, MongoDB - The database, Angular The front-end framework, Supporting Cast : Git for source Control, Bootstrap, Hosting, Example application using MEAN components together, Designing a MEAN stack architecture. [8L]

**Building an Express and Node.js Web Application:**

Installing Node.js, Introduction and Installation process of NPM, JavaScript and Node.js event-driven programming, JavaScript closures, Node modules, developing Node.js web applications, Installing Express, create first Express application, request and response objects, Implementation the MVC Pattern: horizontal and vertical folder structure, file-naming conventions, configure Express application, Rendering Views, serving static files. [9L]

**Part-B**

**AngularJS and MongoDB:**

Installing MongoDB, key features, MongoDB shell, databases, collections and CRUD operations, introduction and understating Mongoose schemas, Key concepts of AngularJS: modules, Two-way data binding, directives, installing AngularJS, Structuring and bootstrapping AngularJS application, MVC entities, routing, services and managing AngularJS authentication. [10L]

**Advanced Topics :**

Writing a REST API: Rules of REST API, setting up API in Express, Methods to read, add, update and delete data in MongoDB, Call API from Express. Creating Angular application with TypeScript: getting up and running with Angular, Working with Angular components, Building a single-page

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application with Angular : Adding navigation, building modular app, binding HTML content, routing parameters, working with forms and handling submitted data. [9L]

**Text Books:**

1. Simon Holmes and Clive Harber “Getting MEAN with Mongo , Express, Angular and Node” Second Edition, Manning Publications, 2019.
2. Amos Q. Haviv, “MEAN Web Development,” Packt Publishing, 2014

**Reference Books:**

1. Elad Elrom, “Pro MEAN Stack Development”, Apress, 2016.
2. Mithun Satheesh, Bruno Joseph D'mello, Jason Krol, “Web Development with MongoDB and NodeJS”, Packt Publishing, 2015.

**Subject Code:** LPEIT-109  
**Subject Name:** MEAN: Full Stack Web Development Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Deploy and implementation of Express and Node.js web application
2.	Design and construct dynamic front-end with Angular
3.	Develop and build data models with MongoDB and Mongoose.
4.	Recognize, contrive and build solutions for engineering problems in the area of contemporary web applications
5.	Function on diverse teams through web application designing and development

**Prerequisites:** Web Technologies

**Detailed Contents:**

1. To install, setup and configure Express, node and npm packages.
2. Create Express project and build static site using Express and Node.
3. Working on the importing Bootstrap option for quick, responsive layouts.
4. To Install of MongoDB and creating a new document/database using CURD Operations like insert, update, read and delete.
5. To building a data model with MongoDB and Mongoose.
6. Connect Express application to MongoDB using Mongoose.
7. To create an angular application and working with its components.
8. To build a single-page application with Angular.
9. To construct a simple login page web application to authenticate users using MEAN stack.

**Mini Project:** Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

**Subject Code:** PEIT-110  
**Subject Name:** Computer Vision

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam (ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Status:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Design and implement algorithms to perform image processing and feature extraction.
2.	Design and implement algorithms for image segmentation.
3.	Design and implement algorithms for representation of shape
4.	Understand the basic techniques and issues in 3-D computer vision.
5.	Design and build a real computer vision-based system
6.	Design and implement algorithms to perform image processing and feature extraction.

**Prerequisites:** Digital Image Processing

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

##### **Part-A**

###### **Unit-1**

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Cameras – lenses, projections, sensors, Representation – color spaces, Camera model and Camera calibration, Binocular imaging systems, Sources, Shadows and Shading. [5L]

###### **Unit-2**

2D/3D Vision: Filters, Binary Images, Features, Edge Detection, Texture, Shape, Segmentation, Clustering, Model Fitting, Probabilistic Models, 3D Vision: Multi view geometry, Stereo, Shape from X, 3D data. [5L]

###### **Unit-3**

Image Processing and Feature Extraction: Image representations (continuous and discrete), Linear Filters, Texture, Edge detection. Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion. [8L]

##### **Part-B**

###### **Unit-4**

Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis. Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition. [10L]

###### **Unit-5**

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Latest trends in computer vision: Computer Vision Interaction for People with Severe Movement Restrictions, DARWIN: A Framework for Machine Learning and Computer Vision Research and Development, Computer Vision Face Tracking For Use in a Perceptual User Interface. [8L]

**Textbooks:**

1. Title Digital Image Processing Author R.C. Gonzalez, R.E Woods Publisher Pearson Education Edition 3rd Edition, 2008
2. Szeliski, R., Computer Vision: Algorithms and Applications, Springer-Verlag London Limited (2011), 1st Edition.
3. Forsyth, A., D. and Ponce, J., Computer Vision: A Modern Approach, Pearson Education (2012) 2nd Edition.

**Reference Books:**

1. Title Computer Vision: A Modern Approach Author D. A. Forsyth, J. Ponce Publisher Prentice Hall Edition 2nd Edition, 2011
2. Title Digital Image Processing and Computer Vision Author R. J. Schalkoff Publisher John Wiley & Sons Australia Edition 1989
3. Title Computer Vision Author L. Shapiro, G. Stockman Publisher Prentice-Hall Edition 2001
4. Title Introductory Techniques for 3D Computer Vision Author E. Trucco, A. Verri Publisher Prentice Hall Edition 1998

**Subject Code:** LPEIT-110  
**Subject Name:** Computer Vision Laboratory

<b>Programme:</b> B.Tech.	<b>L:0 T: 0 P:2</b>
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam (ESE):</b> 1.5Hours
<b>Total Marks:</b> 50	<b>Course Status:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the image formation process
2.	Design and implement algorithms to perform image processing and feature extraction.
3.	Design and implement algorithms for image segmentation.
4.	Design and implement algorithms for representation of shape
5.	Understand the basic techniques and issues in 3-D computer vision.
6.	Design and build a real computer vision-based system

**Pre-requisites:** Basic understanding of programming concepts.

**Detailed Contents:**

1. Introduction and installation of MATLAB and related toolbox.
2. To implement the concept of image formation.
3. Implementation of image pre-processing and image processing concept.
4. To implement edge detection techniques to detect and measure objects in an image.
5. Implementation of filters.
6. Implementations of feature extraction.
7. Implementation of image segmentation techniques  
--To implement texture segmentation using texture filter in computer vision.
8. Implementation of pattern recognition and classification.
9. To implement the concept of 3D vision.

**Mini- Project:** By using various concepts of computer vision, students are required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practicals. Instructor may also frame additional Practicals relevant to the course contents (if required).

**Subject Code:** LPEIT-111  
**Subject Name:** Software Design and Testing

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Use fundamental design principles, methods, patterns and strategies in the creation of a software system and its supporting documents.
2.	Design and Prototype user interfaces to validate requirements
3.	Demonstrate object-oriented design basics like domain models, class diagrams, and interaction (sequence and communication) diagrams.
4.	Produce test cases, plans, and procedures that can be used to verify that they have defined, designed and implemented a system that meets the needs of the intended users and achieve the quality goal.
5.	Apply different strategies for unit-level , system-level testing, integration and regression testing
6.	Prepare and conduct usability tests to evaluate the usability, utility and efficiency of the developed user interface.

**Prerequisites:** Programming for problem solving, Data Structures, Discrete Mathematics.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

##### **Part-A**

###### **Software Design:**

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Design principles (information hiding, cohesion, and coupling), Design for quality attributes (e.g., reliability, usability, maintainability, performance, testability, security, and fault tolerance), Design Strategies: Function Oriented Design, Object Oriented Design. [7L]

###### **Architectural Design:**

Architectural styles, patterns, and frameworks, Architectural trade-offs among various attributes , Hardware and systems engineering issues in software architecture, Requirements traceability in architecture, Service-oriented architectures, Architectures for network, mobile, and embedded systems, Relationship between product architecture and the structure of development organization and market [7L]

###### **Detailed design:**

Design patterns, Database design, Design of networked and mobile systems, Design notations (e.g., class and object diagrams, UML, state diagrams, and formal specification), Design evaluation, Design metrics

[6L]

**Part-B**

**Software Verification and Validation :**

V&V terminology and foundations, Planning the V&V effort, Documenting V&V strategy, including tests and other artifacts, V&V involvement at different points in the life cycle.[3L]

**Testing-Part I:**

Unit testing and test-driven development, Exception handling (testing edge cases and boundary conditions), Coverage analysis and White-Box( structure-based) testing, Black-box functional testing techniques- Boundary Value testing, Equivalence Class based testing, Integration testing, Developing test cases based on use cases and/or user stories, Testing based on operational profiles (e.g., most-used operations first).

[8L]

**Testing-Part II:**

System and acceptance Testing, Testing across quality attributes (e.g. usability, security, compatibility, and accessibility), Regression testing, Testing tools and automation a, User interface testing, Usability testing, Performance testing.

[5L]

**Text Books:**

1. Roger S Pressman, “Software Engineering: A practitioner’s approach”, 7th Edition, McGraw Hill Education, 2010.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication, 2009.
3. Paul C. Jorgensen, Software Testing, A Craftsman’s Approach. 4<sup>th</sup> Edition, Auerbach Publication, 2013.
4. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson India, 2018.
5. Grady Booch, “Object-Oriented Analysis and Design with Applications”, Pearson India, 3rd Edition, 2015.
6. James Rumbaugh, “Object-Oriented Modeling and Design with UML”, 2nd Edition , Pearson Prentice Hall, 2005.
7. Rajesh Gupta, Paul Le Guernic, Sandeep Kumar Shukla, Jean-Pierre Talpin, “Formal Methods and Models for System Design”.

**Reference Books:**

1. Donald W. Boyd, “Systems Analysis and Modeling: A Macro to Micro Approach with Multidisciplinary Applications”, Academic Press, 2001
2. Hassan Gomaa, “Software Modeling and Design: UML, Use Cases, Patterns, and Software Architectures”, Cambridge University Press, 2011.
3. Ned Kock, “Systems Analysis & Design Fundamentals: A Business Process Redesign Approach, SAGE Publications, 2006.
4. Grady Booch, James Rumbaugh, Ivar Jacobson, “Unified Modeling Language User Guide”, 2nd Edition, Addison-Wesley Professional, 2005.
5. Jennifer Preece, Yvonne Rogers and Helen Sharp, “Interaction Design: Beyond Human-Computer Interaction”, Third Edition.

**Subject Code:** LPEIT-111  
**Subject Name:** Software Design Testing and Laboratory

<b>Programme:</b> B.Tech.	<b>L:0T:0P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5Hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Perform requirement analysis of a system.
2.	Perform object-oriented analysis and design of the system.
3.	Develop efficient test cases for the system.
4.	Perform verification and validation of the system.
5.	Incorporate exception handling in the system.
6.	Perform higher level testing of the system for its enhanced performance.

**Prerequisites:** Programming for problem solving, Data Structures, Discrete Mathematics.

**Detailed Contents:**

Use open source software tools like AgroUML, StarUML, UML Modeller, Marathon, SoapUI, etc. to perform the following experiments:

1. Perform the analysis of the specific requirements of the required system and prepare software requirements specification for it.
2. Perform the detailed design of the system by developing its use-cases, use-case diagram, class diagrams, sequence diagrams, etc. and implement the detailed design.
3. Develop test cases covering all the aspects of the system.
4. Perform verification and validation of the system.
5. Include exception handling in the system covering the test of edge cases and boundary conditions.
6. Combine the various units of the system where required and check the system by integration testing.
7. Perform acceptance testing of the system.
8. Ensure the proper working of the existing features of the system by performing regression testing.
9. Test the efficiency of the User Interface of the system.
10. Give workload to the system and do the performance testing.

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

**Subject Code:** PEIT- 112  
**Subject Name:** Digital Forensics

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the concepts and vocabulary of digital forensics
2.	To understand how to examine digital evidences such as the data acquisition, identification analysis.
3.	Understand what open source tools exist for use when performing Digital Forensics
4.	Document their findings when performing a digital forensic analysis.
5.	Write a basic report based on digital forensics findings.
6.	To understand the basic digital forensics and techniques for conducting the forensic examination.

**Prerequisites:** Computer Networks, Security Fundamentals

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### **Detailed Contents:**

#### **Part-A**

##### **Unit -I:**

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues. [4L]

##### **Unit- II:**

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations. [6L]

##### **Unit-III:**

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools. [8L]

#### **Part-B**

##### **Unit-IV:**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case. [8L]

##### **Unit-V:**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool. [10L]

### **Text Books:**

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1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response Essentials”, Addison Wesley, 2002.
2. Nelson, B, Phillips, A. Enfinger, F, Stuart, C., “Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5

**Reference Books:**

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389

**Subject Code:** LPEIT-112  
**Subject Name:** Digital Forensics Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the concepts of GREP
2.	To understand how to manage forensic reports
3.	Understand what open source tools exist for use when performing Digital Forensics
4.	Detailed analysis of standard forensic tools
5.	Examine how information is stored and how it may be deliberately hidden and/or subverted.

**Tools:** Any open source tools can be used like Wireshark, RAM capturer, Network Mapper etc.

**Detailed Contents:**

1. Understanding GREP, Building Regular Expressions, Creating GREP keywords, Viewing and managing keywords and cases
2. Forensic Reports, Creating a forensic report, Proper report writing, Explaining forensics to the uneducated
3. Email Analysis :Viewing e-mail , Webmail, POP, IMAP
4. Detecting File Manipulation using some open source tool
5. Sleuthkit and Autopsy: Study of standard forensic tools
6. File carving and personal artifacts: Finding useful data pieces and assembling them

**Minor Project (Tentative List of Topics):**

1. Analyze a cell phone of your own.
2. Analyze how things you do on a computer or phone affects its files.
3. Analyze a subset of drives in our corpus to determine their usage.
4. Image NPS classroom and laboratory machines, and extract new kinds of data.
5. Analyze the occurrence of malware in the corpus.
6. Analyze the full set of effects on a drive of particular malware attacks.
7. Test forensic methods for analyzing virtual machines.
8. Analyze patterns of timestamps in particular directories across drives.
9. Develop good methods for comparing drives to find similar ones.
10. Develop new techniques for visualizing the data in our corpus.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

**Subject Code:** PEIT-113  
**Subject Name:** Network Security

<b>Programme:</b> B.Tech.	<b>L:3 T:0 P: 0</b>
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam (ESE):</b> 3 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand Symmetric Ciphers, Classical Encryption Techniques, Block Cipher and Data Encryption Standard.
2.	Analyze Public Key Cryptography and RSA
3.	Compare different authentication protocols
4.	Evaluate Network Security requirements and Applications.
5.	Recognize and prevent system security threats

**Pre-requisites:** Data Communication and Computer Networks

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

##### **Part-A**

###### **Symmetric Ciphers:**

Overview- Services, Mechanisms and Attacks, OSI Security Architecture, Model of Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Stenography. Block Cipher and the Data Encryption Standard: Simplified DES, Block Cipher Principles, DES, Strength of DES, Differential and Linear Cryptanalysis.

Symmetric Ciphers: Triple DES, Blowfish. Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. [10]

###### **Public Key Encryption:**

Digital Signatures - Number Theory, Prime Numbers Formats and Euler's Theorems, Testing for Primality. Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, The RSA Algorithms, Key Management, Diffie Hellman Key Exchange. [8L]

##### **Part-B**

###### **Authentication Protocols:**

Message Authentication- Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards. [6L]

###### **Network Security:**

Authentication Applications: Kerberos, X.509 Directory Authentication Service. Electronic Mail Security: Pretty Good Privacy. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload. Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. [6L]

**System Security:**

Intruders, Malicious Software, Viruses and Related Threats, Counter Measures, Firewalls and its Design Principles.

[6L]

**Text Books:**

1. William Stallings, “Cryptography and Network Security”, 7th Edition, Pearson Education, 2017.
2. Behrouz A Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security”, Tata McGraw Hill Education Private Limited, 2011.
3. Joseph MiggaKizza, “Guide to Network Security”, 5<sup>th</sup> Edition, Springer, 2020

**Reference Books:**

1. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security: Private Communication in Public World”, 2nd Edition, Pearson Education, 2011.
2. AtulKahate, “Cryptography and Network Security”, Tata McGrawHill, 2003.
3. Jie Wang, Zachary A. Kissel “Introduction to Network Security: Theory and Practice”, Wiley, 2015.

**Subject Code:** LPEIT-113  
**Subject Name:** Network Security Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 6	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 50	<b>Course Type:</b> Professional Elective-II

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Implement the cipher techniques
2.	Develop the various security algorithms
3.	Use different open source tools for network security and analysis
4.	Detailed analysis of some standard security tools.
5.	Examine how to demonstrate intrusion detection system.

**PrerequisitesTools:** C, C++, Java or equivalent compiler GnuPG, KF Sensor or Equivalent, Snort, Net Stumbler

**Detailed Contents:**

1. Implement the following algorithms
  - a) DES
  - b) RSA Algorithm
  - c) Diffie-Hellman
  - d) MD5
  - e) SHA-1
2. Implement the SIGNATURE SCHEME – Digital Signature Standard
3. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures.
4. Setup a honey pot and monitor the honeypot on network (KF Sensor)
5. Installation of rootkits and study about the variety of options
6. Perform wireless audit on an access point or a router and decrypt WEP and WPA (Net Stumbler)
7. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

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## **Open Elective courses to be offered to other departments**

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**Subject Code:** OEIT-101  
**Subject Name:** Python Programming

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Familiar with Python environment, data types, operators used in Python.
2.	Compare and contrast Python with other programming languages..
3.	Learn the use of control structures and numerous native data types with their methods.
4.	Design user defined functions, modules, packages and file handling
5.	Investigate and implement Graphical User Interfaces based programming
6.	Identify the need of object oriented programming features and implement the same to meet real time requirements.

**Prerequisites:** Knowledge of Programming for Problem Solving and OOPS

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part-A**

**Introduction Python Programming Language:**

History and Origin of Python Language, Python version numbering scheme, Features, Advantages and disadvantages, Major Applications of Python, Installing Python, Setting up Path and Environment Variables, Getting started with Python Programming, Python Interactive Help Feature [5L]

**Software Development, Data types, Operators and Expressions:**

The software Development Process, Case study: income tax Calculator, strings, Assignment and Comments, numeric Data types and Character sets, Operators in Python, Expressions, Precedence, Associativity, Non Associative Operators using modules [5 L]

**Loops and Selection Statements:**

Definite Iteration: The for Loop, Formatting Text for Output, Case Study: An Investment Report, Selection: if and if-else Statements, Conditional Iteration: The while Loop, Case Study: Approximating Square Roots [5 L]

**Strings and Text Files:**

Accessing Characters and Sub-strings in Strings, Data Encryption, Strings and Number Systems, String Methods, Text Files, Case Study: Text Analysis [4 L]

**Part-B**

**Lists and Dictionaries:**

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Lists, Defining Simple Functions, Case Study: Generating Sentences, Dictionaries, Case Study: Non-directive Psychotherapy.[4 L]

#### **Design with Functions:**

Function components, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study: Gathering Information from a File System, Managing a Program's Namespace. [5 L]

#### **Graphical User Interfaces:**

The Behavior of Terminal-Based Programs and GUI-Based Programs, Coding Simple GUI-Based Programs, Windows and Window Components, Command Buttons and Responding to Events, Input and Output with Entry Fields, Defining and Using Instance Variables, Case Study: The Guessing Game Revisited, Useful GUI Resources. [8 L]

#### **Text Books:**

1. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python First Programs", 2 nd Edition, Cengage Learning, 2019.
2. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python: First Programs through Data Structures", 1st Edition, Cengage Learning, 2010.

#### **Reference Books:**

1. Martin C. Brown, "Python The complete Reference", McGraw Hill Education.2001
2. Allen B. Downey, "Think Python", 1st Edition, Green Tea Press, 2012.

#### **E-Books and Online Learning Material:**

1. Fundamentals of Python First Programs by Kenneth A. Lambert  
<https://edubookpdf.com/programming/fundamentals-of-python-first-programs-2nd-edition.html> (Accessed on January 11, 2021)
2. Python Essential Reference by Beazley  
<http://lib.myilibrary.com/Login.aspx?ReturnUrl=%2fOpen.aspx%3fid%3d267855&id=267855> (Accessed on January 11, 2021)
3. <https://www.programiz.com/python-program> (Accessed on January 11, 2021)
4. <https://www.guru99.com/python-tutorials.html> (Accessed on January 11, 2021)

#### **Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/106/106106182/> (Accessed on January 11, 2021)
2. <https://www.coursera.org/learn/python> (Accessed on January 11, 2021)

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**Subject Code:** OEIT- 102

**Subject Name:** Management Information System

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the need and importance of MIS in organizations
2.	Identify, formulate and implement different strategies for competitive advantage
3.	Study and analyze the Business Intelligence and ERP techniques
4.	Define SCM and CRM with role of international systems.
5.	Study of decision support system.
6.	Monitor the challenges and changes in IT in an organization in terms of e-commerce

**Prerequisites:** Knowledge of Information Systems, e-commerce and management skills.

**Additional Material Allowed in ESE:** NIL

#### **Detailed Contents:**

##### **Part -A**

##### **Managing Information Systems in Organizations:**

Definitions of MIS, Importance of MIS, Objectives of MIS, Framework for MIS organization and management triangle, Information systems, Information in organizational functions, information systems for decision making, types of information systems, Define management ,levels of management, managerial Functions, Role of internet, Managing Information Systems in Organization-the IT interaction model, Challenges for the manager, Decision making with MIS-Tactical decisions-operational decisions, strategic decisions, communication in organizations- types of communication. [8L]

##### **Information Systems and Management Strategy:**

What are strategies, characteristics of SMIS, barriers to development of SMIS, Information goods-properties-technology lock-in and switching costs, information systems and competitive strategy value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.[6 L]

**Business Process Integration and ERP:** Introduction to Business Process Integration and Enterprise Resource Planning, Enterprise Resource planning Systems.[4L]

##### **Part-B**

**SCM, CRAM and International Systems:** Introduction to Supply Chain Management Systems & Customer Relationships Management Systems, Comparison between ERP and SCM, components of SCM,Benefits of SCM, Disadvantages of SCM, Challenges of Enterprise Systems Implementations, International Information Systems-Outsourcing and off-shoring.[8L]

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**Decision Support Systems:** Definitions, Simon's model of decision making, Evolution of DSS, Objectives of DSS, classifications of DSS, components of DSS, Functions of DSS, relationship between MIS and DSS, Future development of DSS.[4L]

**E-commerce:** Introduction to E-commerce Technology, categories of e-commerce, e-commerce infrastructure, Electronic payment systems, doing business over internet- networks-electronic data interchange (EDI)-online payment technology, E-business, impact of e-commerce.[4L]

#### **Text Books:**

1. Rahul Dee, "Managing Information Systems in Business ,Government and Society" published by Wiley-India 2012
2. A.K Gupta , "Management Information Systems", Published by S. Chand & Company Ltd, 2013

#### **Reference Books:**

1. Kenneth C. Laudon, Jane P. Laudon, "Management Information Systems", Published by Pearson, 2014.
2. Goyal "Management Information Systems",published by MacMillan,2010

#### **E-Books and Online Learning Material:**

1. [https://books.google.co.in/books?id=PWRwOJ8FmgC&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.co.in/books?id=PWRwOJ8FmgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false).
2. [https://books.google.co.in/books?id=FrIrb6jBLQC&source=gbs\\_similarbooks](https://books.google.co.in/books?id=FrIrb6jBLQC&source=gbs_similarbooks)

#### **Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/110/105/110105146/>
2. <https://nptel.ac.in/courses/110/105/110105145/>

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**Subject Code:** OEIT-103  
**Subject Name:** Web Designing

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Define the basic principles of Web page design.
2.	Visualize the basic concept of HTML.
3.	Recognize the elements of HTML.
4.	Visualize the basic concept of CSS.
5.	Recognize the elements of CSS.
6.	Define the basic principles of Bootstrap.

