

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
(AUTONOMOUS)**

**COMPUTER SCIENCE AND ENGINEERING**  
(Effective for the batches admitted in 2019-20)

**IV B. Tech – I Semester (Theory – 6, Lab – 4) – AK19**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	PC	19APC0519	Cryptography and Network Security	2	0	0	2	30	70	100
2	PC	19APC0526	Mobile Application Development	2	0	0	2	30	70	100
3	OE	19APC0423 19APE0411 19APE0418	Open Elective III (Inter Discipline Elective III) Digital Image Processing Embedded Systems Enabling Technologies For Data Science & Analytics: IoT	3	0	0	3	30	70	100
4	PE	19APE0507 19APE0508 19APE0509 19APE0513 19APE0514	Professional Elective III Deep Learning Techniques Real Time Operating Systems Blockchain Technology Agile Methodologies Adhoc & Sensor Networks	3	0	0	3	30	70	100
5	PE	19APE0510 19APE0511 19APE0512 19APE0515 19APE0516	Professional Elective IV Data Analytics Natural Language Processing Software Project Management Linux Environment System Distributed Systems	3	0	0	3	30	70	100
6	HE	19AHE9903/ 19AHE9910/ 19AHSMB01	Humanities Elective I Professional Communication Mathematical Modeling and Simulation Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
<b>PRACTICAL</b>										
7	PC	19APC0528	Cryptography and Network Security Lab	0	0	2	1	30	70	100
8	PC	19APC0527	Mobile Application Development Lab	0	0	2	1	30	70	100
9	PR	19APR0504	Socially Relevant Projects (15 Hrs / Sem)	0	0	0	0.5	50	-	50
10	PR	19APR0505	Industrial Training / Internship / Research Projects in National Laboratories / Academic Institutions	0	0	3	1.5	50	-	50
<b>TOTAL</b>							<b>19</b>	<b>340</b>	<b>560</b>	<b>900</b>

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0519	CRYPTOGRAPHY AND NETWORK SECURITY	2	0	0	2

**Course Objectives:**

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPsec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls

**Course Outcomes:**

<b>CO1:</b>	Understand basic Cryptographic algorithm, Security issues
<b>CO2:</b>	Identify various type of vulnerabilities of a computer network
<b>CO3:</b>	Outline various Security algorithms.
<b>CO4:</b>	Design secure system
<b>CO5:</b>	Investigate the threads and identify the solution for the threats

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	2												
CO3	2	3												2
CO4	3		2											
CO5	3			3									3	

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

**UNIT - I**

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT - II**

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution

**UNIT - III**

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

**UNIT - IV**

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, combining security associations, key management.

**UNIT - V**

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls. Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

**TEXT BOOKS:**

1. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson Education, 2011.
2. Atul Kahate, "Cryptography and Network Security", 2nd Edition, Mc Graw Hill, 2010.
3. Bernard Menezes "Network Security and Cryptography", 1st Edition, CENGAGE Learning, 2010.

**REFERENCES:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
<b>19APC0526</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Course Objective:**

This course is designed to:

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications.
- To understand fundamentals of android programming.

**Course Outcomes:**

<b>CO1:</b>	Demonstrate knowledge on mobile platforms, mobile user interface and user interface design requirements.
<b>CO2:</b>	Design user interfaces by analyzing user requirements.
<b>CO3:</b>	Develop mobile applications for Messaging, Location-Based Services, and Networking
<b>CO4:</b>	Develop mobile applications and publish in different mobile platforms
<b>CO5:</b>	Use Android studio and iOS tools to develop mobile applications.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	<b>3</b>	<b>2</b>	<b>1</b>		<b>1</b>				<b>1</b>				<b>3</b>	<b>2</b>
CO2	<b>1</b>	<b>2</b>	<b>3</b>										<b>3</b>	
CO3	<b>1</b>		<b>2</b>			<b>2</b>			<b>2</b>	<b>3</b>				<b>2</b>
CO4		<b>2</b>	<b>3</b>	<b>1</b>				<b>1</b>	<b>2</b>	<b>3</b>				<b>2</b>
CO5			<b>3</b>											<b>3</b>

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**Introduction to Android:** The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.

**UNIT - II**

**Basic Widgets:** Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons

**UNIT - III**

Building Blocks for Android Application Design: Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout

ADVANCED USER INTERFACE AND DATA PERSISTENCE: Basic views, Picker views, List view, Image view, Menus with views, Web view, saving Creating and using databases.

**UNIT - IV**

Using Selection widgets and Debugging: Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Messaging, Location-Based Services and Networking SMS messaging, sending e-mail, displaying maps, getting location data, monitoring a location, Consuming web services using HTTP.

**UNIT - V**

ANDROID SERVICES, PUBLISHING ANDROID APPLICATIONS: Services, Communication between a service and an activity, Binding activities to services, Threading, Preparing for publishing, Deploying APK files. Building the app in android debugging an android app. iOS tools, iOS project, Debugging iOS apps

**Text Books**

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. J. F. DiMarzio, Beginning Android Programming with Android Studio, Wiley India, 4 thEdition, 2017.
3. Wei – Meng Lee, Beginning Android 4 Application Development, Wrox, 2017.
4. Jeff McWherter and Scott Gowell, Professional Mobile Application Development,Wiley India, 1 stEdition, 2012.

**Reference Books:**

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition:
4. Neils Smyth, Android Stduio Development Essentials, Creative Space Independent publishing platform, 7 th Edition 2016.
5. Paul Deital and Harvey Deital, Android How to Program,Detial associates pu

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0423	DIGITAL IMAGE PROCESSING	3	0	0	3

**Course Objectives:**

The objectives of the course are:

- Provide the student with the fundamentals of digital image processing.
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

**Course Outcomes:**

<b>CO1:</b>	Review the fundamental concepts of a digital image processing system.
<b>CO2:</b>	Analyze images in the frequency domain using various transforms.
<b>CO3:</b>	Learn different techniques employed for the enhancement of images.
<b>CO4:</b>	Apply the techniques for image restoration and segmentation
<b>CO5:</b>	Analyze and apply various spatial and frequency domain techniques of image compression.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	
CO2	3	3	2	2	2									3
CO3	3													
CO4	2	3	3	3									3	
CO5	1	1			1							1	1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**Image Processing Fundamentals:**

Introduction to Digital Image processing – Example fields of its usage- Fundamental steps in Image Processing, Components of general image processing system, Image sensing and Acquisition – image Modeling - Sampling, Quantization and Digital Image representation - Basic relationships between pixels, - Mathematical tools/ operations applied on images - imaging geometry.

**UNIT - II**

**Image Transforms:**

Discrete Fourier Transform -Discrete Cosine Transforms- Discrete Sine Transform, Walsh- Hadamard Transforms- Haar Transform- Hotelling Transform, Comparison of properties of the above.

**UNIT - III**

**Image Enhancement Techniques:**

Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency Domain, Image smoothing, Image sharpening, Color image Enhancement

**UNIT - IV**

**Image Restoration:**

Degradation model, Algebraic approach to restoration – Inverse filtering – Least Mean Square filters, Constrained Least square restoration, Blind Deconvolution.

**Image segmentation:** Edge detection -,Edge linking , Threshold based segmentation methods – Region based Approaches - Template matching –use of motion in segmentation

**UNIT - V**

**Image Compression:**

Redundancies in Images - Compression models, Information theoretic perspective- Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

**Text Books:**

1. R.C .Gonzalez & R.E. Woods, “Digital Image Processing”, Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A .K. Jain, “Fundamentals of Digital Image processing”, PHI.

**References:**

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, “Digital Image processing using MATLAB”, Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”,Tata McGraw Hill
3. William K. Pratt, “Digital Image Processing”, John Wiley, 3rd Edition, 2004.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0411	EMBEDDED SYSTEMS	3	0	0	3

**Course Objectives:**

This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

**Course Outcomes:**

<b>CO1:</b>	Understand the fundamental concepts of Embedded systems.
<b>CO2:</b>	Analyze TM4C Architecture, Instruction Set, addressing modes to develop programs for various applications using Assembly and Embedded C.
<b>CO3:</b>	Develop an embedded system by interfacing the microcontrollers and IDE tools.
<b>CO4:</b>	Figure out problems using TM4C On chip Resources such as Timer, Clock System, Low Power Modes/techniques and Interrupt Structure.
<b>CO5:</b>	Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2										2	
CO2	3	2											2	
CO3			3										3	
CO4	2													
CO5	2													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT-I**

**INTRODUCTION TO EMBEDDED SYSTEMS**

Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design

**UNIT-II**

**EMBEDDED PROCESSOR ARCHITECTURE**

CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, addressing modes and instruction set basics.

**UNIT- III**

**OVERVIEW OF MICROCONTROLLER AND EMBEDDED SYSTEMS**

Embedded hardware and various building blocks, Processor Selection for an Embedded System, Interfacing Processor, Memories and I/O Devices, I/O Devices and I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices. Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System

**UNIT-IV**

**MICROCONTROLLER FUNDAMENTALS FOR BASIC PROGRAMMING**

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

**UNIT-V**

**EMBEDDED COMMUNICATIONS PROTOCOLS AND INTERNET OF THINGS**

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub BoosterPack” Embedded Networking fundamentals, IoT overview and architecture, Overview of wireless sensor networks and design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API. Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi-Fi Connectivity”

**Text Books:**

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, Create space publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition Jonathan W Valvano, Create space publications ISBN-13: 978-1477508992

**References:**

1. [http://processors.wiki.ti.com/index.php/HandsOn\\_Training\\_for\\_TI\\_Embedded\\_Processors](http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors)
2. [http://processors.wiki.ti.com/index.php/MCU\\_Day\\_Internet\\_of\\_Things\\_2013\\_Workshop](http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop)

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0418	Enabling Technologies for Data Science & Analytics: IoT	3	0	0	3

**Course objectives:**

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IoT Devices.

**Course Outcomes:**

<b>CO1:</b>	Able to understand the applications of IOT
<b>CO2:</b>	Able to understand build blocks of IOT
<b>CO3:</b>	Apply IOT design methodologies
<b>CO4:</b>	Able to understand the HADOOP and IEEE standard protocol
<b>CO5:</b>	Able to understand the Zigbee devices

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2					2			1	
CO2	3	3			2					2			1	
CO3	3	3	2			2	2							1
CO4	3	3	2	2										1
CO5	3				2	2				2			1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT I: Introduction to Internet of Things**

Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. Domain Specific IoTs Introduction, Home Automation, cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle.

**UNIT II: IoT and M2M**

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT System Management with NETCONF-YANG Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCONF, YANG, IoT System Management with NETCONF-YANG.

**UNIT III: Developing Internet of Things**

Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring. Case Studies Illustrating IoT Design: Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

**UNIT IV: Advanced Topics:**

Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis. IEEE 802.15.4: The IEEE 802 committee family of protocols, The physical layer, The Media Access control layer, Uses of 802.15.4, The Future of 802.15.4: 802.15.4e and 802.15.4g.