**Prerequisites:** Basic knowledge in HTML tags & Basic Computer hardware & software.

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part –A**

**Web Design Principles:**

Basic principles involved in developing a web site, planning process, web standards [9L]

**Introduction to HTML:**

HTML Documents, Basic structure of an HTML document, creating an HTML document, Tags, Heading-Paragraphs, Line breaks, HTML Tags, Working with Text, Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Forms attributes and elements, Case Study: Create web page using concepts of HTML. [9L]

**Part – B**

**Cascading Style Sheets:**

Introduction to Cascading Style Sheets, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties), CSS align and color, Case Study: Creating website Layout and Design using concepts CSS. [9L]

**Bootstrap:**

Introduction to Bootstrap, How to use Bootstrap, Bootstrap file structure, Basic HTML structure for Bootstrap, Typography, Responsive classes, The grid system, Packaged Components in Bootstrap- Icons, Navigation bar, Badges, Alerts, Toolbars and button groups, Panels,

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Pagination, Tables. The JavaScript Add-ons in Bootstrap: Custom data attributes, Tabs, Collapse, Tooltips and popovers, Dropdown Menu, Case Study : Create responsive web page using key components of Bootstrap. [9L]

**Text Books:**

1. Snig Bhaumik, “Bootstrap Essentials”, Packt Publishing, 2015
2. Mike McGrath, “HTML, CSS & JavaScript in easy steps”, 2019

**Reference Books:**

1. Jorg Krause, “Introducing Bootstrap 4”, Apress, 2016.

**Guru Nanak Dev Engineering College, Ludhiana****Department of Information Technology****B. Tech (Information Technology) Scheme 2018****Subject Code:** OEIT-104**Subject Name:** Artificial Intelligence

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the concept of Artificial Intelligence, Agents, their types and structure.
2.	Apply and analyze search strategies to solve the informed and uninformed problems
3.	Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
4.	Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.
5.	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.
6.	Examine the issues involved in knowledge bases, reasoning systems and planning

**Prerequisites:** Knowledge of problem solving using different algorithms and basic programming**Additional Material Allowed in ESE:** NIL**Detailed Contents:****Part -A****Introduction:**

Intelligence, Foundations of artificial intelligence (AI). History of AI, Agents and Environments, Rationality of Agents, Nature and Structure of Agents, Communication among Agents. [3 L]

**Problem Formulation and solution:**

State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A\* search, AO\* search, Constraint satisfaction problem, Agenda Driven Search, Mean-end analysis, MinMax Search, Alpha-Beta Pruning, Iterative Deepening. [7 L]

**Game playing:**

Perfect Information game, Imperfect Information game, Evaluation function, Minimax algorithm, Alpha-beta pruning. [3 L]

**Logical Reasoning:**

Inference in Propositional logic and First order Predicate logic, Resolution, Logical reasoning, Forward chaining, Backward chaining [3 L]

**PART-B**

**Knowledge representation:**

Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts. [7L]

**Planning and Learning Agents:**

Intelligent Agents, Nature and structure of Agents, Learning Agents, Introduction to different Forms of Learning, The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.[9L]

**Inductive learning:**

Decision trees, Rule based learning, Current-best-hypothesis search, Least commitment search, Neural networks, Reinforcement learning, Genetic algorithms. [5L]

**Text Books:**

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall. 2010
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India,2011

**Reference Books:**

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill. 2010
2. Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.2018
3. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University,2010

**E-Books and Online Learning Material**

1. HandBook of Artificial Intelligence Edited by Avron Barr and Edward A. Feigenbaum, Computer Science Department Stanford University.  
<https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf>

**Online Courses and Video Lectures**

1. <https://www.coursera.org/courses?query=artificial%20intelligence> (Accessed on May 20,2020)
2. <https://nptel.ac.in/courses/106/105/106105077/> (Accessed on May 20,2020)
3. <https://nptel.ac.in/courses/106/102/106102220/> (Accessed on May 20, 2020)
4. <https://www.youtube.com/watch?v=bV4t4r3SGuI> (Accessed on May 20, 2020)
5. <https://www.youtube.com/watch?v=iF1tOCEXLXY> (Accessed on May 20,2020)

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**Subject Code:** OEIT-105  
**Subject Name:** Digital Marketing

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Explain the role and importance of digital marketing in a rapidly changing business landscape
2.	Discuss the key elements of a digital marketing strategy
3.	Illustrate how the effectiveness of a digital marketing campaign can be measured
4.	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs
5.	Discuss the key elements of a Social Media Marketing strategy
6.	Examine the process of e mail 1 marketing strategy

**Prerequisites:** Knowledge of problem solving using different algorithms and basic programming

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part -A**

**Digital Marketing:**

Introduction to Digital Marketing and its Significance, Traditional Marketing Vs Digital Marketing, Digital Marketing Process [5L]

**Search Engine Optimization:**

Introduction to Search Engine Optimization, Keyword Planner Tools, On Page SEO Techniques-Indexing and Key Word Placement, On Page SEO Techniques- Content Optimization, On Page SEO : Yoast SEO [5L]

**Email Marketing:**

Introduction and Significance, Designing e-mail marketing campaigns using Mail Chimp, Building E-mail List and Signup Forms, Email Marketing Strategy and Monitoring, Email – Atomization [5L]

**Part-B**

**Pay Per Click Advertising:**

Introduction, Pay Per Click Advertising: Google Adword, Types of Bidding strategies, Designing and Monitoring search campaigns, Designing and Monitoring Display campaigns [5L]

**Designing and Monitoring:**

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Designing and Monitoring Video campaigns, Designing and Monitoring Universal App Campaigns [5L]

**Google Analytics:**

Introduction and Significance, Google Analytics Interface and Setup, Understanding Goals and Conversions, Monitoring Traffic Behavior and preparing reports [5L]

**Social Media Marketing:**

Introduction and Significance, Facebook Marketing : Introduction Types of Various Ad Formats, Setting up Facebook Advertising Account ,Under standing Facebook Audience and its Types, Designing Facebook Advertising Campaigns [6L]

**Text Books:**

1. Blanchard O. (2014) Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization
2. Pulizzi, J. (2013) Epic Content Marketing
3. Marketing on Facebook, Best practice guide (2015)

**Reference Books:**

1. Facebook Marketing Press Chaffey, D., & Ellis-Chadwick, F. (2012)
2. Digital Marketing: Strategy, Implementation and Practice, 5/E, Pearson Tapp, A., & Whitten, I., & Housden 2014

**Online Courses and Video Lectures**

1. NPTEL course on Digital Marketing [www.smartinsights.com](http://www.smartinsights.com)
2. [www.hubspot.com](http://www.hubspot.com)
3. [www.mashable.com](http://www.mashable.com)
4. [www.emarketer.com](http://www.emarketer.com)
5. [www.socialmediaexaminer.com](http://www.socialmediaexaminer.com)

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**Subject Code:** OEIT-106

**Subject Name:** System Analysis and Design

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
CO1	Develop a requirements document that details and models an information system design.
CO2	Utilize data flow diagramming, entity relationship modeling, and state process modeling in user requirement analysis
CO3	Compare and contrast conceptual, logical, and physical data models
CO4	Demonstrate an understanding of object and procedural modeling
CO5	Recognize and incorporate user requirements, business rules and constraints into the design of an information system.
CO6	Address coding schemes , error detection in system.

**Prerequisites:** Knowledge of problem solving using different algorithms and basic programming

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part -A**

**Data and Information:**

Types of information: operational, tactical, strategic and statutory, why do we need information systems, management structure, requirements of information at different levels of management, functional allocation of management, requirements of information for various functions, qualities of information, small case study [3L]

**Systems Analysis and Design Life Cycle:**

Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, system design, system implementation, system evaluation, system modification. Role of systems analyst, attributes of a systems analyst, tools used in system analysis [4L]

**Information gathering:** strategies, methods, case study, documenting study, system requirements specification, from narratives of requirements to classification of requirements as strategic, tactical, operational and statutory. Example case study [4L]

**Feasibility analysis:** deciding project goals, examining alternative solutions, cost, benefit analysis, quantifications of costs and benefits, payback period, system proposal preparation for managements, parts and documentation of a proposal, tools for prototype creation [5L]

Tools for systems analysts, data flow diagrams, case study for use of DFD, good conventions, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs [3L]

### **Part-B**

#### **Structured systems analysis and design:**

Procedure specifications in structured English, examples and cases, decision tables for complex logical specifications, specification oriented design vs procedure oriented design [4L]

#### **Data oriented systems design:**

Entity relationship model, E-R diagrams, relationships cardinality and participation, normalizing relations, various normal forms and their need, some examples of relational data base design. [4L]

#### **Data input methods:**

Coding techniques, requirements of coding schemes, error detection of codes, validating input data, input data controls interactive data input [4L]

#### **Designing outputs:**

Output devices, designing output reports, screen design, graphical user interfaces, interactive I/O on terminals. [5L]

#### **Text Books:**

1. Elias M Awad, "Systems analysis and design", 2nd Edition, 1985 (Homewood, Ill. : R.D. Irwin), ISBN: 0256028249 9780256028249
2. Kenneth E. Kendall, Rutgers University Jullie E. , "System Analysis and Design ", 9th Edition , 2014,(Pearson Publication), ISBN-13: 978-0133023442.
3. Charles S. Wasson," System Analysis, Design, and Development: Concepts, Principles, and Practices", Print ISBN:9780471393337 |Online ISBN:9780471728245 |DOI:10.1002/0471728241, 2005
4. George Telecki, "System Analysis, Design, and Development: Concepts, Principles, and Practices," 1st Edition, 2005, : John Wiley & Sons, Inc., : ISBN-13 978-0-471-39333-7, ISBN-10 0-471-39333-9
5. Kenneth E. Kendall," System Analysis and Design",Jan 1996, Prentice Hall Professional Technical Reference, ISBN:978-0-13-148883-0

#### **Reference Books:**

1. Dennis. A.Wixom, B.H. and Roth, R.M," Systems Analysis and Design",2015, John Wiley and sons.
2. Hoffer,J.A.,George, J.F. and Valacich, J.S," Modern System Analysis and Design",2014, Pearson.
3. Kendall, K.E and Kendall, J.E," System Analysis and Design",2013, Pearson

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**E-Books and Online Learning Material:**

1. Systems Analysis and Design by Howard Gould

<https://bookboon.com/premium/books/systems-analysis-and-design> (Accessed on February 9, 2021)

2. Systems Analysis and Program Development by Mostafa Abd-ElHamid

Atwa <https://bookboon.com/premium/books/systems-analysis-and-program-development>

(Accessed on February 9, 2021)

3. System Analysis and Design by Alan Dennis, Barbara Haley Wixom And Roberta M. Roth

[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjkp8flmtzuAhXGzTgGHYfFAHoQFjAEegQIBBAC&url=https%3A%2F%2Fwww.saigontech.edu.vn%2Ffaculty%2Fhuynq%2FSAD%2FSystems\\_Analysis\\_Design\\_UML\\_5th%2520ed.pdf&usg=A\\_OvVaw2-55Fuqk4xaHhk2Awhblkw](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjkp8flmtzuAhXGzTgGHYfFAHoQFjAEegQIBBAC&url=https%3A%2F%2Fwww.saigontech.edu.vn%2Ffaculty%2Fhuynq%2FSAD%2FSystems_Analysis_Design_UML_5th%2520ed.pdf&usg=A_OvVaw2-55Fuqk4xaHhk2Awhblkw) (Accessed on February 9, 2021)

**Online Courses and Video Lectures**

1. <https://www.youtube.com/watch?v=kuy3lj2zGfI> accessed on 9 feb,2021

2. <https://www.youtube.com/watch?v=yurSdXxaIFo&list=PL4F47209691234D1D>

3. <https://www.youtube.com/watch?v=qj3kNYxkt1s&list=PLEAYkSg4uSQ0eDa24iKd7qJlsrvr8XcvF&index=2>

4. <https://nptel.ac.in/courses/106/108/106108102/>

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**Subject Code:** OEIT-107  
**Subject Name:** Cyber Laws and IPR

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Familiarize with Internet and related security issues
2.	Comprehend the concepts and issues related to Cyber World.
3.	Understand the E-commerce framework, models and legal aspects.
4.	Reckon out the need of Intellectual property rights.
5.	Interpret and understand the various chapters and sections under Indian IT Act 2000
6.	Implement of E-commerce related applications as case studies and minor projects

**Prerequisites:** Knowledge of problem solving using different algorithms and basic programming

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part -A**

**Basics of Computer & Internet Technology:**

Internet, ISP & domain name; Network Security; Encryption Techniques. [6L]

**Introduction to Cyber World:**

Introduction to Cyberspace and Cyber Law; Different Components of cyber Laws; Cyber Law and Netizens.Algorithms; Digital Signatures[5L]

**E-Commerce:** Introduction to E-Commerce; Different E-Commerce Models; E-Commerce Trends and Prospects; E-Commerce and Taxation; Legal Aspects of E-Commerce.[8L]

**Part-B**

**Intellectual Property Rights:**

IPR Regime in the Digital Society; Copyright and Patents; International Treaties and Conventions; Business Software Patents; Domain Name Disputes and Resolution. [7L]

**IT ACT 2000:**

Aims and Objectives; Overview of the Act; Jurisdiction; Role of Certifying Authority; Regulators under IT Act; Cyber Crimes-Offences and Contraventions; Grey Areas of IT Act.[10L]

**Text Books:**

1. Nandan Kamath, A Guide to Cyber Laws & IT Act 2000 with Rules & Notification,2019
2. Keith Merill&Deepti Chopra (IK Inter.), Cyber Cops, Cyber Criminals & Internet,2002

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**Reference Books:**

1. Diane Row Land, Information Technology Law, 2005
2. Vakul Sharma (Mc Millian), Handbook of Cyber Laws,2002

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**Subject Code:** OEIT-108  
**Subject Name:** ICT in Agriculture and Rural Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Apply knowledge of Infrastructure, appliances and services to the analysis of ICT in agriculture and rural development.
2.	Identify and study of techniques for increasing productivity through ICT.
3.	Develop techniques for agricultural Marketing with ICT.
4.	Use the concepts, skills, necessary for globalization of e-agriculture.
5.	Learn about the recent applications of ICT and their potential to transform Indian agriculture.
6.	Function on multi-disciplinary teams through various case studies related to impact of ICT on the society.

**Prerequisites:** Fundamentals of Information Technology

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part -A**

**Introduction:**

Introduction to ICT, ICT in Agricultural and Rural Development. [2L]

**ICT Infrastructure, Appliances and Services :**

Making ICTs Affordable in Rural Areas, Mobile Money Moves to Rural Areas, M-PESA's :Pioneering Money Transfer Service, Delivering Content for Mobile Agricultural Services. [6L]

**Impact of Mobile Devices on Agriculture and Rural Development:** Key Benefits and Challenges Related to Mobile Phones and Agricultural Livelihoods, General Principles for Using Mobile Phones in Agricultural Projects. [6L]

**Increasing Productivity through ICT:** Increasing Crop, Livestock, Fishery, Dairy Productivity through ICT, Preventing Yield Losses through Proper Planning and Early Warning Systems . IT Tools for India's with applications in Dairy Industry[6L]

**Agricultural Marketing with ICT:** Mobile Phones as a Marketing Tool, Improvement of Logistics through ICT, Facilitation of Market Research, Access to and Delivery of Inputs [5L]

**Part-B**

**Globalization of e-agriculture:** Global e-agriculture and rural development, evolution of e-agriculture and global ICT trends, key characteristics of e-agriculture development, key lesson from global e-agriculture development, e-agriculture and rural development in Asia. [5L]

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**Applications of ICT:** ICT and its potential to transform Indian agriculture, ICT based pest management for sustainable pulse production. Learning in agriculture and rural development, ICT use in agriculture, key success factors for ICT application in agribusiness, implications of ICT use in agriculture and agribusiness industry. [7L]

**Case Studies:** Impact of digital revolution on rural society in India, Agricultural knowledge dissemination system, Community radio for development of rural India, Mobile communication and development of rural India, Harnessing ICTs for Indian Agricultural and rural development, Agricultural development through Information Communication Technology (ICT) in India. [6L]

#### **Text Books:**

1. V K Dubey and Farida Ahmad, Agrotech Publishing Academy, 2014.
2. ICT in Agriculture, Connecting Smallholders to Knowledge, Networks, and Institutions, ARDB, 2011, The World Bank, Washington, USA.
3. Tomas Mildorf and Karel Charvat, ICT FOR Agriculture, Rural Development, and Environment, Czech centre for science and society, 2012.

#### **Reference Books:**

1. R Saravanan, C.Kathiresan and T.Indra Devi, Information and Communication Technology for Agriculture and Rural Development, New India Publishing Agency, 2011

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**Subject Code:** OEIT-109  
**Subject Name:** IT Enabled Services

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 6	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> Nil
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Open Elective

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Apply knowledge about Business Strategy with special emphasis on challenges and opportunities of IT
2.	Identify, formulate, and review literature to define enterprise IT architecture.
3.	Understand the impact of IT enabled services on major areas like medical, legal and ethical.
4.	Function on multi-disciplinary teams through various case using AutoCAD and SAP
5.	Identify potential applications of IT Enabled Services that can lead to advancement of knowledge in sciences and engineering with benefits in, areas like geography, medical sciences, manufacturing industries etc
6.	Construct knowledge and understanding of Current Trends in IT Enabled Services that can assist in lifelong learning

**Prerequisites:** Fundamentals of Information Technology, Project Management, Web Engineering and Technology

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part -A**

**Business Strategy-Challenges and Opportunities of IT:**

Business Strategy: Challenges and Opportunities in the Globalized, Interconnected, Convergent World, Establishing Principle before practice; IT Strategy: Application, Management and Technology Strategy for IT, Business and IT Alignment: Challenges of IT and Business Strategy Alignment, Inhibitors of Business and IT Strategy Alignment, Three-D Framework for Business and IT Alignment: Discipline, Design and Drive. [5L]

**Enterprise IT Architecture:**

Defining EITA, Contents of Typical Enterprise IT Architecture, Technology Management Strategy framework, Prevalent Technology Reference Architectures Framework and Standards, Program Management, Benefits of PMO, Desired Qualities of Program Office Manager, Maturity of PMO, Implementation of PMO Strategy, Measuring PMO Performance, Success Factors of PMO, Project Scope Management, PMO Dashboard and Reporting [6L]

**Introduction to IT Enabled Services:**

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Definition and Meaning of IT Enabled Services, Users and Technology involved in IT Enabled Services, Deployment challenges and issues in establishment of IT enabled services, Major Application areas like Medical, Legal and Ethical, E-banking and E-commerce/ E-business. [5L]

### **Part-B**

#### **IT Enabled Services in Diverse Areas:**

IP Based Emergency Services:- Overview, Building Blocks, Location based Protocols Used, Overview of Geography Markup Language, NENA i2 vs NENA i3 Architecture for Delivery of Emergency Services, Security issues concerned with IP Based Emergency Services; Role of IT enabled web Services in Medical, Case Study: GNUHealth, openEHR, IT Services in Manufacturing Industries:- Importance of good IT infrastructure for discrete manufacturing companies, Goal, Components and Implementation of good IT infrastructure for manufacturing industries, Case study: AutoCAD, SAP. [8L]

#### **Current Trends in IT Enabled Services:**

Current Employment in the IT and ITES industry: Newly emerging area and requirement of IT enabled service sector. Overview of India's IT and ITES Industry - IT Services (ITES/ BPO Engineering Services, R&D, and Software Products), Industry Oriented Human Resource Requirements: Outlook of IT and ITES industry. Barriers to Trade in ITES Role of International Bodies (WTO & UNCTAD) in facilitating Trade in ITEST/ ITES, experience and Case studies of ITES- call centers, ERP, google. [8L]

#### **Text Books:**

1. Dubey, Sanjiva Shankar, "IT Strategy and Management ", PHI Learning Pvt. Ltd., 2016.
2. Nikhil Treebhooohu, "Promoting IT Enabled Services ", Addison-Wesely, 2013.
3. Sanjiva Shankar Dubey, "IT Services Business Management: Concepts, Processes and Practices ", PHI Learning Pvt. Ltd., 2012.
4. Hannes Tschofenig and Henning Schulzrinne, "Internet Protocol Based Emergency Services ", Wiley, 2013.