**UNIT V: ZigBee:**

Development of the standard, ZigBee Architecture, Association, The ZigBee network layer, The ZigBee APS Layer, The ZigBee Devices Object (ZDO) and the ZigBee Device Profile (ZDP), Zigbee Security, The ZigBee Cluster Library (ZCL), ZigBee Applications profiles, The ZigBee Gateway Specifications for network devices.

**TEXT BOOKS:**

1. Internet of Things a Hands-on Approach by Arshdeep Bahga and Vijay Madiseti. University Press.
2. The Internet of Things key applications and protocols by Oliver Hersent, David Boswarthick and Omar elloumi, Wiley Student Edition.

**REFERENCES:**

1. Internet of Things: Architecture, Design Principles and Applications by Raj Kamal MCGraw Hill Edition.

AIATS TPT - CSE

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0507	Deep Learning Techniques	3	0	0	3

**Course Objectives:**

After completion of the course, students will be able to

- Learn deep learning methods for working with sequential data.
- Learn deep recurrent and memory networks.
- Learn deep Turing machines.
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

**Course Outcomes:**

<b>CO1:</b>	Demonstrate an understanding of statistics and machine learning concepts
<b>CO2:</b>	Demonstrate the basic concepts fundamental learning techniques and layers.
<b>CO3:</b>	Discuss the Neural Network training, various random models.
<b>CO4:</b>	Explain different types of deep learning network models.
<b>CO5:</b>	Classify the Probabilistic Neural Networks.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2		3		2							3	
CO2	2		3	1										
CO3	3	3	3	1										
CO4	2	2	1	3		1		1						
CO5	1	3	2	2				1						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**A Review of Machine Learning:** The Learning Machines, The Math Behind Machine Learning: Linear Algebra, The Math Behind Machine Learning: Statistics, How Does Machine Learning Work?, Logistic Regression, The Logistic Function, Evaluating Models, Building an Understanding of Machine Learning

**UNIT - II**

**Foundations of Neural Networks and Deep Learning :** Neural Networks: Biological Neuron, Perceptron, Multi Layer Perceptron. Training Neural Networks: Back-propagation, Activation Functions, Loss Function, Hyper-parameters.

**UNIT - III**

**Fundamentals of Deep Learning:** Definition of Deep Learning, Common Architecture Principles of Deep Networks, Building Blocks of Deep Learning.

**Architectures of Deep Learning:** Unsupervised Pre trained Networks, Convolution Neural Networks (CNN's), Recurrent Neural Networks, and Recursive Neural Networks

**UNIT - IV**

**Deep Learning Research:** Linear factor models: Probabilistic PCA And Factor Analysis, Independent Component Analysis, Sparse Coding, Manifold Interpretation of PCA, Auto Encoders: Regularized Autoencoders, Representational Power, Layer Size and Depth, Denoising Autoencoders, Applications of Autoencoders.

**UNIT - V**

**Deep Generating Models:** Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolution Boltzmann Machines, Backpropagation through Random Operations, Directed Generative Nets, Generating Static Networks.

**Applications:** Large Scale Deep Learning, Image Recognition, Speech Recognition, Natural Language Processing, Other Applications.

**Text Books:**

1. Deep Learning A practitioner's approach- josh Patterson and Adam Gibson, OREILLY.
2. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.

**References:**

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G., H., and Van Loan, C., F, JHU Press, 2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
4. Bishop, C. , M., Pattern Recognition and Machine Learning, Springer, 2006.

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0508	REAL TIME OPERATING SYSTEMS	3	0	0	3

**Course Objectives:**

- Acquire skills necessary to design and develop embedded applications by means of real-time operating systems
- Understand embedded real-time operating systems

**Course Outcomes:**

<b>CO1:</b>	Characterize real-time systems and describe their functions
<b>CO2:</b>	Analyze, design and implement a real-time system
<b>CO3:</b>	Apply formal methods to the analysis and design of real-time systems
<b>CO4:</b>	Apply formal methods for scheduling real-time systems
<b>CO5:</b>	Characterize and describe reliability and fault tolerance issues and approaches.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	1		2		1								2	
CO3			1	2										2
CO4			1	1										
CO5	2				1									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**Unit-1**

Typical Real time Applications: Digital control, High-level control, Signal processing, other Real-time Applications.

Hard versus Soft Real-Time Systems: Jobs and processors, Release time, dead lines and Timing constraints, Hard and soft timing constraints, Hard Real time systems, Soft Real-time Systems.

A Reference Model of Real Time Systems: Processors and resources, Temporal parameters of Real time workload, periodic task model, precedence constraints and data dependency, Functional parameter, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.

Commonly used Approaches to real time Scheduling: Clock-Driven Approach, Weighted Round-Robin Approach, Priority driven Approach, Dynamic vs Static Systems, Effective release time and deadlines, Optimality of the EDF and LST algorithms, Nonoptimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority driven System, Off line vs On line scheduling, summary.

**Unit-2**

Clock-Driven Scheduling: Notations and Assumptions, static, Timer-Driven scheduler, General Structure of the Cyclic Scheduler, Improving the average response time of Aperiodic Jobs, Scheduling sporadic Jobs, Practical considerations and generalizations, Algorithm for generating Static Schedules, Pros and cons of Clock-driven scheduling, summary.