#### **Reference Books:**

1. S.A. Kelkar, "Strategic IT Management: A concise Study ", PHI Learning Pvt. Ltd., 2010
2. Shiro Uesugi , "IT Enabled Services ", Springer- Verlag Wein, 2013.
3. Lois Burns and Florence Maloney, "Medical Transcription and Terminology: An Integrated Approach", Thomson Delmar Learning, 2nd Edition.2003
4. Kevin Ake, John Clemons, Mark Cubine, Bruce Lilly, "Information Technology for Manufacturing: Reducing Costs and Expanding Capabilities", CRC Press 2016

**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**CHOICE-I  
7<sup>TH</sup> SEMESTER**

Students of 7<sup>th</sup> Semester will undergo 6 Month Industrial/Institutional Training

**CHOICE-I  
8<sup>TH</sup> SEMESTER**

**Subject Name:** Comprehensive Laboratory  
**Subject Code:** PRIT-106

<b>Programme:</b> B.Tech.(IT)	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 <sup>th</sup>	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 20	<b>Percentage of Numerical/Design/Programming Problems:</b> 100
<b>External Marks:</b> 30	<b>Duration of End Semester Exam(ESE):</b>
<b>Total Marks:</b> 50	<b>Course Status:</b> Seminar/Project

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Students are to be made confident in fundamental aspects of any engineering problem/situation
2.	To assess the comprehensive knowledge gained in basic courses relevant to Information Technology.
3.	To explore the application avenues for the core engineering concepts of IT
4.	To comprehend the questions asked and answer them with confidence.
5	To provide a holistic view about core and advanced computing principles
6	To re-iterate and explore the basic concepts of core Information Technology

**Prerequisites:** Advanced programming skills, Networking skills, database management skills

**Contents:**

1. Assessment of Data structures and programming methodology
2. Assessment of tools for software engineering.
3. Assessment of basic organization and Architecture of computer system
4. Assessment of Data base design and models
5. Assessment of various functions and process involved in operating system
6. Mastering the concepts, protocols involved in computer networks.

**Subject Code:** PEIT-115

**Subject Name:** Cloud Infrastructure and Services

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**Prerequisites:** Basics of Networking, Operating System, Virtualization

**Additional Material Allowed in ESE:** NIL

**Course Outcomes:**

After completing this course students will be able

1. To assess existing hosting platforms and computing paradigms currently being used in industry and academia.
2. To comprehend need of data centre, its virtualization techniques and types of clouds.
3. To demonstrate the implementation of cloud by using commercial and open source cloud platforms and its virtualization.
4. To implement cloud-based data storage by considering issues of task partitioning, data partitioning, data synchronization, distributed file system, data replication etc.
5. To teach the distributed computing fundamentals in the context of cloud infrastructure
6. To provide an insight into managing and scheduling of various cloud resources

**Detailed Contents:**

**Part-A**

**Defining Cloud Computing:** Utility Computing, Cloud Types, Examining the characteristics of Cloud Computing, Cloud Computing vs. Cluster computing vs. Grid computing, Assessing the roles of Open Standards [6]

**Virtualization:** Using virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors, Machine Imaging, Porting applications [5]

**Capacity Planning:** Defining Baseline and Metrics, Network Capacity, Scaling [3]

**Overview of OpenStack:** Architecture of OpenStack, project, services, mode of deployment, workflow. [4]

**Cloud Storage:** Object storage and Block storage [2]

**Part-B**

**Cloud Network:** Software-defined networking with OpenStack, Architecture, Protocols, Network functions virtualization (NFV) [4]

**Cloud Management:** Monitoring, Management, Maintenance, Troubleshooting, Backup, Recovery, Service Level Agreement [4]

**Cloud Security:** Cloud Security: Role of Security, Types of Attack, Network Security, Survey on Potential Cloud Barriers in adopting Cloud Computing, New Threats related to Cloud Computing, Security Stack, Gartner's Seven Cloud Computing Security Risks. Other Cloud Security Issues: Virtualization, Access Control & Identity Management, Application Security, Data Life Cycle Management. OpenStack security -

Role-Based Access Control (RBAC), Identity service, Application security, data security.  
[6]

**Containers and Edge Computing:** Introduction to Edge computing, Containers and Edge Computing with OpenStack  
[2]

Textbooks:

1. Barrie Sosinsky (2013), Cloud Computing Bible, Wiley India Pvt. Ltd.
2. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski (2011), Cloud Computing: Principles and paradigms, Wiley India Pvt. Ltd.
3. Anthony Velte, Toby Velte, Robert Elsenpeter (2009), Cloud Computing: A practical Approach, Tata McGrawHill

Reference Books:

1. Michael Miller (2008), Cloud Computing, Que Publishing
2. Anthony Velte, Toby Velte and Robert Elsenpeter (2014), Cloud Computing: A practical Approach by Tata McGrawHill
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper (2009), Cloud Computing for dummies.

Online Courses and Video Lectures

1. Cloud computing By Prof. Soumya Kanti Ghosh | IIT Kharagpur  
Available at: [https://swayam.gov.in/nd1\\_noc20\\_cs20/preview](https://swayam.gov.in/nd1_noc20_cs20/preview)

2. Google Cloud Computing Foundations Course  
By Prof. Soumya Kanti Ghosh, Multifaculty | IIT Kharagpur, Google Cloud  
Available at : [https://swayam.gov.in/nd1\\_noc20\\_cs55/preview](https://swayam.gov.in/nd1_noc20_cs55/preview)

**Subject Code:** LPEIT-115  
**Subject Name:** Cloud Infrastructure and Services Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

Pre-requisites: Basic programming skills and computer fundamentals

#### **Course Outcomes:**

After studying this course, the student will be able to

1. Apply knowledge of software tools and techniques with hands-on experience for Cloud related applications.
2. Design solutions for the understanding of the virtual machines, networks and managing users in Cloud Infrastructure.
3. To conduct investigation and develop programming skills in Cloud Computing related applications.
4. Use the modern engineering tools/platforms such as Open stack, Hadoop for solving problems related to Cloud Computing
5. Function on multi-disciplinary teams through mini projects for exploring applications of Cloud Computing in different sectors.

#### **Detailed Contents**

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top Linux/windows.
2. Introduction to OpenStack and its components.
3. Installation of OpenStack using RDO packstack.
4. Creating and launching a basic virtual machine
5. Creating and managing images and templates
6. Creating and managing networks
7. Creating and managing users
8. Managing security groups and policies
9. Connecting to virtual machine/server from local computer

By using various concepts of syllabus students required to prepare a project in a group of two to three students.

The group of students must submit a project report of 8 to 10 pages (approximately) and the team will

have to demonstrate the project as well as must give a presentation of the same.

Note: It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required)

**Subject Code:** PEIT-116

**Subject Name:** Mobile Application Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understanding the basic mobile platforms and mobile development environments
2.	Make use of Android SDK to setup Android Development Environment
3.	Apply conceptual knowledge of User Interface Designing to design UI in Android SDK
4.	Develop Interactivity based Android Applications using Fragment, Intents and Event Processing
5.	Develop Database oriented Android Applications using Persistent Data Storage
6.	Improve the Android Application Performance using Android Services and Threads Analyze and Solve the bugs using Android Security and Debugging features

**Prerequisites:** Programming in Java.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### Detailed Contents:

##### **Part-A**

**Introduction to Mobile Development:** Brief History of Mobile: Beginning and evolution, Mobile ecosystem: Operator, Network, Devices, Platforms, Operating System, Application Frameworks, Types of Mobile applications, Seven rules for developing mobile strategy. **[4L]**

**Android Development Environment:** Introduction to android, Advantage of Android over other development environment, Android execution environment, Components of android application, Android activity and service life-cycle, Android 7.0 nougat and comparison with older version, Assembling android 7 development workstation, Downloading and installing Android Studio2, Introduction to Android Studio IDE. **[6L]**

**Android User Interface Design:** XML Naming scheme, XML syntax, XML Referencing, XML constants, XML Styles, XML Colors, View Group Class, View Class, Activity Class, UI Design from scratch: Checkbox, Text View, Button element to interface, Error elimination using XML Editor, Working with Relative, Linear, Table and Grid Layouts, Understanding Activity Life Cycle. **[7L]**

##### **Part-B**

**Apps Interactivity in Android:** Android Fragment: Fragment Class, Fragment Life Cycle, Android Intent Class: Intent types, Intent Filters, Instantiating Intent Object, Android Context Class, Event Processing: Events, Event Listener, Event Handler. **[5L]**

**Persistent Data Storage:** SQLite: Android Built in SQLite content provider, Modifying data using your android application, Creating basic activity, Configuring manifest, Packaging and managing SQLite with android app. **[4L]**

**Android Services and Threads:** Android service class: Controlling services, Spawning process, Process Life Cycle, Thread Caveats, Background Processing Services. **[5L]**

**Android Security and Debugging:** Requesting permissions, Creating custom Permissions, Securing application for publication and execution, Tools for debugging, Eclipse Java Editor: Java errors, Debugger, Logcat, Android Debug Bridge (adb), DDMS: Dalvik Debug monitor service, Traceview.[4L]

**Text Books:**

1. Brian Fling, “Mobile Design and Development”, First Edition, O’Reilly, 2009.
2. Rick Rogers, John Lombardo, Zigurd Mednieks and Blake Meike, “Android Application Development”, First Edition, O’Reilly, 2009.
3. Wallace Jackson, “Android Apps for absolute beginners”, Apress, 4th Edition, 2017.

**Reference Books:**

1. Grant Allen, “Beginning Android Get Started building apps for android platform”, Apress, Fifth Edition 2014.
2. Raimon Raflos Montane, Laurence Dawson, “Learning Android Application Development”, Packt Publishers, 2014.
3. Jerome F. DiMarzio, “Beginning Android Programming with Android Studio”, 4th edition, Wrox Publishers, 2016.
4. Antonio Pachon Ruiz, “Mastering Android Application Development”, Packt Publishers, Edition 2015

**E-Books and online learning material:**

1. Android Studio Development Essentials by Neil Smyth  
<https://www.onlineprogrammingbooks.com/android-studio-development-essentials-javaedition/>  
Accessed on June. 20, 2020
2. Android Tutorial by TutorialsPoint  
<https://www.tutorialspoint.com/android/androidTutorial.pdf> Accessed on June. 20, 2020
3. Android Programming Cookbook by Chryssa  
<http://enos.itcollege.ee/~jpoial/allalaadimised/reading/Android-Programming-Cookbook.pdf>  
Accessed on June. 20, 2020

**Online Courses and Video Lectures:**

1. <https://developer.android.com/courses> Accessed on June. 20, 2020
2. <https://www.edx.org/learn/android-development> Accessed on June. 20, 2020
3. <https://www.lynda.com/Android-training-tutorials/947-0.html> Accessed on June. 20, 2020
4. <https://www.coursera.org/projects/build-app-android-studio-java> Accessed on June. 20, 2020
5. <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/> Accessed on June. 20, 2020
6. <https://nptel.ac.in/courses/106/106/106106147/> Accessed on June. 20, 2020
7. <https://web.stanford.edu/class/cs193a/lectures.shtml> Accessed on June. 20, 2020

**Subject Code:** LPEIT-116  
**Subject Name:** Mobile Application Development Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Demonstrate an understanding of design aspects of different mobile development environments
2.	Install, setup and make use of Android SDK 2 to study basic components involved in Android Mobile Application Development
3.	Study and Design using basic designing components, different type of layouts for a UI based on XML in Android Studio2
4.	Develop a basic module using Android development environment involving elements of interactivity
5.	Develop persistent database oriented application module using Android development environment
6.	Integrating the concept of multithreading, resource requests for application performance improvement
7.	Test and solve the bug related issues using tools like` Logcat, Android Debug bridge
8.	Function on diverse teams to identify, formulate and design static web project using XML oriented Designs, Persistent Data Storage and embedded with features like services, threads and debugging in multi-disciplinary environment

**Prerequisites:** Programming in Java, Web Technologies.

**Special Instruction related to resources requirement:** Software like Android Studio.

1. Android Development Environment: To study design aspects of development environment like Android, iOS.
2. Android Development Environment: To setup Android studio2 and study its basic components.
3. Android User Interface Design: To study various XML files needed for interface design.
4. Android User Interface Design: To implement different type of layouts like relative, grid, linear and table.
5. Apps Interactivity in Android: To incorporate element of interactivity using Android Fragment and Intent Class.
6. Persistent Data Storage: To perform database connectivity of android app using SQLite.
7. Android Services and Threads:To implement the concept of multithreading using Android Service class.
8. Android Security and Debugging: To implement concept of permission and perform request for permission to access different hardware components of mobile.

9. Android Security and Debugging: To perform debugging and testing of android app using tools like Logcat, Android debug bridge, DDMS.

Mini Project: - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Reference Books:**

1. Beginning Android Get Started building apps for android platform by Grant Allen, Apress, Fifth Edition 2014.
2. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by Mark Wickham, Apress 2018.

**Subject Code:** PEIT-117

**Subject Name:** Augmented Reality and Virtual Reality

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	To understand the basic concepts of Augmented and Virtual Reality.
2.	Assess and compare technologies in the context of AR and VR systems design.
3.	To apply Environment Modelling in Virtual Reality
4.	Develop interactive augmented reality applications for PC and Mobile based devices using a variety of input devices.
5.	To learn and implement application of VR in Digital Entertainment:
6.	Demonstrate the knowledge of the research literature in augmented reality for both compositing and interactive applications.

**Prerequisites:** Working knowledge of geometry, 3D space, and Linear algebra

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

#### **Part-A**

**Introduction of Virtual Reality:** Fundamental concept and components of Virtual Reality, primary features and present development on Virtual Reality. [4L]

**Multiple Modals of Input and Output Interface in Virtual Reality:** Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices [6L]

**Visual Computation in Virtual Reality:** Fundamentals of computer graphics, software and hardware technology on stereoscopic display, advanced techniques in CG: Management of large scale environments & real time rendering [6L]

**Environment Modeling in Virtual Reality:** Geometric Modeling, Behavior Simulation, Physically Based Simulation. [4L]

#### **Part-B**

**Interactive Techniques in Virtual Reality:** Body Track, Hand Gesture, 3D Menus, Object Grasp. Introduction of Augmented Reality (AR): System structure of Augmented Reality, key technology in AR. [6L]

**Development Tools and Frameworks in Virtual Reality:** Frameworks of software development tools in VR, X3D Standard, Vega, MultiGen, Virtools etc. [6L]

**Application of VR in Digital Entertainment:** VR technology in film & TV production, VR technology in physical exercises and games, demonstration of digital entertainment by VR [4L]

**Text Books:**

1. Doug A. B., Kruijff E., LaViola J. J. and Poupyrev I. , 3D User Interfaces: Theory and Practice , Addison-Wesley (2005,2011p) 2nd ed.
2. Parisi T., Learning Virtual Reality, O'Reilly (2016) 1st ed.
3. Schmalstieg D. and Hollerer T., Augmented And Virtual Reality, Addison-Wesley (2016).

#### **Reference Books:**

1. Whyte J., Virtual Reality and the Built Environment, Architectural Press (2002).
2. Aukstakalnis S., Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Addison-Wesley (2016).

**Subject Code: LPEIT-117**

**Subject Name:** Augmented Reality and Virtual Reality Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
<b>2.</b>	Assess and compare open source tools in the context of AR and VR systems design.
<b>3.</b>	Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR
<b>4.</b>	Design of Google Cardboard for cost effective VR experience
<b>5.</b>	To learn and implement application of VR in Digital Entertainment:
<b>6.</b>	Demonstrate the knowledge of VR to the conduct of scientific research, training, and industrial design.

**Tools:** Unity 3D, Blender, and various Open source tools

#### **Detailed Contents:**

1. Introduction to various Open sources VR Tools
2. Introduction to Unity: Interface overview and navigation
3. Creating a new project, importing standard assets, adding a player character, Objects, lighting, scenes, prefabs, asset store in Unity
4. Scripting in Unity: Creating a New Script, (naming) Syntax, Functions, Variables, Key / Mouse Input, Unity Support
5. Object-Oriented Scripting in Unity , Public variables, the inspector
6. Working of Hololens, Google Glass
7. Intro to Maya:, Basic concepts of 3D modeling, Bevel, Cone, Extrude, Smooth, Booleans
8. Workings on apps related to AR and VR

Mini Project: How to design Google cardboard in laboratory for VR experience

**Subject Code:** PEIT-118  
**Subject Name:** Software Process and Quality Assurance

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
1.	Identify and explain contemporary software life cycle processes, activities, and work products.
2.	Plan tasks, plan task dependencies, estimate effort, and estimate other needed resources.
3.	Recognize and categorize risks, intellectual property, and legal issues of software projects.
4.	Effectively manage changes during the software life cycle including deviations and waivers in software configuration control.
5.	Apply various metrics and measurements to assess the product and the process quality.
6.	Apply standard quality assurance techniques to ensure that requirements are verifiable, traceable, measurable, testable, accurate, unambiguous, consistent, and complete.

**Prerequisites:** Software Engineering.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

##### **Part-A**

**Software Process:** Software engineering process infrastructure (e.g., personnel, tools, and training), Modeling and specification of software processes, Measurement and analysis of software processes, Software engineering process improvement (individual, team, and organization), Quality analysis and control (e.g., defect prevention, review processes, quality metrics, and root cause analysis of critical defects to improve processes and practices).

**[7L]**

**Process Implementation:** Levels of process definition (e.g., organization, project, team, and individual) Life-cycle model characteristics (e.g., plan-based, incremental, iterative, and agile), Individual software process (model, definition, measurement, analysis, and improvement), Team process (model, definition, organization, measurement, analysis, and improvement), Process tailoring, Effect of external factors (e.g., contract and legal requirements, standards, and acquisition practices) on software process **[7L]**

**Project planning and tracking:** Requirements management (e.g., product backlog, priorities, dependencies, and changes), Effort estimation (e.g., use of historical data and consensusbased

estimation techniques), Work breakdown and task scheduling, Resource allocation, Project tracking metrics and techniques (e.g., earned value, velocity, burndown charts, defect tracking, and management of technical debt) , Team self-management (e.g., progress tracking, dynamic workload allocation, and response to emergent issues) [6L]

## **Part-B**

**Software configuration management:** Revision control, Release management, Configuration management tools, Build processes and tools. [4L]

**Software Quality:** Definitions of quality, Society's concern for quality, The costs and impacts of bad quality, A cost of quality model, Quality attributes for software (e.g., dependability, usability, and safety), Roles of people, processes, methods, tools, and technology [6L]

**Process Assurance and Product Assurance:** Nature of process assurance, Quality planning, Process assurance techniques, nature of product assurance, Distinctions between assurance and Verification & Validation, Quality product models, Root cause analysis and defect prevention, Quality product metrics and measurement, Assessment of product quality attributes (e.g., usability, reliability, and availability) [6L]

### **Text Books**

1. Ralf Kneuper, "Software Processes and Life Cycle Models", Springer, 2018.
2. Murali Chemuturi, Mastering Software Quality Assurance – Best Practices, Tools and Techniques for Software Developers", J. Ross Publishing, 2011.
3. Daniel Galin, "Software Quality Assurance – from theory to implementation", Pearson Education, 2009.
4. Roger S Pressman, "Software Engineering: A practitioner's approach", 7th Edition, McGraw Hill Education, 2010.

### **Reference Books**

1. Ivan Mistrik, Richard M Soley, Nour Ali, "Software Quality Assurance – in Large Scale and Complex Software Intensive Systems", Morgan Kaufmann, 2015
2. Yingxu Wang, Graham King, "Software Engineering Processes - Principles and Applications", CRC Press, 2000.
3. Ian Sommerville, "Software Engineering", 10th Edition, Pearson India, 2018.
4. Grady Booch, "Object-Oriented Analysis and Design with Applications", Pearson India, 3rd Edition, 2015.

**Subject Code: LPEIT-118**  
**Subject Name:** Software Process and Quality Assurance Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
<b>1.</b>	Design of software process.
<b>2.</b>	Implement a software process in a typical environment.
<b>3.</b>	Plan a project and track its progress.
<b>4.</b>	Effectively manage changes during the software lifecycle including deviations and waivers in software configuration control.
<b>5.</b>	Verify and validate a software module when the requirement specifications are given.
<b>6.</b>	Perform software audit and improve the quality of code.

**Prerequisites:** Software Engineering

<b>Sr. No.</b>	<b>Name of Practical</b>	<b>No. of Hours</b>
<b>1</b>	Design software process for any case study.	1
<b>2</b>	Implement the software process in an environment (e. g. agile, iterative, plan-based).	1
<b>3</b>	Plan a project involving work breakdown structures, task scheduling.	2
<b>4</b>	Track the progress of the project by using burndown charts.	2
<b>5</b>	Apply software configuration control to manage change and revisions.	2
<b>6</b>	Write a software module and conduct static verification.	2
<b>7</b>	Write a program involving loops and perform white box testing of the program (i.e. dynamic verification).	2
<b>8</b>	Write a software module and perform unit testing (i.e. dynamic verification).	2
<b>9</b>	Write two small software modules. Integrate these modules and test the defects in the interaction between these software modules when they are integrated (i.e. dynamic verification).	2
<b>10</b>	Design a software module as per the requirement specifications and validate it.	2
<b>11</b>	Perform Software Audit including checklist and templates for the software	2

	developed and improve the Code Quality.	
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**Subject Code: PEIT-119**  
**Subject Name: Cyber Security**

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the concept of Cyber Security
<b>2.</b>	Implement appropriate security technologies and policies to protect computers and digital information.
<b>3.</b>	Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
<b>4.</b>	Determine computer networks and examine secure software practices.
<b>5.</b>	Classify the principles of web security.
<b>6.</b>	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

**Prerequisites:** Basic knowledge of Computer Networks

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**PART-A**

**Cyber Security Concepts:** History of cyber space, Cyber Crime, Information Security, Computer Ethics and Security for users, Familiarization with secure web browser and guidelines to choose, Role of Antivirus, Guidelines for Secure password, Two-steps authentication, Introduction to Password Manager, Wi-Fi Security. **[9L]**

**Cyber Security Vulnerabilities& Safe Guards:** Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security. **[9L]**

**PART-B**

**Security in Evolving Technology:** Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. **[9L]**

**Social Engineering:** Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber

Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall, Cyber Security Regulations[9L]

**Text Books:**

1. William Easttom II (2016) Computer Security Fundamentals, 4th edition, Pearson.
2. Sunit Belapure and Nina Godbole (2011) Cyber Security, 1st edition, Wiley.
3. Christopher Hadnagy (2018) Social Engineering: The Science of Human Hacking, 2nd edition, John Wiley & Sons.
4. Thomas A. Johnson (2015) Cyber Security, 1st edition, CRC Press.