**Unit-3**

Priority-Driven Scheduling of periodic Tasks : Static Assumption, Fixed-priority vs Dynamic-priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability test for Fixed-priority tasks with Short Response time, A Schedulability test for Fixed-priority tasks with arbitrary Response time, Sufficient Schedulability conditions for the RM and DM Algorithms, summary.

**Unit-4**

Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and approaches, Diferrable servers, Sporadic Servers, Constant utilization, total bandwidth and weighted fair –Queueing servers, Slack stealing in Dead-line Driven System, Stack stealing in Fixed-priority systems, Scheduling of sporadic jobs, Real-time performance for jobs with soft timing constraints, A two-level scheme for Integrated scheduling.

**Unit-5**

Resources and Resource access control: Assumptions on Resources and their usage, Effects of Resource contention and resource access control, Non Preemptive critical section, Basic Priority inheritance protocol, Basic Priority ceiling protocol, Stack –based, Priority ceiling protocol, Use of priority ceiling protocol in Dynamic priority systems, pre-emption ceiling protocol, Controlling accesses to Multiple unit Resources, Controlling concurrent accesses to data objects.

Multiprocessor Scheduling, Resource access control, and Synchronization: Model of Multiprocessor and Distributed Systems, Task assignment, Multiprocessor Priority ceiling protocol, Elements of Scheduling Algorithms for End-to-End Periodic Tasks, Schedulability of Fixed-priority End-to-End periodic Tasks, End to End tasks in heterogeneous Systems, Predictability and validation of Dynamic Multiprocessor Systems, Summary.

**Text Book:**

1. "Real-Time Systems" by Jane W.S Liu, Pearson Edition, 2006.

**References:**

1. Real-Time Systems: Scheduling, Analysis, and Verification, Cheng, A. M. K.: Wiley, 2002.
2. Z.: Scheduling in Real-Time Systems, by Cottet, F., Delacroix, J., Kaiser, C., Mammeri John Wiley & Sons, 2002.
3. Real-Time Systems, C. M., Shin, K. G. McGraw-Hill, Krishna 1997.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0509	BLOCKCHAIN TECHNOLOGY	3	0	0	3

**Course Objectives:**

By the end of the course, students will be able to

- Understand the philosophy of Blockchain and the cutting edge technology behind its functions
- Illustrate how to setup Ethereum tools
- Explain the key vocabulary and concepts used in Blockchain for Business

**Course Outcomes:**

<b>CO1:</b>	Able to understand the applications of Block Chain
<b>CO2:</b>	Make use of the specific mechanics of Ethereum
<b>CO3:</b>	Experiment with Smart contracts
<b>CO4:</b>	Develop Enterprise applications using Blockchain
<b>CO5:</b>	Create customized blockchain solutions

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	3	3	3	2									
CO3	3	3	3						2				1	
CO4	3	3	3						2	2			1	2
CO5	3	3	3	3									1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**Blockchain concepts:** Blockchain, Blockchain application example: Escrow, Blockchain stack, from web 2.0 to the next generation decentralized web, domain specific Blockchain application, Blockchain benefits and challenges. Blockchain application templates: Blockchain application components, design methodology for Blockchain applications, Blockchain applications templates

**UNIT - II**

**Setting up Ethereum development tools:** Ethereum clients, Ethereum languages, TestRPC, Mist Ethereumwalle, meta mask, web3 JavaScript API, truffle. Ethereum Accounts: Ethereum Accounts, keypairs, working with EOA Accounts, working with contract accounts.

**UNIT - III**

**Smart contracts:** Smart contract, structure of a contract, setting up and interacting with a contract using Geth client, setting up and interacting with a contract using Mist Wallet.

**UNIT - IV**

**Smart contracts (continued):** Smart contract examples, Smart contract patterns. Decentralized Applications: implementing Dapps, case studies.

**UNIT - V**

**Mining:** Consensus on Blockchain network, mining, Block validation, state storage in Ethereum.

**Text book:**

1. Arshadeepbahga, Vijay madiseti, "Blockchain Applications A hands-on approach", VPT 2017.
2. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan, "Blockchain Technology", Universty Press, 2021

**References:**

1. Imran Bashir, "Mastering Blockchain" Packt Publishing Ltd, March 2017.
2. Melanie swan, "Blokchain blueprint for a new economy", O'REILLY

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0513	AGILE METHODOLOGIES	3	0	0	3

**Course Objectives:**

- Master the art of agile development.
- Understand how an iterative, incremental development process leads to faster delivery of more useful software.
- Elucidate the essence of agile development methods
- Explain the principles and practices of extreme programming

**Course Outcomes:**

<b>CO1:</b>	Adopt Extreme Programming
<b>CO2:</b>	Create own agile method by customizing XP to a particular situation
<b>CO3:</b>	They must know about the way of correcting bug during build and code integration(L3)
<b>CO4:</b>	Able to plan for developing the software and managing(L2)
<b>CO5:</b>	known precisely about the different ways of software development(L6)

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				2				2	1
CO2	3	3	2	2	2				2				2	1
CO3	3	3	3	3									3	3
CO4		2	3										3	
CO5	3	3	2	2									2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

Why Agile? , How to be Agile, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value.

**UNIT - II**

Practicing XP-Thinking, Pair Programming, Energized Work, Informative Workspace, RootCause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

**UNIT - III**

Releasing-Done Done, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**UNIT - IV**

Planning-Vision, Release Planning, Risk Management, Iteration Planning, Stories, Estimating.