**Reference Books:**

1. Nina Godbole (2017) Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2nd edition.
2. Jon Erickson (2008) The art of Exploitation, Starch Press, 2nd edition.

**E-Books and online learning material:**

1. Cyber Attacks and Counter Measures: <http://uou.ac.in/progdetail?pid=CEGCS-17> Meilir Page-Jones: Fundamentals.
2. Introduction to Cyber Security available at <http://uou.ac.in/foundation-course>.
3. Cyber Security Techniques <http://uou.ac.in/progdetail?pid=CEGCS-17>.
4. <https://www.cybersecurity.ox.ac.uk/resources/videos>

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/106/106106129/> Accessed on June 11, 2021
2. <https://www.utep.edu/information-resources/iso/security-awareness/videos/security-awareness-videos.html> Accessed on June 11, 2021
3. [https://www.utep.edu/technologysupport/ServiceCatalog/SEC\\_EmailEncryption.html](https://www.utep.edu/technologysupport/ServiceCatalog/SEC_EmailEncryption.html) Accessed on June 11, 2021
4. <https://nptel.ac.in/courses/106/105/106105031/> Accessed on June 11, 2021

**Subject Code:** LPEIT-119  
**Subject Name:** Cyber Security Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the different components of Cyber Security
<b>2.</b>	Analyze the different threats in windows and web security
<b>3.</b>	Identify the use of appropriate tool for the security threat
<b>4.</b>	Implement the security measures in a PC using different tools
<b>5.</b>	Identify the web vulnerabilities.
<b>6.</b>	Evaluate the severity of security threat and generate report

**Perquisites:** Basic knowledge of Computer Networks

**Detailed Contents:**

1. Study of different wireless network components and features of any one of the Mobile Security Apps.
2. Implementation of Windows security using firewall and other tools
3. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
4. Implementation to gather information from any PC's connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc.
5. Implementation of MITM- attack using wireshark/ network sniffers
6. Implementation to identify web vulnerabilities, using OWASP project
7. Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report.
8. Implementation of OS hardening and RAM dump analysis to collect the Artifacts and otherinformation.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-120  
**Subject Name:** Software Defined Networking

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand Software Defined Networking
<b>2.</b>	Analyze the evolution of Software Defined Networks
<b>3.</b>	Identify the various components of SDN and their uses
<b>4.</b>	Provide the SDN Solutions for Data Center Network
<b>5.</b>	Explain the use of SDN in the current networking scenario
<b>6.</b>	Design and develop various applications of SDN

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Introduction:** History of Software Defined Networking (SDN) , Modern Data Center , Traditional Switch Architecture, Need of SDN, SDN implications for Research and Innovation, Evolution of SDN, Network Virtualization, How SDN Works, SDN Devices, SDN Applications.**[9L]**

**Open Flow & SDN Controllers:** Open Flow Specification, Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening up the Device, Networks Functions Virtualization, SDN Controllers, General Concepts. **[9L]**

**Part-B**

**Data Center:** Multitenant and Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network, VLANs – EVPN – VxLAN – NVGRE**[9L]**

**Sdn Programming:** Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications **[9L]**

**Text Books:**

1. Paul Goransson and Chuck Black (2016) *Software Defined Networks: A Comprehensive Approach*, Second Edition, Morgan Kaufmann.
2. Thomas D. Nadeau, Ken Gray (2013) SDN: Software Defined Networks, O'Reilly Media.
3. SiamakAzodolmolky (2013) Software Defined Networking with OpenFlow, Packt Publishing, 2013

**Reference Books:**

1. Siamak Azodolmolky (2013) *Software Defined Networking with Open Flow*, Packet Publishing.
2. Vivek Tiwari (2013) *SDN and Open Flow for Beginners*, Amazon Digital Services, Inc.
3. Fei Hu (2014) *Network Innovation through Open Flow and SDN: Principles and Design*, CRC Press.

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**Online Courses and Video Lectures:**

1. Udemy: Software Defined Networking (SDN) Made Simple by Vipin Gupta  
<https://www.udemy.com/course/sdn-made-simple/>
2. Coursera: Software Defined Networking by Dr. Nick Feamster,  
<https://www.coursera.org/learn/sdn?aid=true>

**Subject Code:** LPEIT-120

**Subject Name:** Software Defined Networking Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand and install Mininet
2.	Configure Mininet for different solutions
3.	Create SDN applications without using controller
4.	Customize Mininet Topologies
5.	Create different applications with Mininet
6.	Develop SDN projects

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

1. Overview of Mininet
2. Setting up the Environment and Implementation of Controllers in Mininet
3. Creating Hub Application without using controller
4. Creating Switch Application without using controller
5. Creating firewall application without using controller
6. Mininet Custom Topologies in POX, ODL, Floodlight
7. Using Wireshark with Mininet and OpenFlow.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-123  
**Subject Name:** Business Enterprise Application

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the basics of enterprise applications
2.	Acquire knowledge of enterprise architecture
3.	Analyze the process of inception of enterprise architecture.
4.	Develop and understanding ways of constructing enterprise applications
5.	Acquire the basic knowledge of testing and rolling out enterprise applications.
6.	Knowledge of advanced topics for developing enterprise applications.

**Prerequisites:** Software Engineering

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Introduction to enterprise applications:** Introduction to enterprise applications and their types, integration with legacy systems, life cycle of raising an enterprise application, integration with partners, heterogeneous environment, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications, ETL, direct data integration, middleware requirements [7L]

**Inception of enterprise applications:** Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation [4L]

**Concept of architecture:** Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design [7L]

**Construction readiness of enterprise applications:** Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage [6L]

**Types and methods of testing an enterprise application:** Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application. [6L]

**Advanced Topics:** Integration Patterns, Service oriented integration-Web services, Service Choreography and Orchestration, BPMN, BPEL, Messaging based integration- Synchronous and

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Asynchronous Messaging, message structure, JAVA messaging services, Enterprise service bus routing, scalable connectivity and protocol, Global and Brokered ESBs, Support to SOA[**8L**]

**Text Books:**

1. Anubhav Pradhan, Satheesha B. Nanjappa et. al., "Raising Enterprise Applications", Wiley India, 2016.
2. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service - oriented Frameworks", Business Science Reference, 2015.

**Reference Books:**

1. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2015.
2. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison - Wesley, 2015.
3. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2016.

**Subject Code:** PEIT-124

**Subject Name:** ICT in Agriculture and Rural Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1.	Identify the use of Information Communication and Technology in rural development.
2.	Have an understanding of modern agricultural practices and the scope of ICT in agriculture.
3.	Apply the services of Mobile Devices in Agriculture and Rural Development.
4.	Know how to increase productivity and deal with marketing practices for Agri-Business through ICT.
5.	Utilize and provide knowledge on various ICT Based rural development programs run by different units.
6.	Identify the impact of ICT on rural development through sustainable agricultural practices.

**Prerequisites:** Fundamentals of Information Technology

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part-A**

**Introduction:** Introduction to ICT, ICT in Agricultural and Rural Development. [2L]

**ICT Infrastructure, Appliances and Services :** Limitations in the use of ICTs in Agriculture, Making ICTs Affordable in Rural Areas, Mobile Money Moves to Rural Areas, M-PESA's : Pioneering Money Transfer Service, Delivering Content for Mobile Agricultural Services. [5L]

**Impact of Mobile Devices on Agriculture and Rural Development:** Key Benefits and Challenges Related to Mobile Phones and Agricultural Livelihoods, General Principles for Using Mobile Phones in Agricultural Projects. [5L]

**Increasing Productivity through ICT:** Increasing Crop, Livestock, and Fishery Productivity Through ICT, Achieving Good Farming Practices through Improved Soil, Nutrient, and Land Management, Preventing Yield Losses through Proper Planning and Early Warning Systems, IT Tools having applications in Dairy Industry. [6L]

**Part-B**

**Agricultural Marketing with ICT:** Mobile Phones as a Marketing Tool, Improving Logistics and Access to Inputs, Smallholder Inclusion in Commercial Supply Chains. [6L]

**E-Agriculture and rural development:** Importance of Rural Development, Evolution of E-agriculture, Benefits And Challenges in E Agriculture , ICT Based E-Agriculture Programs in India, Smart Mobile Application and E-Agriculture. [6L]

**Case Studies:** Impact of digital revolution on rural society in India, Agricultural knowledge dissemination system, Community radio for development of rural India, Mobile communication and development of rural India, Harnessing ICTs for Indian Agricultural and rural development, Agricultural development through Information Communication Technology (ICT) in India. [6L]

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**Text Books:**

1. VK Dubey and Farida Ahmad, “ICT: A 21st Century Agrarian Revolution for Rural Development” Agrotech Publishing Academy, 2014
2. “ICT in agriculture: connecting smallholders to knowledge, networks, and institutions” Updated edition, World Bank Publications, 2017.
3. Tomas Mildorf, Karel Charvat jr, “ICT FOR Agriculture, Rural Development, and Environment”, Czech centre for science and society, 2012.

**Reference Books:**

1. R. Saravanan, C. Kathiresan and T. Indra Devi, “Information and Communication Technology for Agriculture and Rural Development”, 1st Edition, New India Publishing Agency, 2011

**E-Books and Online Learning Material:**

1. ICT in agriculture: connecting smallholders to knowledge, networks, and institutions by World Bank Publications  
<https://openknowledge.worldbank.org/handle/10986/27526>(Accessed on June 01, 2021)
2. ICT FOR Agriculture, Rural Development, and Environment by Tomas Mildorf, Karel Charvat jr  
<https://www.researchgate.net/publication/233920880> ICT FOR AGRICULTURE RURAL DEVELOPMENT AND ENVIRONMENT - Where we are Where we will go(Accessed on June 01, 2021)

**Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/126/104/126104006/>(Accessed on June 01, 2021)“ICT for Agriculture Development” <https://www.youtube.com/watch?v=eRx5eWz1a8o>(Accessed on June 01, 2021)
2. “Role of ICT in Dissemination of Agricultural Information among Farmers”  
<https://www.youtube.com/watch?v=ePfMZvQvInM>(Accessed on June 01, 2021)
3. “Panel Discussion on ICT Tools for the Resilient Agriculture Education in India”  
<https://icar.org.in/content/webinar-%E2%80%9Cpanel-discussion-ict-tools-resilient-agriculture-education-india%E2%80%9D-organized>(Accessed on June 01, 2021)

**Subject Code:** PEIT-125  
**Subject Name:** Research Methodologies

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
<b>1.</b>	To develop understanding of the fundamental theoretical ideas and logic of research.
<b>2.</b>	To identify appropriate research topics and define appropriate research problem and parameters
<b>3.</b>	To develop understanding of the issues involved in planning, designing, executing, evaluating and reporting research;
<b>4.</b>	To introduce students to many of the technical aspects of how to do empirical research using some of the main data collection and analysis techniques
<b>5</b>	To write a research report and thesis
<b>6</b>	To write a research proposal (grants)

**Prerequisites:** Probability

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Concept of Research:** Research: Definition, meaning, need, process and types of research (Qualitative and Quantitative). Research design: Definition, types, Principles, identification and formulation of problem, components and criteria.[4L]

**Research Methods, Techniques and Tools:** Research Methods: Scientific, Historical, Descriptive, Survey & Case Study and Experimental Method: their application in Library & Information Science.[6L]

**Research Techniques and Tools:** Questionnaire, Schedule, Interview, Observation, library records and reports. Scales and Check Lists, Library records and reports.[5L]

**Part-B**

**Data Analysis and Interpretation:** Role of Statistical Methods in Research; Descriptive Statistical –Measurement of Central Tendency; Correlation, Regression. Statistical Techniques: Measures of Mean, Mode, Median. Measures of Dispersion: Mean deviation. Standard deviation. Presentation of Data: Tabular, graphic, bar diagram, pipeline graphics; Testing of Hypothesis and Statistical Inference; Computerized Statistical Packages: Use of SPSS[6L]

**Nominal and operational definition:** Designing research proposal; Literature search: Print and Non-print and Electronic Sources. [6L]

**Research Reporting:** Guidelines of Research Reporting, Style Manuals –MLA, APA, E-Citation and methods of Research Evaluation. Research Reporting, Technique and Precaution of Interpretation, Significance of Report Writing, Layout and Types of Report.[8L]

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**Text Books:**

1. C R Kotari, Research Methodology, Vishwa Prakashan.
2. Cooper and Schinder, Business Research Methods, TMH.
3. David Luck and Ronald Rubin, Marketing Research, PHI.
4. Naresh Amphora, Marketing Research, Pearson Education.
5. S. N. Murthy and U. Bhojanna, Business Research Methods, 3rd Edition, Excel Book

**Reference Books:**

1. Abrams, M.A., Social Surveys and Social Action, London: Heinemann, 1951.
2. Arthur, Maurice, Philosophy of Scientific Investigation, Baltimore: John Hopkins University Press, 1943.
3. Bernal, J.D., The Social Function of Science, London: George Routledge and Sons, 1939.  
Chase, Stuart, The Proper Study of Mankind: An inquiry into the Science of Human Relations, New York, Harper and Row Publishers, 1958. S. N. Murthy and U. Bhojanna, Business Research Methods, Excel Books

**Subject Code:** PEIT-126  
**Subject Name:** Enterprise Resource Planning

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Make basic use of Enterprise software, and its role in integrating business functions
<b>2.</b>	To understand and examine the functional modules of ERP
<b>3.</b>	Illustrate various technologies related to ERP
<b>4.</b>	Analyze the strategic options for ERP identification and adoption.
<b>5.</b>	Design the ERP implementation strategies.
<b>6.</b>	Create re-engineered business processes for successful ERP implementation.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**ERP- Introduction:** An Overview, A Brief History of ERP, Advantages of ERP, Business Functions and Business Processes, Roadmap for Successful ERP Implementation, Basic ERP Concepts, ERP Architectures; Risks of ERP: ERP implementation Failures, Minimising Risk, People, Process and Technology Risks; Implementation Issues, Operation and Maintenance Issues, Managing Risk on ERP Projects; Benefits of ERP. **[12L]**

**ERP and Related Technologies:** Business Intelligence & Analytics, E-Commerce, M-commerce, Data Warehousing, Data Mining, Online Analytical Processing, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Geographical Information Systems, Intranets and Extranets , ERP Security.**[8L]**

**Part-B**

**ERP Functional Modules:** Financial Module, Manufacturing (Production) Module, Human Resources Management Module, Plant Maintenance Module, Materials Management Module, Quality Management Module, Marketing Module, Sales, Distribution and Service Module; ERP Development Models **[7L]**

**ERP Implementation:** Technological, Operational and Business Reasons for Implementing, ERP Implementation Life Cycle and its Phases, ERP Package Selection, Implementation Challenges, ERP Implementation Process: Methodologies, Organisation of the ERP Project Team, Strategy, Plan, Risk Assessment, Budget, cost, Performance Measurement, System Issues; ERP Training and Education, Success and failure factors of an ERP Implementation, ERP Operation and Maintenance.**[13L]**

**Text Books:**

1. Enterprise Resource Planning, Third or Fourth Edition, Alexis Leon, McGraw Hill , 2019.

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**Reference Books:**

1. Daniel E.O'Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.
2. ERP in practice – Vaman – TMH, 2008
3. Ellen Monk, Bret Wagner, Concepts in Enterprise resource planning, Cengage learning, Third edition, 2009

**Subject Code:** PEIT-127  
**Subject Name:** Engineering Entrepreneurship

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I)	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Inculcate various entrepreneurship skills to students.
<b>2.</b>	Impart knowledge about industry structure and how to start up a company
<b>3.</b>	Analyze how to generate and exploit new opportunities
<b>4.</b>	Locate domestic and international opportunities
<b>5.</b>	Understand various sources of capital for business.
<b>6.</b>	Identify and understand and differentiate various legal issues for the entrepreneur such as patents, law suits, copy rights etc.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Entrepreneurship and the Entrepreneurial Mind-Set:** The nature of entrepreneurship, entrepreneur's thinking, the intention to act entrepreneurially, Entrepreneur background and characteristics, Role models and support systems, sustainable entrepreneurship, corporate Entrepreneurship, establishing corporate entrepreneurship in organization [3L]

**Generating And Exploiting New Entry Opportunities And Business Ideas:** new entry, generation of new entry of opportunity, risk reduction strategies for new entry exploitation. ideas from trend analysis, trends, sources of new ideas, methods of generating ideas, creative problem solving, creativity and entrepreneurship, innovation, entrepreneurial innovation, opportunity recognition, product planning and development process, e-commerce and business startup.[5L]

**Identifying and Analyzing Domestic and International Opportunities:** Opportunity recognition and the opportunity assessment plan, information sources, sources of information for start-up entrepreneurs in India, technical consultancy organizations, government policies for small scale enterprises, Nature of international entrepreneurship, the importance of international business to the firm, international versus domestic entrepreneurship. [5L]

**Protecting the Idea and Other Legal Issues for the Entrepreneur:** Intellectual property, need for a lawyer, selection of a lawyer, legal issues in setting up the organization, patents, business methods patents, startup without a patent, trademarks, copyrights, trade secrets and noncompetition agreements, licensing, product safety and liability, insurance, Sarbanes-Oxley act, Contracts. [4L]

**The Business Plan:** Planning as part of the business operation, writing the business plan, scope and values of the business plan, evaluation of the plan, presenting the plan, information needs, financial information needs, using the internet as a resource tool, using and implementing the business plan, reasons of business plan failure. [2L]

**The Marketing Plan:** Industry Analysis, Marketing research for the new venture, difference between a business plan and a marketing plan. Preparing the marketing plan, characteristics of a marketing plan, the marketing mix, steps in preparing the marketing plan. [2L]

### PART - B

**The Organizational Plan:** Developing the management team, legal forms of business, tax attributes of forms of business, the limited liability company versus the S-corporation, designing the organization, building the management team and a successful organization culture, the role of a board of directors, the board of advisors. [3L]

**The Financial Plan:** Operating and capital budgets, forecasting sales, pro forma income statements, pro forma cash flow statement, pro forma balance sheet, break-even analysis, pro forma sources and applications of funds statement, software packages. [3L]

**Sources of Capital:** An overview, personal funds, family and friends, commercial banks, role of Government Agencies in small-business financing, research and development limited partnerships, Government grants, Private placement, bootstrap financing, financing the business, informal risk-capital market, venture capital, valuing your company, going public. [4L]

**Management of Enterprises:** Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds. [4L]

**Case Studies:** Case studies related to successful entrepreneurs [5L]

#### Text Books:

1. Robert D. Hsirich, Mathew J. Manimala, Michael P. Peters and Dean A. Shepherd, "Entrepreneurship", 9/e, McGraw Hill Education, 2014.
2. Thomas H. Byers, Richard C. Dorf, Andrew J. Melson, "Technology Ventures: From idea to Enterprise", 4/e McGraw Hill, 2014.
3. Saini, J. S., 'Entrepreneurial Development Programmes and Practices', Deep & Deep Publications (P), Ltd, 2008.

#### Reference Books:

1. Kenji Uchino, "Entrepreneurship for Engineers", CRC Press, 2009.
2. Vasant Desai, "Entrepreneurship Development", PHI, 2011.
3. Anjan Rai Chaudhri, "Managing New Ventures: Concepts and Cases On Entrepreneurship", PHI, 2010.

**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**CHOICE-II  
7<sup>TH</sup> SEMESTER**

**Subject Name:** Comprehensive Laboratory  
**Subject Code:** PRIT-106

<b>Programme:</b> B.Tech.(IT)	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 <sup>th</sup>	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 20	<b>Percentage of Numerical/Design/Programming Problems:</b> 100
<b>External Marks:</b> 30	<b>Duration of End Semester Exam(ESE):</b>
<b>Total Marks:</b> 50	<b>Course Status:</b> Seminar/Project

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Students are to be made confident in fundamental aspects of any engineering problem/situation
2.	To assess the comprehensive knowledge gained in basic courses relevant to Information Technology.
3.	To explore the application avenues for the core engineering concepts of IT
4.	To comprehend the questions asked and answer them with confidence.
5	To provide a holistic view about core and advanced computing principles
6	To re-iterate and explore the basic concepts of core Information Technology

**Prerequisites:** Advanced programming skills, Networking skills, database management skills

### **Contents:**

1. Assessment of Data structures and programming methodology
2. Assessment of tools for software engineering.
3. Assessment of basic organization and Architecture of computer system
4. Assessment of Data base design and models
5. Assessment of various functions and process involved in operating system
6. Mastering the concepts, protocols involved in computer networks.

**Subject Code:** PEIT-115

**Subject Name:** Cloud Infrastructure and Services

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**Prerequisites:** Basics of Networking, Operating System, Virtualization

**Additional Material Allowed in ESE:** NIL

**Course Outcomes:**

After completing this course students will be able

1. To assess existing hosting platforms and computing paradigms currently being used in industry and academia.
2. To comprehend need of data centre, its virtualization techniques and types of clouds.
3. To demonstrate the implementation of cloud by using commercial and open source cloud platforms and its virtualization.
4. To implement cloud-based data storage by considering issues of task partitioning, data partitioning, data synchronization, distributed file system, data replication etc.
5. To teach the distributed computing fundamentals in the context of cloud infrastructure
6. To provide an insight into managing and scheduling of various cloud resources

**Detailed Contents:**

**Part-A**

**Defining Cloud Computing:** Utility Computing, Cloud Types, Examining the characteristics of Cloud Computing, Cloud Computing vs. Cluster computing vs. Grid computing, Assessing the roles of Open Standards

[6]

**Virtualization:** Using virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors, Machine Imaging, Porting applications [5]

**Capacity Planning:** Defining Baseline and Metrics, Network Capacity, Scaling [3]

**Overview of OpenStack:** Architecture of OpenStack, project, services, mode of deployment, workflow. [4]

**Cloud Storage:** Object storage and Block storage [2]

**Part-B**

**Cloud Network:** Software-defined networking with OpenStack, Architecture, Protocols, Network functions virtualization (NFV) [4]

**Cloud Management:** Monitoring, Management, Maintenance, Troubleshooting, Backup, Recovery, Service Level Agreement [4]

**Cloud Security:** Cloud Security: Role of Security, Types of Attack, Network Security, Survey on Potential Cloud Barriers in adopting Cloud Computing, New Threats related to

Cloud Computing, Security Stack, Gartner's Seven Cloud Computing Security Risks. Other Cloud Security Issues: Virtualization, Access Control & Identity Management, Application Security, Data Life Cycle Management. OpenStack security - Role-Based Access Control (RBAC), Identity service, Application security, data security.  
[6]

**Containers and Edge Computing:** Introduction to Edge computing, Containers and Edge Computing with OpenStack

[2]

Textbooks:

1. Barrie Sosinsky (2013), Cloud Computing Bible, Wiley India Pvt. Ltd.
2. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski (2011), Cloud Computing: Principles and paradigms, Wiley India Pvt. Ltd.
3. Anthony Velte, Toby Velte, Robert Elsenpeter (2009), Cloud Computing: A practical Approach, Tata McGrawHill

Reference Books:

1. Michael Miller (2008), Cloud Computing, Que Publishing
2. Anthony Velte, Toby Velte and Robert Elsenpeter (2014), Cloud Computing: A practical Approach by Tata McGrawHill
3. Judith Hurwitz, Robin Billor, Marcia Kaufman, Fern Halper (2009), Cloud Computing for dummies.