**UNIT - V**

Developing-Incremental Requirements, Customer Tests, Test- Driven Development, Refactoring, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

**Text book:**

1. James Shore and Shane Warden, " The Art of Agile Development", O'REILLY, 2007.

**References:**

1. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices" , PHI, 2002.
2. Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012.
3. Bhuvan Unhelkar, "The Art of Agile Practice: A Composite Approach for Projects and Organizations", CRC Press.
4. Jim Highsmith, "Agile Project Management", Pearson education, 2004.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0514	ADHOC & SENSOR NETWORKS	3	0	0	3

**Course Objectives:**

- To understand the basics of Ad-hoc & Sensor Networks.
- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

**Course Outcomes:**

<b>CO1:</b>	List the design issues for Adhoc and sensor networks
<b>CO2:</b>	Analyze the use of TCP in Wireless networks.
<b>CO3:</b>	Justify the need for new MAC Protocols for Adhoc networks.
<b>CO4:</b>	Extend the existing protocols to make them suitable for Adhoc Networks.
<b>CO5:</b>	Evaluate the performance of Protocols in Adhoc and sensor networks. Design new Protocols for Adhoc and Sensor networks.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3											3	
CO3	3	2		3									3	
CO4	3	2	3											2
CO5	3	2	3	2	3									3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

IEEE 802 Networking Standard. Fundamentals of WLANs, IEEE 802.11 standard. What is Wireless Internet?, Mobile IP, Cellular and Adhoc Wireless Networks, Applications of Adhoc Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

**UNIT - II**

Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that used Directional Antennas, Other MAC Protocols.

**UNIT - III**

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table-Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols, Power-Aware Routing Protocols.

**UNIT - IV**

Multicast Routing in Ad hoc Wireless Networks- Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An architecture reference model for multicast routing protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols, Mesh-Based Multicast Routing Protocols, Summary of Tree and Mesh-Based Protocols. Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions. TCP over Ad Hoc Wireless Networks, Other Transport Layer Protocols for Ad Hoc Wireless Networks.

**UNIT - V**

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Wireless Sensor Networks- Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other issues.

**Text book:**

Murthy, C. Siva Ram, and B. S. Manoj. Ad hoc wireless networks: Architectures and protocols. Pearson Education India, 2004.

**References:**

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication -2002.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0510	DATA ANALYTICS	3	0	0	3

**Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of Analytics for Business
- To introduce the tools, technologies & programming languages which is used in day today analytics cycle

**Course Outcomes:**

<b>CO1:</b>	Distinguish Styles of data analysis
<b>CO2:</b>	Classify approaches to generalize from data
<b>CO3:</b>	Apply Generalized linear Models
<b>CO4:</b>	Interpret the results of the model
<b>CO5:</b>	Understand the data analytics role in real-time applications

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		2												
CO3			2										2	
CO4		2	2	2		2								
CO5	2				3									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

An overview of R, Vectors, factors, univariate time series, Data frames, matrices, Functions, operators, loops, Graphics, Revealing views of the data, Data summary, Statistical analysis questions, aims, and strategies; Statistical models, Distributions: models for the random component, Simulation of random numbers and random samples, Model assumptions

**UNIT - II**

Basic concepts of estimation, Confidence intervals and tests of hypotheses, Contingency tables, One-way unstructured comparisons, Response curves, Data with a nested variation structure, Resampling methods for standard errors, tests, and confidence intervals, Theories of inference, Regression with a single predictor, multiple linear regressions.

**UNIT - III**

Exploiting the linear model framework: Levels of a factor – using indicator variables, Fitting multiple lines, Polynomial regression, Methods for passing smooth curves through data, Smoothing with multiple explanatory variables, Generalized linear models, Logistic multiple regression, Logistic models for categorical data, Poisson regression, Additional notes on generalized linear models, Models with an ordered categorical or categorical response, Survival analysis, Transformations for count data, Time series models

**UNIT - IV**

Simulation - Motivating Examples, Simulation Modeling Method, case study. Introduction to optimization – Introduction, Methods in Optimization- Linear Programming, Integer Programming—Enforcing Integrality Restrictions on Decision Variables, Nonlinear Optimization Models. Forecasting Analytics - Methods and Quantitative Approaches of Forecasting, Applied Forecasting Analytics Process, Applications, Evaluating Forecast Accuracy. Survival Analysis – Introduction, Motivating Business Problems, Methods of Survival Analysis, case study

**UNIT - V**

Applications: Retail Analytics, Marketing Analytics, Financial Analytics, Social Media and Web Analytics, Healthcare Analytics

**Text Books:**

1. Data Analysis and Graphics Using R – an Example-Based Approach, John Maindonald, W. John Braun, Third Edition, 2010
2. Essentials of Business Analytics An Introduction to the Methodology and its Applications, Bhimasankaram Pochiraju, Sridhar Seshadri, Springer, 2019, <https://doi.org/10.1007/978-3-319-68837-4>

**Reference Books:**

1. Data Analytics Using R Paperback, Seema Acharya, McGraw Hill Education, Apr 2018
2. R for Everyone: Advanced Analytics and Graphics Paperback, Jared P. Lander, Pearson Education, 2018
3. Fundamentals of Business Analytics, R N Prasad, Seema Acharya, Wiley Publications, 2ed Paperback, 2016
4. Business Analytics for Decision Making, Regi Mathew, First Edition, Pearson Paperback, 2020

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0511	NATURAL LANGUAGE PROCESSING	3	0	0	3

**Course Objectives:**

- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approaches to machine translation.
- Explore machine learning techniques used in NLP.