Online Courses and Video Lectures

1. Cloud computing By Prof. Soumya Kanti Ghosh | IIT Kharagpur  
Available at: [https://swayam.gov.in/nd1\\_noc20\\_cs20/preview](https://swayam.gov.in/nd1_noc20_cs20/preview)

2. Google Cloud Computing Foundations Course  
By Prof. Soumya Kanti Ghosh, Multifaculty | IIT Kharagpur, Google Cloud  
Available at : [https://swayam.gov.in/nd1\\_noc20\\_cs55/preview](https://swayam.gov.in/nd1_noc20_cs55/preview)

**Subject Code: LPEIT-115**  
**Subject Name: Cloud Infrastructure and Services Laboratory**

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 8 (Choice- I )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

Pre-requisites: Basic programming skills and computer fundamentals

**Course Outcomes:**

After studying this course, the student will be able to

1. Apply knowledge of software tools and techniques with hands-on experience for Cloud related applications.
2. Design solutions for the understanding of the virtual machines, networks and managing users in Cloud Infrastructure.
3. To conduct investigation and develop programming skills in Cloud Computing related applications.
4. Use the modern engineering tools/platforms such as Open stack, Hadoop for solving problems related to  
Cloud Computing
5. Function on multi-disciplinary teams through mini projects for exploring applications of Cloud Computing in different sectors.

**Detailed Contents**

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top of Linux/windows.
2. Introduction to OpenStack and its components.
3. Installation of OpenStack using RDO packstack.
4. Creating and launching a basic virtual machine
5. Creating and managing images and templates
6. Creating and managing networks
7. Creating and managing users
8. Managing security groups and policies
9. Connecting to virtual machine/server from local computer

By using various concepts of syllabus students required to prepare a project in a group of two to three students.

The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

Note: It is recommended that mini project allocation to students be done within two-three weeks of the start

of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's

relevant to the course contents (if required)

**Subject Code:** PEIT-116

**Subject Name:** Mobile Application Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understanding the basic mobile platforms and mobile development environments
<b>2.</b>	Make use of Android SDK to setup Android Development Environment
<b>3.</b>	Apply conceptual knowledge of User Interface Designing to design UI in Android SDK
<b>4.</b>	Develop Interactivity based Android Applications using Fragment, Intents and Event Processing
<b>5.</b>	Develop Database oriented Android Applications using Persistent Data Storage
<b>6.</b>	Improve the Android Application Performance using Android Services and Threads Analyze and Solve the bugs using Android Security and Debugging features

**Prerequisites:** Programming in Java.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

### **Detailed Contents:**

#### **Part-A**

**Introduction to Mobile Development:** Brief History of Mobile: Beginning and evolution, Mobile ecosystem: Operator, Network, Devices, Platforms, Operating System, Application Frameworks, Types of Mobile applications, Seven rules for developing mobile strategy. [4L]

**Android Development Environment:** Introduction to android, Advantage of Android over other development environment, Android execution environment, Components of android application, Android activity and service life-cycle, Android 7.0 nougat and comparison with older version, Assembling android 7 development workstation, Downloading and installing Android Studio2, Introduction to Android Studio IDE. [6L]

**Android User Interface Design:** XML Naming scheme, XML syntax, XML Referencing, XML constants, XML Styles, XML Colors, View Group Class, View Class, Activity Class, UI Design from scratch: Checkbox, Text View, Button element to interface, Error elimination using XML Editor, Working with Relative, Linear, Table and Grid Layouts, Understanding Activity Life Cycle. [7L]

#### **Part-B**

**Apps Interactivity in Android:** Android Fragment: Fragment Class, Fragment Life Cycle, Android Intent Class: Intent types, Intent Filters, Instantiating Intent Object, Android Context Class, Event Processing: Events, Event Listener, Event Handler. [5L]

**Persistent Data Storage:** SQLite: Android Built in SQLite content provider, Modifying data using your android application, Creating basic activity, Configuring manifest, Packaging and managing SQLite with android app. [4L]

**Android Services and Threads:** Android service class: Controlling services, Spawning process, Process Life Cycle, Thread Caveats, Background Processing Services. [5L]

**Android Security and Debugging:** Requesting permissions, Creating custom Permissions, Securing application for publication and execution, Tools for debugging, Eclipse Java Editor: Java errors, Debugger, Logcat, Android Debug Bridge (adb), DDMS: Dalvik Debug monitor service, Traceview.[4L]

**Text Books:**

1. Brian Fling, “Mobile Design and Development”, First Edition, O’Reilly, 2009.
2. Rick Rogers, John Lombardo, Zigurd Mednieks and Blake Meike, “Android Application Development”, First Edition, O’Reilly, 2009.
3. Wallace Jackson, “Android Apps for absolute beginners”, Apress, 4th Edition, 2017.

**Reference Books:**

1. Grant Allen, “Beginning Android Get Started building apps for android platform”, Apress, Fifth Edition 2014.
2. Raimon Raflos Montane, Laurence Dawson, “Learning Android Application Development”, Packt Publishers, 2014.
3. Jerome F. DiMarzio, “Beginning Android Programming with Android Studio”, 4th edition, Wrox Publishers, 2016.
4. Antonio Pachon Ruiz, “Mastering Android Application Development”, Packt Publishers, Edition 2015

**E-Books and online learning material:**

1. Android Studio Development Essentials by Neil Smyth  
<https://www.onlineprogrammingbooks.com/android-studio-development-essentials-javaedition/> Accessed on June. 20, 2020
2. [Android Tutorial by TutorialsPoint](https://www.tutorialspoint.com/android/android_tutorial.pdf)  
[https://www.tutorialspoint.com/android/android\\_tutorial.pdf](https://www.tutorialspoint.com/android/android_tutorial.pdf) Accessed on June. 20, 2020
3. Android Programming Cookbook by Chryssa  
<http://enos.itcollege.ee/~jpoial/allalaadimised/reading/Android-Programming-Cookbook.pdf> Accessed on June. 20, 2020

**Online Courses and Video Lectures:**

1. <https://developer.android.com/courses> Accessed on June. 20, 2020
2. <https://www.edx.org/learn/android-development> Accessed on June. 20, 2020

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|--|-------------------|
| 3. <a href="https://www.lynda.com/Android-training-tutorials/947-0.html">https://www.lynda.com/Android-training-tutorials/947-0.html</a><br>20, 2020         | Accessed on June. |
| 4. <a href="https://www.coursera.org/projects/build-app-android-studio-java">https://www.coursera.org/projects/build-app-android-studio-java</a><br>20, 2020 | Accessed on June. |
| 5. <a href="https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/">https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/</a><br>20, 2020                   | Accessed on June. |
| 6. <a href="https://nptel.ac.in/courses/106/106/106106147/">https://nptel.ac.in/courses/106/106/106106147/</a><br>20, 2020                                   | Accessed on June. |
| 7. <a href="https://web.stanford.edu/class/cs193a/lectures.shtml">https://web.stanford.edu/class/cs193a/lectures.shtml</a><br>20, 2020                       | Accessed on June. |

**Subject Code: LPEIT-116**  
**Subject Name: Mobile Application Development Laboratory**

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Demonstrate an understanding of design aspects of different mobile development environments
<b>2.</b>	Install, setup and make use of Android SDK 2 to study basic components involved in Android Mobile Application Development
<b>3.</b>	Study and Design using basic designing components, different type of layouts for a UI based on XML in Android Studio2
<b>4.</b>	Develop a basic module using Android development environment involving elements of interactivity
<b>5.</b>	Develop persistent database oriented application module using Android development environment
<b>6.</b>	Integrating the concept of multithreading, resource requests for application performance improvement
<b>7.</b>	Test and solve the bug related issues using tools like` Logcat, Android Debug bridge
<b>8.</b>	Function on diverse teams to identify, formulate and design static web project using XML oriented Designs, Persistent Data Storage and embedded with features like services, threads and debugging in multi-disciplinary environment

**Prerequisites:** Programming in Java, Web Technologies.

**Special Instruction related to resources requirement:** Software like Android Studio.

1. Android Development Environment: To study design aspects of development environment like Android, iOS.
2. Android Development Environment: To setup Android studio2 and study its basic components.
3. Android User Interface Design: To study various XML files needed for interface design.
4. Android User Interface Design: To implement different type of layouts like relative, grid, linear and table.
5. Apps Interactivity in Android: To incorporate element of interactivity using Android Fragment and Intent Class.
6. Persistent Data Storage: To perform database connectivity of android app using SQLite.
7. Android Services and Threads:To implement the concept of multithreading using Android Service class.
8. Android Security and Debugging: To implement concept of permission and perform request for permission to access different hardware components of mobile.

9. Android Security and Debugging: To perform debugging and testing of android app using tools like Logcat, Android debug bridge, DDMS.

Mini Project: - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Reference Books:**

1. Beginning Android Get Started building apps for android platform by Grant Allen, Apress, Fifth Edition 2014.
2. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by MarkWickham, Apress 2018.

**Subject Code:** PEIT-117  
**Subject Name:** Augmented Reality and Virtual Reality

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	To understand the basic concepts of Augmented and Virtual Reality.
<b>2.</b>	Assess and compare technologies in the context of AR and VR systems design.
<b>3.</b>	To apply Environment Modelling in Virtual Reality
<b>4.</b>	Develop interactive augmented reality applications for PC and Mobile based devices using a variety of input devices.
<b>5.</b>	To learn and implement application of VR in Digital Entertainment:
<b>6.</b>	Demonstrate the knowledge of the research literature in augmented reality for both compositing and interactive applications.

**Prerequisites:** Working knowledge of geometry, 3D space, and Linear algebra

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

#### **Part-A**

**Introduction of Virtual Reality:** Fundamental concept and components of Virtual Reality, primary features and present development on Virtual Reality. [4L]

**Multiple Modals of Input and Output Interface in Virtual Reality:** Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices [6L]

**Visual Computation in Virtual Reality:** Fundamentals of computer graphics, software and hardware technology on stereoscopic display, advanced techniques in CG: Management of large scale environments & real time rendering [6L]

**Environment Modeling in Virtual Reality:** Geometric Modeling, Behavior Simulation, Physically Based Simulation. [4L]

#### **Part-B**

**Interactive Techniques in Virtual Reality:** Body Track, Hand Gesture, 3D Menus, Object Grasp. Introduction of Augmented Reality (AR): System structure of Augmented Reality, key technology in AR. [6L]

**Development Tools and Frameworks in Virtual Reality:** Frameworks of software development tools in VR, X3D Standard, Vega, MultiGen, Virtools etc. [6L]

**Application of VR in Digital Entertainment:** VR technology in film & TV production, VR technology in physical exercises and games, demonstration of digital entertainment by VR [4L]

**Text Books:**

1. Doug A. B., Kruijff E., LaViola J. J. and Poupyrev I. , 3D User Interfaces: Theory and Practice , Addison-Wesley (2005,2011p) 2nd ed.
2. Parisi T., Learning Virtual Reality, O'Reilly (2016) 1st ed.
3. Schmalstieg D. and Hollerer T., AugmentedAnd Virtual Reality, Addison-Wesley (2016).

**Reference Books:**

1. Whyte J., Virtual Reality and the Built Environment, Architectural Press (2002).
2. Aukstakalnis S., Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Addison-Wesley (2016).

**Subject Code:** LPEIT-117

**Subject Name:** Augmented Reality and Virtual Reality Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
<b>2.</b>	Assess and compare open source tools in the context of AR and VR systems design.
<b>3.</b>	Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR
<b>4.</b>	Design of Google Cardboard for cost effective VR experience
<b>5.</b>	To learn and implement application of VR in Digital Entertainment:
<b>6.</b>	Demonstrate the knowledge of VR to the conduct of scientific research, training, and industrial design.

**Tools:** Unity 3D, Blender, and various Open source tools

#### **Detailed Contents:**

1. Introduction to various Open sources VR Tools
2. Introduction to Unity: Interface overview and navigation
3. Creating a new project, importing standard assets, adding a player character, Objects, lighting, scenes, prefabs, asset store in Unity
4. Scripting in Unity: Creating a New Script, (naming) Syntax, Functions, Variables, Key / Mouse Input, Unity Support
5. Object-Oriented Scripting in Unity , Public variables, the inspector
6. Working of Hololens, Google Glass
7. Intro to Maya:, Basic concepts of 3D modeling, Bevel, Cone, Extrude, Smooth, Booleans
8. Workings on apps related to AR and VR

Mini Project: How to design Google cardboard in laboratory for VR experience

**Subject Code:** PEIT-118  
**Subject Name:** Software Process and Quality Assurance

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
<b>1.</b>	Identify and explain contemporary software life cycle processes, activities, and work products.
<b>2.</b>	Plan tasks, plan task dependencies, estimate effort, and estimate other needed resources.
<b>3.</b>	Recognize and categorize risks, intellectual property, and legal issues of software projects.
<b>4.</b>	Effectively manage changes during the software life cycle including deviations and waivers in software configuration control.
<b>5.</b>	Apply various metrics and measurements to assess the product and the process quality.
<b>6.</b>	Apply standard quality assurance techniques to ensure that requirements are verifiable, traceable, measurable, testable, accurate, unambiguous, consistent, and complete.

**Prerequisites:** Software Engineering.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**Software Process:** Software engineering process infrastructure (e.g., personnel, tools, and training), Modeling and specification of software processes, Measurement and analysis of software processes, Software engineering process improvement (individual, team, and organization), Quality analysis and control (e.g., defect prevention, review processes, quality metrics, and root cause analysis of critical defects to improve processes and practices). [7L]

**Process Implementation:** Levels of process definition (e.g., organization, project, team, and individual) Life-cycle model characteristics (e.g., plan-based, incremental, iterative, and agile), Individual software process (model, definition, measurement, analysis, and improvement), Team process (model, definition, organization, measurement, analysis, and improvement), Process tailoring, Effect of external factors (e.g., contract and legal requirements, standards, and acquisition practices) on software process [7L]

**Project planning and tracking:** Requirements management (e.g., product backlog, priorities, dependencies, and changes), Effort estimation (e.g., use of historical data and consensusbased estimation techniques), Work breakdown and task scheduling, Resource allocation, Project tracking metrics and techniques (e.g., earned value,velocity, burndown charts, defect tracking, and management of technical debt) , Team self-management (e.g., progress tracking, dynamic workload allocation, and response to emergent issues) [6L]

### **Part-B**

**Software configuration management:** Revision control, Release management, Configuration management tools, Build processes and tools. [4L]

**Software Quality:** Definitions of quality, Society's concern for quality, The costs and impacts of bad quality, A cost of quality model, Quality attributes for software (e.g., dependability, usability, and safety), Roles of people, processes, methods, tools, and technology [6L]

**Process Assurance and Product Assurance:** Nature of process assurance, Quality planning, Process assurance techniques, nature of product assurance, Distinctions between assurance and Verification &Validation, Quality product models, Root cause analysis and defect prevention, Quality product metrics and measurement, Assessment of product quality attributes (e.g., usability, reliability, and availability) [6L]

#### **Text Books**

1. Ralf Kneuper, "Software Processes and Life Cycle Models", Springer, 2018.
2. Murali Chemuturi, Mastering Software Quality Assurance – Best Practices, Tools and Techniques for Software Developers", J. Ross Publishing, 2011.
3. Daniel Galin, "Software Quality Assurance – from theory to implementation", Pearson Education, 2009.
4. Roger S Pressman, "Software Engineering: A practitioner's approach", 7th Edition, McGraw Hill Education, 2010.

#### **Reference Books**

1. Ivan Mistrik, Richard M Soley, Nour Ali, "Software Quality Assurance – in Large Scale and Complex Software Intensive Systems", Morgan Kaufmann, 2015

2. Yingxu Wang, Graham King, “Software Engineering Processes - Principles and Applications”, CRC Press, 2000.
3. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson India, 2018.
4. Grady Booch, “Object-Oriented Analysis and Design with Applications”, Pearson India, 3rd Edition, 2015.

**Subject Code: LPEIT-118**  
**Subject Name: Software Process and Quality Assurance Laboratory**

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
<b>1.</b>	Design of software process.
<b>2.</b>	Implement a software process in a typical environment.
<b>3.</b>	Plan a project and track its progress.
<b>4.</b>	Effectively manage changes during the software lifecycle including deviations and waivers in software configuration control.
<b>5.</b>	Verify and validate a software module when the requirement specifications are given.
<b>6.</b>	Perform software audit and improve the quality of code.

**Prerequisites:** Software Engineering

<b>Sr. No.</b>	<b>Name of Practical</b>	<b>No. of Hours</b>
<b>1</b>	Design software process for any case study.	1
<b>2</b>	Implement the software process in an environment (e. g. agile, iterative, plan-based).	1
<b>3</b>	Plan a project involving work breakdown structures, task scheduling.	2
<b>4</b>	Track the progress of the project by using burndown charts.	2
<b>5</b>	Apply software configuration control to manage change and revisions.	2
<b>6</b>	Write a software module and conduct static verification.	2
<b>7</b>	Write a program involving loops and perform white box testing of the program (i.e. dynamic verification).	2
<b>8</b>	Write a software module and perform unit testing (i.e. dynamic verification).	2
<b>9</b>	Write two small software modules. Integrate these modules and test the defects in the interaction between these software modules when they are integrated (i.e. dynamic verification).	2
<b>10</b>	Design a software module as per the requirement specifications and validate it.	2
<b>11</b>	Perform Software Audit including checklist and templates for the software developed and improve the Code Quality.	2

**Subject Code:** PEIT-119  
**Subject Name:** Cyber Security

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the concept of Cyber Security
<b>2.</b>	Implement appropriate security technologies and policies to protect computers and digital information.
<b>3.</b>	Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
<b>4.</b>	Determine computer networks and examine secure software practices.
<b>5.</b>	Classify the principles of web security.
<b>6.</b>	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

**Prerequisites:** Basic knowledge of Computer Networks

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**PART-A**

**Cyber Security Concepts:** History of cyber space, Cyber Crime, Information Security, Computer

Ethics and Security for users, Familiarization with secure web browser and guidelines to choose, Role

of Antivirus, Guidelines for Secure password, Two-steps authentication, Introduction to Password

Manager, Wi-Fi Security. **[9L]**

**Cyber Security Vulnerabilities& Safe Guards:** Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security. **[9L]**

**PART-B**

**Security in Evolving Technology:** Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like

SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. [9L]

**Social Engineering:** Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall, Cyber Security Regulations[9L]

**Text Books:**

1. William Easttom II (2016) Computer Security Fundamentals, 4th edition, Pearson.
2. Sunit Belapure and Nina Godbole (2011) Cyber Security, 1st edition, Wiley.
3. Christopher Hadnagy (2018) Social Engineering: The Science of Human Hacking, 2nd edition, John Wiley & Sons.
4. Thomas A. Johnson (2015) Cyber Security, 1st edition, CRC Press.

**Reference Books:**

1. Nina Godbole (2017) Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2nd edition.
2. Jon Erickson (2008) The art of Exploitation, Starch Press, 2nd edition.

**E-Books and online learning material:**

1. Cyber Attacks and Counter Measures: <http://uou.ac.in/progdetail?pid=CEGCS-17> Meilir Page-Jones: Fundamentals.
2. Introduction to Cyber Security available at <http://uou.ac.in/foundation-course>.
3. Cyber Security Techniques <http://uou.ac.in/progdetail?pid=CEGCS-17>.
4. <https://www.cybersecurity.ox.ac.uk/resources/videos>

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/106/106106129/> Accessed on June 11, 2021
2. <https://www.utep.edu/information-resources/iso/security-awareness/videos/security-awareness-videos.html> Accessed on June 11, 2021
3. [https://www.utep.edu/technologysupport/ServiceCatalog/SEC\\_EmailEncryption.html](https://www.utep.edu/technologysupport/ServiceCatalog/SEC_EmailEncryption.html) Accessed on June 11, 2021
4. <https://nptel.ac.in/courses/106/105/106105031/> Accessed on June 11, 2021

**Subject Code:** LPEIT-119  
**Subject Name:** Cyber Security Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the different components of Cyber Security
<b>2.</b>	Analyze the different threats in windows and web security
<b>3.</b>	Identify the use of appropriate tool for the security threat
<b>4.</b>	Implement the security measures in a PC using different tools
<b>5.</b>	Identify the web vulnerabilities.
<b>6.</b>	Evaluate the severity of security threat and generate report

**Perquisites:** Basic knowledge of Computer Networks

**Detailed Contents:**

1. Study of different wireless network components and features of any one of the Mobile Security Apps.
2. Implementation of Windows security using firewall and other tools
3. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
4. Implementation to gather information from any PC's connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc.
5. Implementation of MITM- attack using wireshark/ network sniffers
6. Implementation to identify web vulnerabilities, using OWASP project
7. Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report.
8. Implementation of OS hardening and RAM dump analysis to collect the Artifacts and other information.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-120  
**Subject Name:** Software Defined Networking

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand Software Defined Networking
<b>2.</b>	Analyze the evolution of Software Defined Networks
<b>3.</b>	Identify the various components of SDN and their uses
<b>4.</b>	Provide the SDN Solutions for Data Center Network
<b>5.</b>	Explain the use of SDN in the current networking scenario
<b>6.</b>	Design and develop various applications of SDN

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Introduction:** History of Software Defined Networking (SDN) , Modern Data Center , Traditional Switch Architecture, Need of SDN, SDN implications for Research and Innovation, Evolution of SDN, Network Virtualization, How SDN Works, SDN Devices, SDN Applications.**[9L]**

**Open Flow & SDN Controllers:** Open Flow Specification, Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening up the Device, Networks Functions Virtualization, SDN Controllers, General Concepts. **[9L]**

**Part-B**

**Data Center:** Multitenant and Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network, VLANs – EVPN – VxLAN – NVGRE**[9L]**

**Sdn Programming:** Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications **[9L]**

**Text Books:**

1. Paul Goransson and Chuck Black (2016) *Software Defined Networks: A Comprehensive Approach*, Second Edition, Morgan Kaufmann.
2. Thomas D. Nadeau, Ken Gray (2013) SDN: Software Defined Networks, O'Reilly Media.
3. SiamakAzodolmolky (2013) Software Defined Networking with OpenFlow, Packt Publishing, 2013

**Reference Books:**

1. Siamak Azodolmolky (2013) *Software Defined Networking with Open Flow*, Packet Publishing.
2. Vivek Tiwari (2013) *SDN and Open Flow for Beginners*, Amazon Digital Services, Inc.
3. Fei Hu (2014) *Network Innovation through Open Flow and SDN: Principles and Design*, CRC Press.