**Course Outcomes:**

<b>CO1:</b>	Build NLP applications using Python.
<b>CO2:</b>	Apply various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
<b>CO3:</b>	Explain the fundamentals of CFG and parsers and mechanisms in ATN's.
<b>CO4:</b>	Apply Semantic Interpretation and Language Modeling..
<b>CO5:</b>	Interpret Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												3
CO4			3											
CO5				3									3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**Introduction to Natural language:** The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax

**UNIT - II**

**Grammars and Parsing:** Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

**UNIT - III**

**Grammars for Natural Language:** Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

**UNIT - IV**

**Semantic Interpretation:** Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.

**Language Modeling:** Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

**UNIT - V**

**Machine Translation Survey:** Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

**Multilingual Information Retrieval:** Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

**Multilingual Automatic Summarization:** Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

**TEXT BOOKS:**

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications : From Theory To Practice Daniel M.Bikel and Imed Zitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi,Vineet chaitanya,Prentice -Hall of India.

**REFERENCES:**

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0512	SOFTWARE PROJECT MANAGEMENT	3	0	0	3

**Course Objectives:**

- Understanding the specific roles within a software organization as related to project and process management
- Describe the principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management).
- Understanding the basic infrastructure competences (e.g., process modeling and measurement)
- Understanding the basic steps of project planning, project management, quality assurance, and process management and their relationships

**Course Outcomes:**

<b>CO1:</b>	Describe the purpose and importance of project management.
<b>CO2:</b>	Manage the size of software project.
<b>CO3:</b>	Develop artifacts and model-based software.
<b>CO4:</b>	Plan/monitor the activities in software development
<b>CO5:</b>	Implement the process of project management and its applications

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		2	2										2	
CO3		2	2										2	
CO4		2	2										2	
CO5	3													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**Conventional Software Management:** The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation

**UNIT - II**

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**The old way and the new:** The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process

**UNIT - III**

**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.

**UNIT - IV**

**Work Flows of the process:** Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Interaction planning process, Pragmatic planning.

**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building Blocks, The Project Environment

**UNIT - V**

**Project Control and Process instrumentation:** The server care Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation.

**Tailoring the Process:** Process discriminates, Example. Future Software Project Management: Modern Project Profiles Next generation Software economics, modern Process transitions.

**Case Study:** The Command Center Processing and Display System-Replacement (CCPDS-R)

**Text Books:**

1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata Mc- Graw Hill

**Reference Books :**

1. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006
2. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
3. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, second edition, Wiley India, 2004.
4. Agile Project Management, Jim Highsmith, Pearson education, 2004
5. The art of Project management, Scott Berkun, O'Reilly, 2005.
6. Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0515	LINUX ENVIRONMENT SYSTEM	3	0	0	3

**Course Objectives:**

- Understand the Multiuser, Multiprocessing, Multitasking, and multiprogramming environment.
- Learn the various flavors and installation types of Linux operating system.
- Experiences the installation and configuration status of Linux system.
- Learn the file system and various commands of Linux environment system.

**Course Outcomes:**

<b>CO1:</b>	Able to describe and use the LINUX operating system.
<b>CO2:</b>	Able to describe and use the fundamental LINUX system tools and utilities.
<b>CO3:</b>	Able to describe and write shell scripts in order to perform basic shell programming.
<b>CO4:</b>	Able to describe and understand the LINUX file system.
<b>CO5:</b>	Effectively use the Linux system to accomplish typical personal, office, technical, and software development tasks.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3												
CO2	2	2			2									
CO3			3	2										
CO4		3												
CO5										2			2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**INTRODUCTION TO LINUX OPERATING SYSTEM:** Introduction and Types of Operating Systems, Linux Operating System, Features, Architecture Of Linux OS and Shell Interface, Linux System Calls, Linux Shared Memory Management, Device and Disk Management in Linux, Swap space and its management. File System and Directory Structure in Linux. Multi-Processing, load sharing and Multi-Threading in Linux, Types of Users in Linux, Capabilities of Super Users and equivalents.

**UNIT - II**

**INSTALLING LINUX AS A SERVER :** Linux and Linux Distributions ; Major differences between various Operating Systems (on the basis of: Single Users vs Multiusers vs Network Users; Separation of the GUI and the Kernel; Domains; Active Directory;).  
**INSTALLING LINUX IN A SERVER CONFIGUARTION :** Before Installation; Hardware; Server Design ;Dual-Booting Issues; Modes of Installation; Installing Fedora Linux; Creating a Boot Disk; Starting the Installation; GNOME AND KDE: The History of X Windows; The Downside; Enter GNOME; About GNOME ; Starting X Windows and GNOME; GNOME Basics; The GNOME Configuration Tool.

**UNIT - III**

**INSTALLING SOFTWARE :** The Fedora Package Manager; Installing a New Package using dpkg and RPM; Querying a Package; Uninstalling a Package using dpkg and RPM; Compiling Software; Getting and Unpacking the Package; Looking for Documentation; Configuring the Package; Compiling Your Package; Installing the Package, Driver Support for various devices in linux. **MANAGING USERS:** Home Directories ;Passwords; Shells; Stratup Scripts; Mail; User Databases; The / etc /passwd File; The / etc / shadow File; The / etc /group File; User Management Tools; Command-Line User Management; User LinuxConf to Manipulate Users and Groups; SetUID and SetGID Programs.

**UNIT - IV**

**THE COMMAND LINE :** An Introduction to BASH, KORN, C, A Shell etc. ; BASH commands: Job Control; Environment Variables; Pipes; Redirection; Command-Line Shortcuts; Documentation Tools; The man Command; the text info System; File Listings; Owner ships and permissions; Listing Files; File and Directory Types; Change Ownership; Change Group; Change Mode ; File Management and Manipulation; Process Manipulation; Miscellaneous Tools; Various Editors Available like: Vi and its modes, Pico, Joe and emacs, Su Command. **BOOTING AND SHUTTING DOWN:** LILO and GRUB; Configuring LILO; Additional LILO options; Adding a New Kernel to Boot ; Running LILO; The Steps of Booting; Enabling and disabling Services.

**UNIT - V**

**FILE SYSTEMS:** The Makeup File Systems; Managing File Systems; Adding and Partitioning a Disk; Network File S ystems; Quota Management; **CORE SYSTEM SERVICES:** The init Service; The inetd and xinetd Processess; The syslogd Daemon; The cron Program. **PRINTING :** The Basic of lpd; Installing LPRng; Configuring /etc/printcap; The /ETC/lpd.perms File; Clients of lpd, Interfacing Printer through Operating System.

**Text Books:**

1. Linux Administration: A Beginner's Guide by Steve Shah , Wale Soyinka, ISBN 0072262591 (0-07-226259-1), McGraw-Hill Education.
2. Unix Shell Programming, Yashavant P. Kanetkar, BPB Publications, 2003.
3. UNIX Concepts and Applications by Sumitabha Das Tata McGraw-Hill, 2006.
4. Operating System Concepts 8<sup>th</sup> edition, by Galvin Wiley Global Education, 2012.

**Reference Books :**

1. Unix operating system, by Grace Todino, John Strang, Jerry D. Peek Oreily publications 1993.
2. Operating System Concepts 8<sup>th</sup> edition, by Galvin Wiley Global Education, 2012.

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0516	DISTRIBUTED SYSTEMS	3	0	0	3

**Course Objectives:**

- Understand the issues involved in studying process and resource management.
- Understand in detail the system level and support required for distributed system.
- Introduce the idea of peer to peer services and file system.
- Understand foundations of Distributed Systems.

**Course Outcomes:**

<b>CO1:</b>	Understand trends in distributed systems
<b>CO2:</b>	Apply remote method invocation and objects
<b>CO3:</b>	Analyze the various distributed file system and file sharing methods
<b>CO4:</b>	Apply various synchronization techniques and distributed algorithms.
<b>CO5:</b>	Design process and resources management systems

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	3												
CO3	3			3									3	
CO4	3		3		2									
CO5	3		3											3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

**INTRODUCTION:** Examples of Distributed Systems – Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

**UNIT - II**

**COMMUNICATION IN DISTRIBUTED SYSTEM:** System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

**UNIT - III**

**PEER TO PEER SERVICES AND FILE SYSTEM:** Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

**UNIT - IV**

**SYNCHRONIZATION AND REPLICATION:** Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control- Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

**UNIT - V**

**PROCESS & RESOURCE MANAGEMENT:** Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**Text Books:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, –Distributed Systems Concepts and Design, Fifth Edition, Pearson Education, 2012.

**Reference Books:**

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 2nd Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman&Hall/CRC, Taylor & Fransis Group, 2007.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHE9903	PROFESSIONAL COMMUNICATION	2	0	0	2

**Course Objectives:**

Upon completing this course, you will be able to:

- analyze the elements of the communication process.
- analyze social and professional interactions.
- analyze the importance of ethical and social responsibility in the communication process.
- analyze types, importance, and usefulness of effective nonverbal strategies.
- analyze the components of listening and the 4 types: deliberative, critical, empathic, and appreciative.
- create a cover letter, resume and participate in a successful interview.
- identify and analyze group purposes, member roles, and leadership styles.
- analyze how groups solve problems, manage and resolve conflict, and build consensus.
- prepare and deliver a speech cognizant of audience, purpose, occasion, topic choice, incorporating ideas in an organized fashion that are engaging and logical, and incorporating relevant technology that enhances the presentation.

**Course Outcomes:**

<b>CO1:</b>	Construct sentence structures using correct vocabulary and without any grammatical errors
<b>CO2:</b>	Speak clearly and concisely in formal and in informal conversations.
<b>CO3:</b>	Compose and communicate the information through drafting, editing and presentation .
<b>CO4:</b>	Applying interpersonal skills in appropriate manner towards the growth of best career.
<b>CO5:</b>	Identify and apply communication skills effectively for professional success.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2								
CO2						2			3	3				
CO3						2			3	3				
CO4									3	3				
CO5						2			3	3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

Grammar & Vocabulary: Parts of Speech, Articles, The Prepositions, Subject-Verb agreement, Tenses, Active and Passive Voice, Direct & Indirect Speech. Degrees of Comparison, Punctuation, Vocabulary

**UNIT - II**

Communication Skills: Importance of Communication, Non-verbal Communication, Introduction, Kinesics, Proxemics, Chronemics Basics of Technical Communication, Group Discussion, Interviews, Conversations

**UNIT - III**

Telephone Skills: Understanding Telephone Communication, Types of calls, Handling calls, Leaving a message, Making requests, Asking for and giving information, Giving Instructions, Making or changing appointments

**UNIT - IV**

Interpersonal Skills: Team management, Problem solving and Decision Making, Managing Time and Stress, Technology @ work, Etiquette

**UNIT - V**

Written Communication, Email, Professional Letters, (a) Letters of application (b) Business letters (c) Using Salutations (d) Routine letters (e) Request letters (f) Persuasive letters, Report writing, Note making, Meetings, Agenda, Notice