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**Online Courses and Video Lectures:**

1. Udemy: Software Defined Networking (SDN) Made Simple by Vipin Gupta  
<https://www.udemy.com/course/sdn-made-simple/>
2. Coursera: Software Defined Networking by Dr. Nick Feamster,  
<https://www.coursera.org/learn/sdn?aid=true>

**Subject Code:** LPEIT-120

**Subject Name:** Software Defined Networking Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand and install Mininet
2.	Configure Mininet for different solutions
3.	Create SDN applications without using controller
4.	Customize Mininet Topologies
5.	Create different applications with Mininet
6.	Develop SDN projects

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

1. Overview of Mininet
2. Setting up the Environment and Implementation of Controllers in Mininet
3. Creating Hub Application without using controller
4. Creating Switch Application without using controller
5. Creating firewall application without using controller
6. Mininet Custom Topologies in POX, ODL, Floodlight
7. Using Wireshark with Mininet and OpenFlow.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-123  
**Subject Name:** Business Enterprise Application

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand the basics of enterprise applications
2.	Acquire knowledge of enterprise architecture
3.	Analyze the process of inception of enterprise architecture.
4.	Develop and understanding ways of constructing enterprise applications
5.	Acquire the basic knowledge of testing and rolling out enterprise applications.
6.	Knowledge of advanced topics for developing enterprise applications.

**Prerequisites:** Software Engineering

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Introduction to enterprise applications:** Introduction to enterprise applications and their types, integration with legacy systems, life cycle of raising an enterprise application, integration with partners, heterogeneous environment, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications, ETL, direct data integration, middleware requirements [7L]

**Inception of enterprise applications:** Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation [4L]

**Concept of architecture:** Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design [7L]

**Construction readiness of enterprise applications:** Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage [6L]

**Types and methods of testing an enterprise application:** Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application. [6L]

**Advanced Topics:** Integration Patterns, Service oriented integration-Web services, Service Choreography and Orchestration, BPMN, BPEL, Messaging based integration- Synchronous and

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Asynchronous Messaging, message structure, JAVA messaging services, Enterprise service bus routing, scalable connectivity and protocol, Global and Brokered ESBs, Support to SOA[**8L**]

**Text Books:**

1. Anubhav Pradhan, Satheesha B. Nanjappa et. al., "Raising Enterprise Applications", Wiley India, 2016.
2. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service - oriented Frameworks", Business Science Reference, 2015.

**Reference Books:**

1. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2015.
2. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison - Wesley, 2015.
3. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2016.

**Subject Code:** PEIT-124

**Subject Name:** ICT in Agriculture and Rural Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes
1.	Identify the use of Information Communication and Technology in rural development.
2.	Have an understanding of modern agricultural practices and the scope of ICT in agriculture.
3.	Apply the services of Mobile Devices in Agriculture and Rural Development.
4.	Know how to increase productivity and deal with marketing practices for Agri-Business through ICT.
5.	Utilize and provide knowledge on various ICT Based rural development programs run by different units.
6.	Identify the impact of ICT on rural development through sustainable agricultural practices.

**Prerequisites:** Fundamentals of Information Technology

**Additional Material Allowed in ESE:** NIL

**Detailed Contents:**

**Part-A**

**Introduction:** Introduction to ICT, ICT in Agricultural and Rural Development. [2L]

**ICT Infrastructure, Appliances and Services :** Limitations in the use of ICTs in Agriculture, Making ICTs Affordable in Rural Areas, Mobile Money Moves to Rural Areas, M-PESA's : Pioneering Money Transfer Service, Delivering Content for Mobile Agricultural Services. [5L]

**Impact of Mobile Devices on Agriculture and Rural Development:** Key Benefits and Challenges Related to Mobile Phones and Agricultural Livelihoods, General Principles for Using Mobile Phones in Agricultural Projects. [5L]

**Increasing Productivity through ICT:** Increasing Crop, Livestock, and Fishery Productivity Through ICT, Achieving Good Farming Practices through Improved Soil, Nutrient, and Land Management, Preventing Yield Losses through Proper Planning and Early Warning Systems, IT Tools having applications in Dairy Industry. [6L]

**Part-B**

**Agricultural Marketing with ICT:** Mobile Phones as a Marketing Tool, Improving Logistics and Access to Inputs, Smallholder Inclusion in Commercial Supply Chains. [6L]

**E-Agriculture and rural development:** Importance of Rural Development, Evolution of E-agriculture, Benefits And Challenges in E Agriculture , ICT Based E-Agriculture Programs in India, Smart Mobile Application and E-Agriculture. [6L]

**Case Studies:** Impact of digital revolution on rural society in India, Agricultural knowledge dissemination system, Community radio for development of rural India, Mobile communication and development of rural India, Harnessing ICTs for Indian Agricultural and rural development, Agricultural development through Information Communication Technology (ICT) in India. [6L]

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**Text Books:**

1. VK Dubey and Farida Ahmad, “ICT: A 21st Century Agrarian Revolution for Rural Development” Agrotech Publishing Academy, 2014
2. “ICT in agriculture: connecting smallholders to knowledge, networks, and institutions” Updated edition, World Bank Publications, 2017.
3. Tomas Mildorf, Karel Charvat jr, “ICT FOR Agriculture, Rural Development, and Environment”, Czech centre for science and society, 2012.

**Reference Books:**

1. R. Saravanan, C. Kathiresan and T. Indra Devi, “Information and Communication Technology for Agriculture and Rural Development”, 1st Edition, New India Publishing Agency, 2011

**E-Books and Online Learning Material:**

1. ICT in agriculture: connecting smallholders to knowledge, networks, and institutions by World Bank Publications  
<https://openknowledge.worldbank.org/handle/10986/27526>(Accessed on June 01, 2021)
2. ICT FOR Agriculture, Rural Development, and Environment by Tomas Mildorf, Karel Charvat jr  
<https://www.researchgate.net/publication/233920880> ICT FOR AGRICULTURE RURAL DEVELOPMENT AND ENVIRONMENT - Where we are Where we will go(Accessed on June 01, 2021)

**Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/126/104/126104006/>(Accessed on June 01, 2021)“ICT for Agriculture Development” <https://www.youtube.com/watch?v=eRx5eWz1a8o>(Accessed on June 01, 2021)
2. “Role of ICT in Dissemination of Agricultural Information among Farmers”  
<https://www.youtube.com/watch?v=ePfMZvQvInM>(Accessed on June 01, 2021)
3. “Panel Discussion on ICT Tools for the Resilient Agriculture Education in India”  
<https://icar.org.in/content/webinar-%E2%80%9Cpanel-discussion-ict-tools-resilient-agriculture-education-india%E2%80%9D-organized>(Accessed on June 01, 2021)

**Subject Code:** PEIT-125  
**Subject Name:** Research Methodologies

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
<b>1.</b>	To develop understanding of the fundamental theoretical ideas and logic of research.
<b>2.</b>	To identify appropriate research topics and define appropriate research problem and parameters
<b>3.</b>	To develop understanding of the issues involved in planning, designing, executing, evaluating and reporting research;
<b>4.</b>	To introduce students to many of the technical aspects of how to do empirical research using some of the main data collection and analysis techniques
<b>5</b>	To write a research report and thesis
<b>6</b>	To write a research proposal (grants)

**Prerequisites:** Probability

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

#### **Part-A**

**Concept of Research:** Research: Definition, meaning, need, process and types of research (Qualitative and Quantitative). Research design: Definition, types, Principles, identification and formulation of problem, components and criteria.[4L]

**Research Methods, Techniques and Tools:** Research Methods: Scientific, Historical, Descriptive, Survey & Case Study and Experimental Method: their application in Library & Information Science.[6L]

**Research Techniques and Tools:** Questionnaire, Schedule, Interview, Observation, library records and reports. Scales and Check Lists, Library records and reports.[5L]

#### **Part-B**

**Data Analysis and Interpretation:** Role of Statistical Methods in Research; Descriptive Statistical –Measurement of Central Tendency; Correlation, Regression. Statistical Techniques: Measures of Mean, Mode, Median. Measures of Dispersion: Mean deviation. Standard deviation. Presentation of Data: Tabular, graphic, bar diagram, pipeline graphics; Testing of Hypothesis and Statistical Inference; Computerized Statistical Packages: Use of SPSS[6L]

**Nominal and operational definition:** Designing research proposal; Literature search: Print and Non-print and Electronic Sources. [6L]

**Research Reporting:** Guidelines of Research Reporting, Style Manuals –MLA, APA, E-Citation and methods of Research Evaluation. Research Reporting, Technique and Precaution of Interpretation, Significance of Report Writing, Layout and Types of Report.[8L]

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**Text Books:**

1. C R Kotari, Research Methodology, Vishwa Prakashan.
2. Cooper and Schinder, Business Research Methods, TMH.
3. David Luck and Ronald Rubin, Marketing Research, PHI.
4. Naresh Amphora, Marketing Research, Pearson Education.
5. S. N. Murthy and U. Bhojanna, Business Research Methods, 3rd Edition, Excel Book

**Reference Books:**

1. Abrams, M.A., Social Surveys and Social Action, London: Heinemann, 1951.
2. Arthur, Maurice, Philosophy of Scientific Investigation, Baltimore: John Hopkins University Press, 1943.
3. Bernal, J.D., The Social Function of Science, London: George Routledge and Sons, 1939.  
Chase, Stuart, The Proper Study of Mankind: An inquiry into the Science of Human Relations, New York, Harper and Row Publishers, 1958. S. N. Murthy and U. Bhojanna, Business Research Methods, Excel Books

**Subject Code:** PEIT-126  
**Subject Name:** Enterprise Resource Planning

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Make basic use of Enterprise software, and its role in integrating business functions
2.	To understand and examine the functional modules of ERP
3.	Illustrate various technologies related to ERP
4.	Analyze the strategic options for ERP identification and adoption.
5.	Design the ERP implementation strategies.
6.	Create re-engineered business processes for successful ERP implementation.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**ERP- Introduction:** An Overview, A Brief History of ERP, Advantages of ERP, Business Functions and Business Processes, Roadmap for Successful ERP Implementation, Basic ERP Concepts, ERP Architectures; Risks of ERP: ERP implementation Failures, Minimising Risk, People, Process and Technology Risks; Implementation Issues, Operation and Maintenance Issues, Managing Risk on ERP Projects; Benefits of ERP. **[12L]**

**ERP and Related Technologies:** Business Intelligence & Analytics, E-Commerce, M-commerce, Data Warehousing, Data Mining, Online Analytical Processing, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Geographical Information Systems, Intranets and Extranets , ERP Security.**[8L]**

**Part-B**

**ERP Functional Modules:** Financial Module, Manufacturing (Production) Module, Human Resources Management Module, Plant Maintenance Module, Materials Management Module, Quality Management Module, Marketing Module, Sales, Distribution and Service Module; ERP Development Models **[7L]**

**ERP Implementation:** Technological, Operational and Business Reasons for Implementing, ERP Implementation Life Cycle and its Phases, ERP Package Selection, Implementation Challenges, ERP Implementation Process: Methodologies, Organisation of the ERP Project Team, Strategy, Plan, Risk Assessment, Budget, cost, Performance Measurement, System Issues; ERP Training and Education, Success and failure factors of an ERP Implementation, ERP Operation and Maintenance.**[13L]**

**Text Books:**

1. Enterprise Resource Planning, Third or Fourth Edition, Alexis Leon, McGraw Hill , 2019.

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**Reference Books:**

1. Daniel E.O'Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.
2. ERP in practice – Vaman – TMH, 2008
3. Ellen Monk, Bret Wagner, Concepts in Enterprise resource planning, Cengage learning, Third edition, 2009

**Subject Code:** PEIT-127  
**Subject Name:** Engineering Entrepreneurship

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- II )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Inculcate various entrepreneurship skills to students.
<b>2.</b>	Impart knowledge about industry structure and how to start up a company
<b>3.</b>	Analyze how to generate and exploit new opportunities
<b>4.</b>	Locate domestic and international opportunities
<b>5.</b>	Understand various sources of capital for business.
<b>6.</b>	Identify and understand and differentiate various legal issues for the entrepreneur such as patents, law suits, copy rights etc.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Entrepreneurship and the Entrepreneurial Mind-Set:** The nature of entrepreneurship, entrepreneur's thinking, the intention to act entrepreneurially, Entrepreneur background and characteristics, Role models and support systems, sustainable entrepreneurship, corporate Entrepreneurship, establishing corporate entrepreneurship in organization [3L]

**Generating And Exploiting New Entry Opportunities And Business Ideas:** new entry, generation of new entry of opportunity, risk reduction strategies for new entry exploitation. ideas from trend analysis, trends, sources of new ideas, methods of generating ideas, creative problem solving, creativity and entrepreneurship, innovation, entrepreneurial innovation, opportunity recognition, product planning and development process, e-commerce and business startup.[5L]

**Identifying and Analyzing Domestic and International Opportunities:** Opportunity recognition and the opportunity assessment plan, information sources, sources of information for start-up entrepreneurs in India, technical consultancy organizations, government policies for small scale enterprises, Nature of international entrepreneurship, the importance of international business to the firm, international versus domestic entrepreneurship. [5L]

**Protecting the Idea and Other Legal Issues for the Entrepreneur:** Intellectual property, need for a lawyer, selection of a lawyer, legal issues in setting up the organization, patents, business methods patents, startup without a patent, trademarks, copyrights, trade secrets and noncompetition agreements, licensing, product safety and liability, insurance, Sarbanes-Oxley act, Contracts. [4L]

**The Business Plan:** Planning as part of the business operation, writing the business plan, scope and values of the business plan, evaluation of the plan, presenting the plan, information needs, financial information needs, using the internet as a resource tool, using and implementing the business plan, reasons of business plan failure. [2L]

**The Marketing Plan:** Industry Analysis, Marketing research for the new venture, difference between a business plan and a marketing plan. Preparing the marketing plan, characteristics of a marketing plan, the marketing mix, steps in preparing the marketing plan. [2L]

### PART - B

**The Organizational Plan:** Developing the management team, legal forms of business, tax attributes of forms of business, the limited liability company versus the S-corporation, designing the organization, building the management team and a successful organization culture, the role of a board of directors, the board of advisors. [3L]

**The Financial Plan:** Operating and capital budgets, forecasting sales, pro forma income statements, pro forma cash flow statement, pro forma balance sheet, break-even analysis, pro forma sources and applications of funds statement, software packages. [3L]

**Sources of Capital:** An overview, personal funds, family and friends, commercial banks, role of Government Agencies in small-business financing, research and development limited partnerships, Government grants, Private placement, bootstrap financing, financing the business, informal risk-capital market, venture capital, valuing your company, going public. [4L]

**Management of Enterprises:** Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds. [4L]

**Case Studies:** Case studies related to successful entrepreneurs [5L]

#### Text Books:

1. Robert D. Hsirich, Mathew J. Manimala, Michael P. Peters and Dean A. Shepherd, "Entrepreneurship", 9/e, McGraw Hill Education, 2014.
2. Thomas H. Byers, Richard C. Dorf, Andrew J. Melson, "Technology Ventures: From idea to Enterprise", 4/e McGraw Hill, 2014.
3. Saini, J. S., 'Entrepreneurial Development Programmes and Practices', Deep & Deep Publications (P), Ltd, 2008.

#### Reference Books:

1. Kenji Uchino, "Entrepreneurship for Engineers", CRC Press, 2009.
2. Vasant Desai, "Entrepreneurship Development", PHI, 2011.
3. Anjan Rai Chaudhri, "Managing New Ventures: Concepts and Cases On Entrepreneurship", PHI, 2010.

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**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**CHOICE-II  
8<sup>TH</sup> SEMESTER**

Students of 8<sup>th</sup> Semester will undergo 6 Month Industrial/Institutional Training

**BACHELORS OF TECHNOLOGY  
INFORMATION TECHNOLOGY**

**CHOICE-III  
7<sup>TH</sup> SEMESTER**

**Subject Name:** Comprehensive Laboratory  
**Subject Code:** PRIT-106

<b>Programme:</b> B.Tech.(IT)	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 <sup>th</sup> (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 20	<b>Percentage of Numerical/Design/Programming Problems:</b> 100
<b>External Marks:</b> 30	<b>Duration of End Semester Exam(ESE):</b>
<b>Total Marks:</b> 50	<b>Course Status:</b> Seminar/Project

**On completion of the course the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
1.	Students are to be made confident in fundamental aspects of any engineering problem/situation
2.	To assess the comprehensive knowledge gained in basic courses relevant to Information Technology.
3.	To explore the application avenues for the core engineering concepts of IT
4.	To comprehend the questions asked and answer them with confidence.
5	To provide a holistic view about core and advanced computing principles
6	To re-iterate and explore the basic concepts of core Information Technology

**Prerequisites:** Advanced programming skills, Networking skills, database management skills

**Contents:**

1. Assessment of Data structures and programming methodology
2. Assessment of tools for software engineering.
3. Assessment of basic organization and Architecture of computer system
4. Assessment of Data base design and models
5. Assessment of various functions and process involved in operating system
6. Mastering the concepts, protocols involved in computer networks.

**Subject Code:** PEIT-115

**Subject Name:** Cloud Infrastructure and Services

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**Prerequisites:** Basics of Networking, Operating System, Virtualization

**Additional Material Allowed in ESE:** NIL

**Course Outcomes:**

After completing this course students will be able

1. To assess existing hosting platforms and computing paradigms currently being used in industry and academia.
2. To comprehend need of data centre, its virtualization techniques and types of clouds.
3. To demonstrate the implementation of cloud by using commercial and open source cloud platforms and its virtualization.
4. To implement cloud-based data storage by considering issues of task partitioning, data partitioning, data synchronization, distributed file system, data replication etc.
5. To teach the distributed computing fundamentals in the context of cloud infrastructure
6. To provide an insight into managing and scheduling of various cloud resources

**Detailed Contents:**

**Part-A**

**Defining Cloud Computing:** Utility Computing, Cloud Types, Examining the characteristics of Cloud Computing, Cloud Computing vs. Cluster computing vs. Grid computing, Assessing the roles of Open Standards [6]

**Virtualization:** Using virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors, Machine Imaging, Porting applications [5]

**Capacity Planning:** Defining Baseline and Metrics, Network Capacity, Scaling [3]

**Overview of OpenStack:** Architecture of OpenStack, project, services, mode of deployment, workflow. [4]

**Cloud Storage:** Object storage and Block storage [2]

**Part-B**

**Cloud Network:** Software-defined networking with OpenStack, Architecture, Protocols, Network functions virtualization (NFV) [4]

**Cloud Management:** Monitoring, Management, Maintenance, Troubleshooting, Backup, Recovery, Service Level Agreement [4]

**Cloud Security:** Cloud Security: Role of Security, Types of Attack, Network Security, Survey on Potential Cloud Barriers in adopting Cloud Computing, New Threats related to Cloud Computing, Security Stack, Gartner's Seven Cloud Computing Security Risks. Other Cloud Security Issues: Virtualization, Access Control & Identity Management, Application Security, Data Life Cycle Management. OpenStack security - Role-Based Access Control (RBAC), Identity service, Application security, data security. [6]

**Containers and Edge Computing:** Introduction to Edge computing, Containers and Edge Computing with OpenStack [2]

Textbooks:

1. Barrie Sosinsky (2013), Cloud Computing Bible, Wiley India Pvt. Ltd.
2. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski (2011), Cloud Computing: Principles and paradigms, Wiley India Pvt. Ltd.
3. Anthony Velte, Toby Velte, Robert Elsenpeter (2009), Cloud Computing: A practical Approach, Tata McGrawHill

Reference Books:

1. Michael Miller (2008), Cloud Computing, Que Publishing
2. Anthony Velte, Toby Velte and Robert Elsenpeter (2014), Cloud Computing: A practical Approach by Tata McGrawHill
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper (2009), Cloud Computing for dummies.

Online Courses and Video Lectures

1. Cloud computing By Prof. Soumya Kanti Ghosh | IIT Kharagpur

Available at: [https://swayam.gov.in/nd1\\_noc20\\_cs20/preview](https://swayam.gov.in/nd1_noc20_cs20/preview)

2. Google Cloud Computing Foundations Course

By Prof. Soumya Kanti Ghosh, Multifaculty | IIT Kharagpur, Google Cloud

Available at : [https://swayam.gov.in/nd1\\_noc20\\_cs55/preview](https://swayam.gov.in/nd1_noc20_cs55/preview)

**Subject Code: LPEIT-115**  
**Subject Name: Cloud Infrastructure and Services Laboratory**

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

Pre-requisites: Basic programming skills and computer fundamentals

**Course Outcomes:**

After studying this course, the student will be able to

1. Apply knowledge of software tools and techniques with hands-on experience for Cloud related applications.
2. Design solutions for the understanding of the virtual machines, networks and managing users in Cloud Infrastructure.
3. To conduct investigation and develop programming skills in Cloud Computing related applications.
4. Use the modern engineering tools/platforms such as Open stack, Hadoop for solving problems related to Cloud Computing
5. Function on multi-disciplinary teams through mini projects for exploring applications of Cloud Computing in different sectors.

**Detailed Contents**

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top Linux/windows.
2. Introduction to OpenStack and its components.
3. Installation of OpenStack using RDO packstack.
4. Creating and launching a basic virtual machine
5. Creating and managing images and templates
6. Creating and managing networks
7. Creating and managing users
8. Managing security groups and policies
9. Connecting to virtual machine/server from local computer

By using various concepts of syllabus students required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

Note: It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required)

**Subject Code:** PEIT-116  
**Subject Name:** Mobile Application Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understanding the basic mobile platforms and mobile development environments
<b>2.</b>	Make use of Android SDK to setup Android Development Environment
<b>3.</b>	Apply conceptual knowledge of User Interface Designing to design UI in Android SDK
<b>4.</b>	Develop Interactivity based Android Applications using Fragment, Intents and Event Processing
<b>5.</b>	Develop Database oriented Android Applications using Persistent Data Storage
<b>6.</b>	Improve the Android Application Performance using Android Services and Threads Analyze and Solve the bugs using Android Security and Debugging features

**Prerequisites:** Programming in Java.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### Detailed Contents:

##### **Part-A**

**Introduction to Mobile Development:** Brief History of Mobile: Beginning and evolution, Mobile ecosystem: Operator, Network, Devices, Platforms, Operating System, Application Frameworks, Types of Mobile applications, Seven rules for developing mobile strategy. **[4L]**

**Android Development Environment:** Introduction to android, Advantage of Android over other development environment, Android execution environment, Components of android application, Android activity and service life-cycle, Android 7.0 nougat and comparison with older version, Assembling android 7 development workstation, Downloading and installing Android Studio2, Introduction to Android Studio IDE. **[6L]**

**Android User Interface Design:** XML Naming scheme, XML syntax, XML Referencing, XML constants, XML Styles, XML Colors, View Group Class, View Class, Activity Class, UI Design from scratch: Checkbox, Text View, Button element to interface, Error elimination using XML Editor, Working with Relative, Linear, Table and Grid Layouts, Understanding Activity Life Cycle. **[7L]**

##### **Part-B**

**Apps Interactivity in Android:** Android Fragment: Fragment Class, Fragment Life Cycle, Android Intent Class: Intent types, Intent Filters, Instantiating Intent Object, Android Context Class, Event Processing: Events, Event Listener, Event Handler. **[5L]**

**Persistent Data Storage:** SQLite: Android Built in SQLite content provider, Modifying data using your android application, Creating basic activity, Configuring manifest, Packaging and managing SQLite with android app. **[4L]**

**Android Services and Threads:** Android service class: Controlling services, Spawning process, Process Life Cycle, Thread Caveats, Background Processing Services. **[5L]**

**Android Security and Debugging:** Requesting permissions, Creating custom Permissions, Securing application for publication and execution, Tools for debugging, Eclipse Java Editor: Java errors, Debugger, Logcat, Android Debug Bridge (adb), DDMS: Dalvik Debug monitor service, Traceview. **[4L]**

#### Text Books:

1. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly, 2009.

2. Rick Rogers, John Lombardo, Zigurd Mednieks and Blake Meike, "Android Application Development", First Edition, O'Reilly, 2009.
3. Wallace Jackson, "Android Apps for absolute beginners", Apress, 4th Edition, 2017.

#### **Reference Books:**

1. Grant Allen, "Beginning Android Get Started building apps for android platform", Apress, Fifth Edition 2014.
2. Raimon Raflos Montane, Laurence Dawson, "Learning Android Application Development", Packt Publishers, 2014.
3. Jerome F. DiMarzio, "Beginning Android Programming with Android Studio", 4th edition, Wrox Publishers, 2016.
4. Antonio Pachon Ruiz, "Mastering Android Application Development", Packt Publishers, Edition 2015

#### **E-Books and online learning material:**

1. Android Studio Development Essentials by Neil Smyth  
<https://www.onlineprogrammingbooks.com/android-studio-development-essentials-javaedition/>  
Accessed on June. 20, 2020
2. [Android Tutorial by TutorialsPoint](https://www.tutorialspoint.com/android/android_tutorial.pdf)  
[https://www.tutorialspoint.com/android/android\\_tutorial.pdf](https://www.tutorialspoint.com/android/android_tutorial.pdf)      Accessed on June. 20, 2020
3. Android Programming Cookbook by Chryssa  
<http://enos.itcollege.ee/~jpoial/allalaadimised/reading/Android-Programming-Cookbook.pdf>  
Accessed on June. 20, 2020

#### **Online Courses and Video Lectures:**

- |  |                            |
|--|----------------------------|
| 1. <a href="https://developer.android.com/courses">https://developer.android.com/courses</a>   | Accessed on June. 20, 2020 |
| 2. <a href="https://www.edx.org/learn/android-development">https://www.edx.org/learn/android-development</a>                                     | Accessed on June. 20, 2020 |
| 3. <a href="https://www.lynda.com/Android-training-tutorials/947-0.html">https://www.lynda.com/Android-training-tutorials/947-0.html</a>         | Accessed on June. 20, 2020 |
| 4. <a href="https://www.coursera.org/projects/build-app-android-studio-java">https://www.coursera.org/projects/build-app-android-studio-java</a> | Accessed on June. 20, 2020 |
| 5. <a href="https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/">https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/</a>                   | Accessed on June. 20, 2020 |
| 6. <a href="https://nptel.ac.in/courses/106/106/106106147/">https://nptel.ac.in/courses/106/106/106106147/</a>                                   | Accessed on June. 20, 2020 |
| 7. <a href="https://web.stanford.edu/class/cs193a/lectures.shtml">https://web.stanford.edu/class/cs193a/lectures.shtml</a>                       | Accessed on June. 20, 2020 |

**Subject Code: LPEIT-116**  
**Subject Name: Mobile Application Development Laboratory**

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Demonstrate an understanding of design aspects of different mobile development environments
<b>2.</b>	Install, setup and make use of Android SDK 2 to study basic components involved in Android Mobile Application Development
<b>3.</b>	Study and Design using basic designing components, different type of layouts for a UI based on XML in Android Studio2
<b>4.</b>	Develop a basic module using Android development environment involving elements of interactivity
<b>5.</b>	Develop persistent database oriented application module using Android development environment
<b>6.</b>	Integrating the concept of multithreading, resource requests for application performance improvement
<b>7.</b>	Test and solve the bug related issues using tools like` Logcat, Android Debug bridge
<b>8.</b>	Function on diverse teams to identify, formulate and design static web project using XML oriented Designs, Persistent Data Storage and embedded with features like services, threads and debugging in multi-disciplinary environment

**Prerequisites:** Programming in Java, Web Technologies.

**Special Instruction related to resources requirement:** Software like Android Studio.

1. Android Development Environment: To study design aspects of development environment like Android, iOS.
2. Android Development Environment: To setup Android studio2 and study its basic components.
3. Android User Interface Design: To study various XML files needed for interface design.
4. Android User Interface Design: To implement different type of layouts like relative, grid, linear and table.
5. Apps Interactivity in Android: To incorporate element of interactivity using Android Fragment and Intent Class.
6. Persistent Data Storage: To perform database connectivity of android app using SQLite.
7. Android Services and Threads:To implement the concept of multithreading using Android Service class.
8. Android Security and Debugging: To implement concept of permission and perform request for permission to access different hardware components of mobile.
9. Android Security and Debugging: To perform debugging and testing of android app using tools like Logcat, Android debug bridge, DDMS.

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Reference Books:**

1. Beginning Android Get Started building apps for android platform by Grant Allen, Apress, Fifth Edition 2014.
2. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by Mark Wickham, Apress 2018.

**Subject Code:** PEIT-117  
**Subject Name:** Augmented Reality and Virtual Reality

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	To understand the basic concepts of Augmented and Virtual Reality.
2.	Assess and compare technologies in the context of AR and VR systems design.
3.	To apply Environment Modelling in Virtual Reality
4.	Develop interactive augmented reality applications for PC and Mobile based devices using a variety of input devices.
5.	To learn and implement application of VR in Digital Entertainment:
6.	Demonstrate the knowledge of the research literature in augmented reality for both compositing and interactive applications.

**Prerequisites:** Working knowledge of geometry, 3D space, and Linear algebra

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part-A**

**Introduction of Virtual Reality:** Fundamental concept and components of Virtual Reality, primary features and present development on Virtual Reality. [4L]

**Multiple Modals of Input and Output Interface in Virtual Reality:** Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices [6L]

**Visual Computation in Virtual Reality:** Fundamentals of computer graphics, software and hardware technology on stereoscopic display, advanced techniques in CG: Management of large scale environments & real time rendering [6L]

**Environment Modeling in Virtual Reality:** Geometric Modeling, Behavior Simulation, Physically Based Simulation. [4L]

**Part-B**

**Interactive Techniques in Virtual Reality:** Body Track, Hand Gesture, 3D Menus, Object Grasp. Introduction of Augmented Reality (AR): System structure of Augmented Reality, key technology in AR. [6L]

**Development Tools and Frameworks in Virtual Reality:** Frameworks of software development tools in VR, X3D Standard, Vega, MultiGen, Virtools etc. [6L]

**Application of VR in Digital Entertainment:** VR technology in film & TV production, VR technology in physical exercises and games, demonstration of digital entertainment by VR [4L]

**Text Books:**

1. Doug A. B., Kruijff E., LaViola J. J. and Poupyrev I. , 3D User Interfaces: Theory and Practice , Addison-Wesley (2005,2011p) 2nd ed.
2. Parisi T., Learning Virtual Reality, O'Reilly (2016) 1st ed.
3. Schmalstieg D. and Hollerer T., AugmentedAnd Virtual Reality, Addison-Wesley (2016).

**Reference Books:**

1. Whyte J., Virtual Reality and the Built Environment, Architectural Press (2002).

2. Aukstakalnis S., Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Addison-Wesley (2016).

**Subject Code:** LPEIT-117

**Subject Name:** Augmented Reality and Virtual Reality Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-III

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
<b>2.</b>	Assess and compare open source tools in the context of AR and VR systems design.
<b>3.</b>	Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR
<b>4.</b>	Design of Google Cardboard for cost effective VR experience
<b>5.</b>	To learn and implement application of VR in Digital Entertainment:
<b>6.</b>	Demonstrate the knowledge of VR to the conduct of scientific research, training, and industrial design.

**Tools:** Unity 3D, Blender, and various Open source tools

#### **Detailed Contents:**

1. Introduction to various Open sources VR Tools
2. Introduction to Unity: Interface overview and navigation
3. Creating a new project, importing standard assets, adding a player character, Objects, lighting, scenes, prefabs, asset store in Unity
4. Scripting in Unity: Creating a New Script, (naming) Syntax, Functions, Variables, Key / Mouse Input, Unity Support
5. Object-Oriented Scripting in Unity , Public variables, the inspector
6. Working of Hololens, Google Glass
7. Intro to Maya:, Basic concepts of 3D modeling, Bevel, Cone, Extrude, Smooth, Booleans
8. Workings on apps related to AR and VR

Mini Project: How to design Google cardboard in laboratory for VR experience

**Subject Code:** PEIT-123  
**Subject Name:** Business Enterprise Application

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the basics of enterprise applications
<b>2.</b>	Acquire knowledge of enterprise architecture
<b>3.</b>	Analyze the process of inception of enterprise architecture.
<b>4.</b>	Develop and understanding ways of constructing enterprise applications
<b>5.</b>	Acquire the basic knowledge of testing and rolling out enterprise applications.
<b>6.</b>	Knowledge of advanced topics for developing enterprise applications.

**Prerequisites:** Software Engineering

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Introduction to enterprise applications:** Introduction to enterprise applications and their types, integration with legacy systems, life cycle of raising an enterprise application, integration with partners, heterogeneous environment, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications, ETL, direct data integration, middleware requirements[7L]

**Inception of enterprise applications:** Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation [4L]

**Concept of architecture:** Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design [7L]

**Construction readiness of enterprise applications:** Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage [6L]

**Types and methods of testing an enterprise application:** Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application. [6L]

**Advanced Topics:** Integration Patterns, Service oriented integration-Web services, Service Choreography and Orchestration, BPMN, BPEL, Messaging based integration- Synchronous and Asynchronous Messaging, message structure, JAVA messaging services, Enterprise service bus routing, scalable connectivity and protocol, Global and Brokered ESBs, Support to SOA[8L]

**Text Books:**

1. Anubhav Pradhan, Satheesha B. Nanjappa et. al., "Raising Enterprise Applications", Wiley India, 2016.
2. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration"

for Business Processes: Service - oriented Frameworks", Business Science Reference,2015.

**Reference Books:**

1. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2015.
2. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison - Wesley, 2015.
3. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2016.

**Subject Code:** PEIT-124  
**Subject Name:** ICT in Agriculture and Rural Development

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7(Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Identify the use of Information Communication and Technology in rural development.
<b>2.</b>	Have an understanding of modern agricultural practices and the scope of ICT in agriculture.
<b>3.</b>	Apply the services of Mobile Devices in Agriculture and Rural Development.
<b>4.</b>	Know how to increase productivity and deal with marketing practices for Agri-Business through ICT.
<b>5.</b>	Utilize and provide knowledge on various ICT Based rural development programs run by different units.
<b>6.</b>	Identify the impact of ICT on rural development through sustainable agricultural practices.

**Prerequisites:** Fundamentals of Information Technology

**Additional Material Allowed in ESE:** NIL

#### Detailed Contents:

##### **Part-A**

**Introduction:** Introduction to ICT, ICT in Agricultural and Rural Development. [2L]

**ICT Infrastructure, Appliances and Services :** Limitations in the use of ICTs in Agriculture, Making ICTs Affordable in Rural Areas, Mobile Money Moves to Rural Areas, M-PESA's : Pioneering Money Transfer Service, Delivering Content for Mobile Agricultural Services. [5L]

**Impact of Mobile Devices on Agriculture and Rural Development:** Key Benefits and Challenges Related to Mobile Phones and Agricultural Livelihoods, General Principles for Using Mobile Phones in Agricultural Projects. [5L]

**Increasing Productivity through ICT:** Increasing Crop, Livestock, and Fishery Productivity Through ICT, Achieving Good Farming Practices through Improved Soil, Nutrient, and Land Management, Preventing Yield Losses through Proper Planning and Early Warning Systems, IT Tools having applications in Dairy Industry. [6L]

##### **Part-B**

**Agricultural Marketing with ICT:** Mobile Phones as a Marketing Tool, Improving Logistics and Access to Inputs, Smallholder Inclusion in Commercial Supply Chains. [6L]

**E-Agriculture and rural development:** Importance of Rural Development, Evolution of E-agriculture, Benefits And Challenges in E Agriculture , ICT Based E-Agriculture Programs in India, Smart Mobile Application and E-Agriculture. [6L]

**Case Studies:** Impact of digital revolution on rural society in India, Agricultural knowledge dissemination system, Community radio for development of rural India, Mobile communication and development of rural India, Harnessing ICTs for Indian Agricultural and rural development, Agricultural development through Information Communication Technology (ICT) in India. [6L]

#### Text Books:

1. VK Dubey and Farida Ahmad, "ICT: A 21st Century Agrarian Revolution for Rural Development" Agrotech Publishing Academy, 2014

2. “ICT in agriculture: connecting smallholders to knowledge, networks, and institutions” Updated edition, World Bank Publications, 2017.
3. Tomas Mildorf, Karel Charvat jr, “ICT FOR Agriculture, Rural Development, and Environment”, Czech centre for science and society, 2012.

#### **Reference Books:**

1. R. Saravanan, C. Kathiresan and T. Indra Devi, “Information and Communication Technology for Agriculture and Rural Development”, 1st Edition, New India Publishing Agency, 2011

#### **E-Books and Online Learning Material:**

1. ICT in agriculture: connecting smallholders to knowledge, networks, and institutions by World Bank Publications  
<https://openknowledge.worldbank.org/handle/10986/27526>(Accessed on June 01, 2021)
2. ICT FOR Agriculture, Rural Development, and Environment by Tomas Mildorf, Karel Charvat jr  
<https://www.researchgate.net/publication/233920880 ICT FOR AGRICULTURE RURAL DEVELOPMENT AND ENVIRONMENT - Where we are Where we will go>(Accessed on June 01, 2021)

#### **Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/126/104/126104006/>(Accessed on June 01, 2021)“ICT for Agriculture Development” <https://www.youtube.com/watch?v=eRx5eWz1a8o>(Accessed on June 01, 2021)
2. “Role of ICT in Dissemination of Agricultural Information among Farmers”  
<https://www.youtube.com/watch?v=ePfMZvQvInM>(Accessed on June 01, 2021)
3. “Panel Discussion on ICT Tools for the Resilient Agriculture Education in India”  
<https://icar.org.in/content/webinar-%E2%80%9Cpanel-discussion-ict-tools-resilient-agriculture-education-india%E2%80%9D-organized>(Accessed on June 01, 2021)

**Subject Code:** PEIT-125  
**Subject Name:** Research Methodologies

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 7 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-IV

**On Completion of the course, the student will have the ability to:**

<b>CO #</b>	<b>Course Outcomes</b>
<b>1.</b>	To develop understanding of the fundamental theoretical ideas and logic of research.
<b>2.</b>	To identify appropriate research topics and define appropriate research problem and parameters
<b>3.</b>	To develop understanding of the issues involved in planning, designing, executing, evaluating and reporting research;
<b>4.</b>	To introduce students to many of the technical aspects of how to do empirical research using some of the main data collection and analysis techniques
<b>5</b>	To write a research report and thesis
<b>6</b>	To write a research proposal (grants)

**Prerequisites:** Probability

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

#### **Part-A**

**Concept of Research:** Research: Definition, meaning, need, process and types of research (Qualitative and Quantitative). Research design: Definition, types, Principles, identification and formulation of problem, components and criteria.[4L]

**Research Methods, Techniques and Tools:** Research Methods: Scientific, Historical, Descriptive, Survey & Case Study and Experimental Method: their application in Library & Information Science.[6L]

**Research Techniques and Tools:** Questionnaire, Schedule, Interview, Observation, library records and reports. Scales and Check Lists, Library records and reports.[5L]

#### **Part-B**

**Data Analysis and Interpretation:** Role of Statistical Methods in Research; Descriptive Statistical – Measurement of Central Tendency; Correlation, Regression. Statistical Techniques: Measures of Mean, Mode, Median. Measures of Dispersion: Mean deviation. Standard deviation. Presentation of Data: Tabular, graphic, bar diagram, pipeline graphics; Testing of Hypothesis and Statistical Inference; Computerized Statistical Packages: Use of SPSS[6L]

**Nominal and operational definition:** Designing research proposal; Literature search: Print and Non-print and Electronic Sources. [6L]

**Research Reporting:** Guidelines of Research Reporting, Style Manuals –MLA, APA, E-Citation and methods of Research Evaluation. Research Reporting, Technique and Precaution of Interpretation, Significance of Report Writing, Layout and Types of Report.[8L]

#### **Text Books:**

1. C R Kotari, Research Methodology, Vishwa Prakashan.
2. Cooper and Schinder, Business Research Methods, TMH.
3. David Luck and Ronald Rubin, Marketing Research, PHI.

4. Naresh Amphora, Marketing Research, Pearson Education.
5. S. N. Murthy and U. Bhojanna, Business Research Methods, 3rd Edition, Excel Book

**Reference Books:**

1. Abrams, M.A., Social Surveys and Social Action, London: Heinemann, 1951.
2. Arthur, Maurice, Philosophy of Scientific Investigation, Baltimore: John Hopkins University Press, 1943.
3. Bernal, J.D., The Social Function of Science, London: George Routledge and Sons, 1939. Chase, Stuart, The Proper Study of Mankind: An inquiry into the Science of Human Relations, New York, Harper and Row Publishers, 1958. S. N. Murthy and U. Bhojanna, Business Research Methods, Excel Books

**B.Tech IT**  
**8<sup>th</sup> Semester Syllabus Choice-III**

**Subject Code:** PEIT-118  
**Subject Name:** Software Process and Quality Assurance

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8(Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 40%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-V

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
<b>1.</b>	Identify and explain contemporary software life cycle processes, activities, and work products.
<b>2.</b>	Plan tasks, plan task dependencies, estimate effort, and estimate other needed resources.
<b>3.</b>	Recognize and categorize risks, intellectual property, and legal issues of software projects.
<b>4.</b>	Effectively manage changes during the software life cycle including deviations and waivers in software configuration control.
<b>5.</b>	Apply various metrics and measurements to assess the product and the process quality.
<b>6.</b>	Apply standard quality assurance techniques to ensure that requirements are verifiable, traceable, measurable, testable, accurate, unambiguous, consistent, and complete.

**Prerequisites:** Software Engineering.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

##### **Part-A**

**Software Process:** Software engineering process infrastructure (e.g., personnel, tools, and training), Modeling and specification of software processes, Measurement and analysis of software processes, Software engineering process improvement (individual, team, and organization), Quality analysis and control (e.g., defect prevention, review processes, quality metrics, and root cause analysis of critical defects to improve processes and practices).

**[7L]**

**Process Implementation:** Levels of process definition (e.g., organization, project, team, and individual) Life-cycle model characteristics (e.g., plan-based, incremental, iterative, and agile), Individual software process (model, definition, measurement, analysis, and improvement), Team process (model, definition, organization, measurement, analysis, and improvement), Process tailoring, Effect of external factors (e.g., contract and legal requirements, standards, and acquisition practices) on software process **[7L]**

**Project planning and tracking:** Requirements management (e.g., product backlog, priorities, dependencies, and changes), Effort estimation (e.g., use of historical data and consensusbased estimation techniques), Work breakdown and task scheduling, Resource allocation, Project tracking metrics and techniques (e.g., earned value, velocity, burndown charts, defect tracking, and management

of technical debt) , Team self-management (e.g., progress tracking, dynamic workload allocation, and response to emergent issues) [6L]

### **Part-B**

**Software configuration management:** Revision control, Release management, Configuration management tools, Build processes and tools. [4L]

**Software Quality:** Definitions of quality, Society's concern for quality, The costs and impacts of bad quality, A cost of quality model, Quality attributes for software (e.g., dependability, usability, and safety), Roles of people, processes, methods, tools, and technology [6L]

**Process Assurance and Product Assurance:** Nature of process assurance, Quality planning, Process assurance techniques, nature of product assurance, Distinctions between assurance and Verification &Validation, Quality product models, Root cause analysis and defect prevention, Quality product metrics and measurement, Assessment of product quality attributes (e.g., usability, reliability, and availability) [6L]

#### **Text Books**

1. Ralf Kneuper, "Software Processes and Life Cycle Models", Springer, 2018.
2. Murali Chemuturi, Mastering Software Quality Assurance – Best Practices, Tools and Techniques for Software Developers", J. Ross Publishing, 2011.
3. Daniel Galin, "Software Quality Assurance – from theory to implementation", Pearson Education, 2009.
4. Roger S Pressman, "Software Engineering: A practitioner's approach", 7th Edition, McGraw Hill Education, 2010.

#### **Reference Books**

1. Ivan Mistrik, Richard M Soley, Nour Ali, "Software Quality Assurance – in Large Scale and Complex Software Intensive Systems", Morgan Kaufmann, 2015
2. Yingxu Wang, Graham King, "Software Engineering Processes - Principles and Applications", CRC Press, 2000.
3. Ian Sommerville, "Software Engineering", 10th Edition, Pearson India, 2018.
4. Grady Booch, "Object-Oriented Analysis and Design with Applications", Pearson India, 3rd Edition, 2015.

**Subject Code: LPEIT-118**  
**Subject Name:** Software Process and Quality Assurance Laboratory

<b>Programme:</b> B.Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-V

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcome</b>
<b>1.</b>	Design of software process.
<b>2.</b>	Implement a software process in a typical environment.
<b>3.</b>	Plan a project and track its progress.
<b>4.</b>	Effectively manage changes during the software lifecycle including deviations and waivers in software configuration control.
<b>5.</b>	Verify and validate a software module when the requirement specifications are given.
<b>6.</b>	Perform software audit and improve the quality of code.

**Prerequisites:** Software Engineering

<b>Sr. No.</b>	<b>Name of Practical</b>	<b>No. of Hours</b>
<b>1</b>	Design software process for any case study.	1
<b>2</b>	Implement the software process in an environment (e. g. agile, iterative, plan-based).	1
<b>3</b>	Plan a project involving work breakdown structures, task scheduling.	2
<b>4</b>	Track the progress of the project by using burndown charts.	2
<b>5</b>	Apply software configuration control to manage change and revisions.	2
<b>6</b>	Write a software module and conduct static verification.	2
<b>7</b>	Write a program involving loops and perform white box testing of the program (i.e. dynamic verification).	2
<b>8</b>	Write a software module and perform unit testing (i.e. dynamic verification).	2
<b>9</b>	Write two small software modules. Integrate these modules and test the defects in the interaction between these software modules when they are integrated (i.e. dynamic verification).	2
<b>10</b>	Design a software module as per the requirement specifications and validate it.	2
<b>11</b>	Perform Software Audit including checklist and templates for the software developed and improve the Code Quality.	2

**Subject Code: PEIT-119**  
**Subject Name: Cyber Security**

<b>Programme:</b> B.Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-V

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the concept of Cyber Security
<b>2.</b>	Implement appropriate security technologies and policies to protect computers and digital information.
<b>3.</b>	Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
<b>4.</b>	Determine computer networks and examine secure software practices.
<b>5.</b>	Classify the principles of web security.
<b>6.</b>	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

**Prerequisites:** Basic knowledge of Computer Networks

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

#### **Detailed Contents:**

#### **PART-A**

**Cyber Security Concepts:** History of cyber space, Cyber Crime, Information Security, Computer Ethics and Security for users, Familiarization with secure web browser and guidelines to choose, Role of Antivirus, Guidelines for Secure password, Two-steps authentication, Introduction to Password Manager, Wi-Fi Security. **[9L]**

**Cyber Security Vulnerabilities& Safe Guards:** Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security. **[9L]**

#### **PART-B**

**Security in Evolving Technology:** Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. **[9L]**

**Social Engineering:** Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall, Cyber Security Regulations**[9L]**

#### **Text Books:**

1. William Easttom II (2016) Computer Security Fundamentals, 4th edition, Pearson.
2. Sunit Belapure and Nina Godbole (2011) Cyber Security, 1st edition, Wiley.
3. Christopher Hadnagy (2018) Social Engineering: The Science of Human Hacking, 2nd edition, John Wiley & Sons.

4. Thomas A. Johnson (2015) Cyber Security, 1st edition, CRC Press.

**Reference Books:**

1. Nina Godbole (2017) Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2nd edition.
2. Jon Erickson (2008) The art of Exploitation, Starch Press, 2nd edition.

**E-Books and online learning material:**

1. Cyber Attacks and Counter Measures: <http://uou.ac.in/progdetail?pid=CEGCS-17> Meilir Page-Jones: Fundamentals.
2. Introduction to Cyber Security available at <http://uou.ac.in/foundation-course>.
3. Cyber Security Techniques <http://uou.ac.in/progdetail?pid=CEGCS-17>.
4. <https://www.cybersecurity.ox.ac.uk/resources/videos>

**Online Courses and Video Lectures:**

1. <https://nptel.ac.in/courses/106/106/106106129/> Accessed on June 11, 2021
2. <https://www.utep.edu/information-resources/iso/security-awareness/videos/security-awareness-videos.html> Accessed on June 11, 2021
3. [https://www.utep.edu/technologysupport/ServiceCatalog/SEC\\_EmailEncryption.html](https://www.utep.edu/technologysupport/ServiceCatalog/SEC_EmailEncryption.html) Accessed on June 11, 2021
4. <https://nptel.ac.in/courses/106/105/106105031/> Accessed on June 11, 2021

**Subject Code:** LPEIT-119  
**Subject Name:** Cyber Security Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective-V

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand the different components of Cyber Security
<b>2.</b>	Analyze the different threats in windows and web security
<b>3.</b>	Identify the use of appropriate tool for the security threat
<b>4.</b>	Implement the security measures in a PC using different tools
<b>5.</b>	Identify the web vulnerabilities.
<b>6.</b>	Evaluate the severity of security threat and generate report

**Perquisites:** Basic knowledge of Computer Networks

**Detailed Contents:**

1. Study of different wireless network components and features of any one of the Mobile Security Apps.
2. Implementation of Windows security using firewall and other tools
3. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
4. Implementation to gather information from any PC's connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc.
5. Implementation of MITM- attack using wireshark/ network sniffers
6. Implementation to identify web vulnerabilities, using OWASP project
7. Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report.
8. Implementation of OS hardening and RAM dump analysis to collect the Artifacts and otherinformation.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-120  
**Subject Name:** Software Defined Networking

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 0 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 30%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-V

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Understand Software Defined Networking
<b>2.</b>	Analyze the evolution of Software Defined Networks
<b>3.</b>	Identify the various components of SDN and their uses
<b>4.</b>	Provide the SDN Solutions for Data Center Network
<b>5.</b>	Explain the use of SDN in the current networking scenario
<b>6.</b>	Design and develop various applications of SDN

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Introduction:** History of Software Defined Networking (SDN) , Modern Data Center , Traditional Switch Architecture, Need of SDN, SDN implications for Research and Innovation, Evolution of SDN, Network Virtualization, How SDN Works, SDN Devices, SDN Applications.**[9L]**

**Open Flow & SDN Controllers:** Open Flow Specification, Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening up the Device, Networks Functions Virtualization, SDN Controllers, General Concepts. **[9L]**

**Part-B**

**Data Center:** Multitenant and Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network, VLANs – EVPN – VxLAN – NVGRE**[9L]**

**Sdn Programming:** Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications **[9L]**

**Text Books:**

1. Paul Goransson and Chuck Black (2016) *Software Defined Networks: A Comprehensive Approach*, Second Edition, Morgan Kaufmann.
2. Thomas D. Nadeau, Ken Gray (2013) SDN: Software Defined Networks, O'Reilly Media.
3. SiamakAzodolmolky (2013) Software Defined Networking with OpenFlow, Packt Publishing, 2013

**Reference Books:**

1. Siamak Azodolmolky (2013) *Software Defined Networking with Open Flow*, Packet Publishing.
2. Vivek Tiwari (2013) *SDN and Open Flow for Beginners*, Amazon Digital Services, Inc.
3. Fei Hu (2014) *Network Innovation through Open Flow and SDN: Principles and Design*, CRC Press.

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**Online Courses and Video Lectures:**

1. Udemy: Software Defined Networking (SDN) Made Simple by Vipin Gupta  
<https://www.udemy.com/course/sdn-made-simple/>
2. Coursera: Software Defined Networking by Dr. Nick Feamster,  
<https://www.coursera.org/learn/sdn?aid=true>

**Subject Code:** LPEIT-120

**Subject Name:** Software Defined Networking Laboratory

<b>Programme:</b> B.Tech.	<b>L:</b> 0 <b>T:</b> 0 <b>P:</b> 2
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 24 Hours
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 30	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 20	<b>Duration of End Semester Exam(ESE):</b> 1.5 hours
<b>Total Marks:</b> 50	<b>Elective Status:</b> Professional Elective- V

**On completion of the course the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Understand and install Mininet
2.	Configure Mininet for different solutions
3.	Create SDN applications without using controller
4.	Customize Mininet Topologies
5.	Create different applications with Mininet
6.	Develop SDN projects

**Prerequisites:** Computer Networks

**Additional Material Allowed in ESE:** Scientific Calculator

### **Detailed Contents:**

1. Overview of Mininet
2. Setting up the Environment and Implementation of Controllers in Mininet
3. Creating Hub Application without using controller
4. Creating Switch Application without using controller
5. Creating firewall application without using controller
6. Mininet Custom Topologies in POX, ODL, Floodlight
7. Using Wireshark with Mininet and OpenFlow.

**Mini Project:** Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Subject Code:** PEIT-126  
**Subject Name:** Enterprise Resource Planning

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 10%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-VI

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
1.	Make basic use of Enterprise software, and its role in integrating business functions
2.	To understand and examine the functional modules of ERP
3.	Illustrate various technologies related to ERP
4.	Analyze the strategic options for ERP identification and adoption.
5.	Design the ERP implementation strategies.
6.	Create re-engineered business processes for successful ERP implementation.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**ERP- Introduction:** An Overview, A Brief History of ERP, Advantages of ERP, Business Functions and Business Processes, Roadmap for Successful ERP Implementation, Basic ERP Concepts, ERP Architectures; Risks of ERP: ERP implementation Failures, Minimising Risk, People, Process and Technology Risks; Implementation Issues, Operation and Maintenance Issues, Managing Risk on ERP Projects; Benefits of ERP. [12L]

**ERP and Related Technologies:** Business Intelligence & Analytics, E-Commerce, M-commerce, Data Warehousing, Data Mining, Online Analytical Processing, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Geographical Information Systems, Intranets and Extranets , ERP Security.[8L]

**Part-B**

**ERP Functional Modules:** Financial Module, Manufacturing (Production) Module, Human Resources Management Module, Plant Maintenance Module, Materials Management Module, Quality Management Module, Marketing Module, Sales, Distribution and Service Module; ERP Development Models [7L]

**ERP Implementation:** Technological, Operational and Business Reasons for Implementing, ERP Implementation Life Cycle and its Phases, ERP Package Selection, Implementation Challenges, ERP Implementation Process: Methodologies, Organisation of the ERP Project Team, Strategy, Plan, Risk Assessment, Budget, cost, Performance Measurement, System Issues; ERP Training and Education, Success and failure factors of an ERP Implementation, ERP Operation and Maintenance.[13L]

**Text Books:**

1. Enterprise Resource Planning, Third or Fourth Edition, Alexis Leon, McGraw Hill , 2019.

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**Reference Books:**

1. Daniel E.O'Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.
2. ERP in practice – Vaman – TMH, 2008
3. Ellen Monk, Bret Wagner, Concepts in Enterprise resource planning, Cengage learning, Third edition, 2009

**Subject Code:** PEIT-127  
**Subject Name:** Engineering Entrepreneurship

<b>Programme:</b> B.Tech.	<b>L:</b> 3 <b>T:</b> 1 <b>P:</b> 0
<b>Semester:</b> 8 (Choice- III )	<b>Teaching Hours:</b> 36 Hours
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 4
<b>Internal Marks:</b> 40	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 60	<b>Duration of End Semester Exam(ESE):</b> 3hours
<b>Total Marks:</b> 100	<b>Elective Status:</b> Professional Elective-VI

**On Completion of the course, the student will have the ability to:**

<b>CO#</b>	<b>Course Outcomes</b>
<b>1.</b>	Inculcate various entrepreneurship skills to students.
<b>2.</b>	Impart knowledge about industry structure and how to start up a company
<b>3.</b>	Analyze how to generate and exploit new opportunities
<b>4.</b>	Locate domestic and international opportunities
<b>5.</b>	Understand various sources of capital for business.
<b>6.</b>	Identify and understand and differentiate various legal issues for the entrepreneur such as patents, law suits, copy rights etc.

**Prerequisites:** None

**Additional Material Allowed in ESE:** Scientific Calculator

**Detailed Contents:**

**Part-A**

**Entrepreneurship and the Entrepreneurial Mind-Set:** The nature of entrepreneurship, entrepreneur's thinking, the intention to act entrepreneurially, Entrepreneur background and characteristics, Role models and support systems, sustainable entrepreneurship, corporate Entrepreneurship, establishing corporate entrepreneurship in organization [3L]

**Generating And Exploiting New Entry Opportunities And Business Ideas:** new entry, generation of new entry of opportunity, risk reduction strategies for new entry exploitation. ideas from trend analysis, trends, sources of new ideas, methods of generating ideas, creative problem solving, creativity and entrepreneurship, innovation, entrepreneurial innovation, opportunity recognition, product planning and development process, e-commerce and business startup.[5L]

**Identifying and Analyzing Domestic and International Opportunities:** Opportunity recognition and the opportunity assessment plan, information sources, sources of information for start-up entrepreneurs in India, technical consultancy organizations, government policies for small scale enterprises, Nature of international entrepreneurship, the importance of international business to the firm, international versus domestic entrepreneurship. [5L]

**Protecting the Idea and Other Legal Issues for the Entrepreneur:** Intellectual property, need for a lawyer, selection of a lawyer, legal issues in setting up the organization, patents, business methods patents, startup without a patent, trademarks, copyrights, trade secrets and noncompetition agreements, licensing, product safety and liability, insurance, Sarbanes-Oxley act, Contracts. [4L]

**The Business Plan:** Planning as part of the business operation, writing the business plan, scope and values of the business plan, evaluation of the plan, presenting the plan, information needs, financial information needs, using the internet as a resource tool, using and implementing the business plan, reasons of business plan failure. [2L]

**The Marketing Plan:** Industry Analysis, Marketing research for the new venture, difference between a business plan and a marketing plan. Preparing the marketing plan, characteristics of a marketing plan, the marketing mix, steps in preparing the marketing plan. [2L]

### PART - B

**The Organizational Plan:** Developing the management team, legal forms of business, tax attributes of forms of business, the limited liability company versus the S-corporation, designing the organization, building the management team and a successful organization culture, the role of a board of directors, the board of advisors. [3L]

**The Financial Plan:** Operating and capital budgets, forecasting sales, pro forma income statements, pro forma cash flow statement, pro forma balance sheet, break-even analysis, pro forma sources and applications of funds statement, software packages. [3L]

**Sources of Capital:** An overview, personal funds, family and friends, commercial banks, role of Government Agencies in small-business financing, research and development limited partnerships, Government grants, Private placement, bootstrap financing, financing the business, informal risk-capital market, venture capital, valuing your company, going public. [4L]

**Management of Enterprises:** Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds. [4L]

**Case Studies:** Case studies related to successful entrepreneurs [5L]

#### Text Books:

1. Robert D. Hsirich, Mathew J. Manimala, Michael P. Peters and Dean A. Shepherd, "Entrepreneurship", 9/e, McGraw Hill Education, 2014.
2. Thomas H. Byers, Richard C. Dorf, Andrew J. Melson, "Technology Ventures: From idea to Enterprise", 4/e McGraw Hill, 2014.
3. Saini, J. S., 'Entrepreneurial Development Programmes and Practices', Deep & Deep Publications (P), Ltd, 2008.

#### Reference Books:

1. Kenji Uchino, "Entrepreneurship for Engineers", CRC Press, 2009.
2. Vasant Desai, "Entrepreneurship Development", PHI, 2011.
3. Anjan Rai Chaudhri, "Managing New Ventures: Concepts and Cases On Entrepreneurship", PHI, 2010.

**Subject Name:** Business Information System  
**Subject Code – PEIT-130**

<b>Programme:</b> B.Tech(IT)	<b>L:3 T:1 P:0</b>
<b>Semester:</b> 8(Choice-III)	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 03
<b>Internal Marks:</b> 40	<b>Percentage of Numerical Content-</b> Nil
External Marks: 60	<b>Duration of End Semester Exam:</b> 3hrs
<b>Total marks:</b> 100	

**Additional Materila Allowed in End Semester Exam : None**

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
CO1	To know about modern business organization, their structures and business process flows.
CO2	To know various enterprise systems and different types of data in them.
CO3	To know the procurement process, information flow in Enterprise System and monitoring the process.
CO4	To know the basic fulfilment process and its financial impact.
CO5	To know the production strategies and basic production process.
CO6	To know all the additional integrated information processes required for business development.

## Detailed Contents

### Part A

- Organization, Business Process & Information Systems [6]**
- The Modern Global Business Environment:** Global Competition, The Information Revolution, The knowledge worker, key business processes.
- The Functional Organizational Structure:** The Salio effect, delays in executing the process, excess inventory, lack of visibility across processes.
- The importance of Information Systems:** Data and Information, Functional information systems, Enterprise systems, why information is important
- Flows in Business Processes**
- The roles of Enterprise systems in Organization:** Execute the Process, Capture and store process data, Monitor process performance
- Financial impact of process steps [5]**
- Enterprise Systems:** Stand-Alone mainframe systems, Client-Server Architecture, Service-oriented architecture, types of enterprise systems
- Types of data in ES:** Transaction Data, Master Data, Organizational Data
- Super Skateboard Builders (SSB):** Product Line, Customers, Vendors (Suppliers), Employees, Information Systems
- The Procurement Process [5]**
- Key Concepts and Assumptions:** A Basic Procurement Process, Physical Flow, Document and Data Flow, Information Flow, Financial Impact

**Role of Enterprise Systems in the Procurement Process:** Execute the Process, Capture and Store Process Data, Monitor the Process

**Part B**

**The Fulfilment Process**

[4]

**Key Concepts and Assumptions:** A Basic Fulfillment Process, Physical Flow, Document and Data Flow, Information Flow, Financial Impact

**Role of Enterprise Systems in the Fulfillment Process:** Execute the Process, Capture and Store Process Data, Monitor the Process

**The Production Process**

[5]

**Key Concepts and Assumptions:** Production Processes and Strategies, Master Data in the Production Process, A Basic Production Process, Physical Flow, Document and Data Flow, Information Flow

**Role of Enterprise Systems in the Production Process:** Execute the Process, Capture and Store Process Data, Monitor the process

**Integrated Processes**

[8]

**Integrated Processes:** Integrated Process Execution, The Fulfillment Process: Initial Steps, Review Inventory of Finished Goods, The Production Process: Initial Steps, Review Inventory of Raw Materials, The Procurement Process, The Production Process Resumed, The Fulfillment Process Resumed

**Additional IntraCompany Processes:** Human Capital Management, Asset Management

**Extended (InterCompany) Processes:** Supply Chain Management (SCM), Supplier Relationship Management (SRM), Product Life Cycle Management (PLM), Customer Relationship Management (CRM)

**Text Books:**

1. Essentials of Business Processes and Information Systems by Simha R. Magal & Jeffrey Word
2. Business Information Systems by Muneesh Kumar

**Subject Name:** Term Paper  
**Subject Code – PEIT-107**

<b>Programme:</b> B.Tech(IT)	<b>L:3 T:1 P:0</b>
<b>Semester:</b> 8(Choice-III)	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 03
<b>Internal Marks:</b> 40	<b>Percentage of Numerical Content-</b> Nil
External Marks: 60	<b>Duration of End Semester Exam:</b> 3hrs
<b>Total marks:</b> 100	<b>Course Status:</b> Seminar/Project

**Pre-requisites:** Knowledge of basic sciences.

**Course Outcomes**

- a. The student will write a technical paper with explanation and logical thought process.
- b. The student will develop a presentation skill of technical topics.
- c. The student will develop reading habit and comprehending technical literature.
- d. The student will collate information in a logical manner.

**General Guidelines**

A term (or research) paper is primarily a record of intelligent reading in several sources on a Particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned.

The evaluation will be done by Board of examiners comprising of the faculties.

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

**1. Choosing a Subject**

The subject chosen should not be too general and relevant to the curriculum .

**2. Finding Sources of materials**

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.

**3. Collecting the notes**

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a ) Get facts, not just opinions. Compare the facts with author's conclusion.
- b ) In research studies, notice the methods and procedures, results & conclusions.

c) Check cross references.

#### **4. Outlining the paper**

a) Review notes to find main sub-divisions of the subject.

b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### **5. Writing the first draft**

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose

b) main body of the paper

c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

#### **6. Editing & Preparing the final Paper**

a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.

c) Check for proper spelling, phrasing and sentence construction.

d) Check for proper form on footnotes, quotes, and punctuation.

e) Check to see that quotations serve one of the following purposes:

( i) Show evidence of what an author has said.

( ii) Avoid misrepresentation through restatement.

( iii) Save unnecessary writing when ideas have been well expressed by the original author.

f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

### **Contents**

Term papers should be composed of the following sections:

1 ) Title page

2 ) Table of contents

3 ) Introduction

4 ) Review

5 ) Discussion & Conclusion

6 ) References and Bibliography

7) Appendix