**Suggested books for reading:**

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication – Principles and Practice, 3<sup>rd</sup> Edition, Oxford University Press, 2015.
2. Professional Communication Skills, Er A.K. Jain, Dr. Pravin S.R. Bhatia, Dr. A.M. Sheikh, S.Chand & Company Ltd, New Delhi, 2011.
3. Soft Skills for everyone, Jeff Butterfield, Cengage Learning India Private Ltd, New Delhi, 2014.
4. Basic communication Skills P. Kiranmai Dutt, Geetha Rajeevan, Cambridge University Press India Pvt. Ltd, New Delhi, 2010.
5. A Course in Communication Skills, P.Kiranmai Dutt, Geetha Rajeevan, CLN Prakash, Cambridge University Press India Pvt Ltd, New Delhi, 2013.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHE9910	Mathematical Modeling and Simulation	2	0	0	2

**Course Objectives:**

This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.

**Course Outcomes:**

<b>CO1:</b>	Utilize Basic Model Forms.
<b>CO2:</b>	Understand Basic Simulation Approaches.
<b>CO3:</b>	Evaluate Handling Stepped And Event-Based Time In Simulations
<b>CO4:</b>	Distinguish Discrete Versus Continuous Modeling
<b>CO5:</b>	Apply Numerical Techniques and Calculate Sources and Propagation Of Error

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2									3	
CO2	2	3	2	2	2								2	2
CO3		2		3									2	
CO4	3	3	2	2									2	
CO5	2	2	2	2								2	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

What is mathematical modelling? What objectives can modelling achieve? Classifications of models Stages of modelling . Systems analysis- Making assumptions- Flow diagrams- Choosing mathematical equations.

**UNIT - II**

Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modeling-Numerical Techniques-Sources and Propagation of Error.

**UNIT - III**

Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations

**UNIT - IV**

Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms Handling Inter-partition Dependencies

**UNIT - V**

Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise Random Variate Generation-Sensitivity Analysis

**Text Books:**

1. Mathematical modeling, JN Kapur, Newage publishers
2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers by Kai Velten, Wiley Publishers.
3. Introduction to Mathematical Modeling and Computer Simulations By Vladimir Mityushev,Wojciech Nawalaniec Natalia RylkoPublished by Chapman and Hall/CRC

**Reference Books:**

- <http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf>  
<https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379>  
<https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers>

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHSMB01	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	2	0	0	2

**Course Objectives:**

- To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
- To be familiar with demand concepts, types of methods or techniques of demand those are used by the entrepreneur or producer.
- To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
- To introduce the concepts of cost and significance, limitation of Break even analysis.
- To provide the optimal decisions acquiring the knowledge on financial accounting and its analysis

**Course Outcomes:**

<b>CO1:</b>	Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
<b>CO2:</b>	Apply the Concept of Production cost and revenues for effective Business decision
<b>CO3:</b>	Analyze how to invest their capital and maximize returns.
<b>CO4:</b>	Evaluate the capital budgeting techniques.
<b>CO5:</b>	Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						1				1			
CO2	1	2												
CO3	2					1								
CO4											3			
CO5				2							2			

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**UNIT - I**

Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

**UNIT – II**

Introduction – Nature, meaning, significance, functions and advantages. Production Function- Least- cost combination- Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

**UNIT – III**

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

**UNIT – IV**

Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

**UNIT – V**

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). **Financial Analysis** - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

**Text Books:**

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

**Reference Books:**

1. Ahuja HI Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0528	CRYPTOGRAPHY AND NETWORK SECURITY LAB	0	0	2	1

**Course Objectives:**

- To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
- To familiarize symmetric and asymmetric cryptography

**Course Outcomes:**

<b>CO1:</b>	Implement the cipher techniques
<b>CO2:</b>	Develop the various security algorithms
<b>CO3:</b>	Use different open source tools for network security and analysis
<b>CO4:</b>	configure and implement firewall
<b>CO5:</b>	Implements various security models and tools.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2										2	
CO2	3		2											2
CO3	3				3								2	2
CO4	3	3	2										2	2
CO5	3	3	2											2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**List of Experiments:**

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. 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 'Hello world'. 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
  - a. Ceaser cipher
  - b. Substitution cipher
  - c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.
12.
  - a. How to setup firewall
  - b. How to configure firewall
  - c. How to disable firewall
13. How to configure PGP (**Pretty Good Privacy**)

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**B.Tech IV Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0527	MOBILE APPLICATION DEVELOPMENT LABORATORY	0	0	2	1

**Course Objectives:**

- Mobile Application Development course is designed to quickly get you up to write applications for Android devices.
- The student will learn the basics of Android platform, get to understand the application frontiers and able to design his own applications

**Course Outcomes:**

<b>CO1:</b>	Create data sharing with different applications and sending and intercepting SMS.
<b>CO2:</b>	Develop applications using services and publishing android applications.
<b>CO3:</b>	To demonstrate their skills of using Android software development tools
<b>CO4:</b>	Use Android studio and iOS tools to develop mobile applications.
<b>CO5:</b>	Work independently or in teams with effective communication.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1		1					1			1	
CO2		2	1	1									2	
CO3	3		3		2	1								3
CO4	2		3		1									3
CO5							1		1	1				

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

- Setting Up the Development Environment
  - Download/Install the SDK
  - Download/Install the Eclipse Plugin
  - Download/Install the SDK Platform Components
- Test the android development environment by performing the following operations.
  - Add the sample application to a project in Android studio.
  - Create an Android Virtual Device (AVD) for sample project.
  - Create a launch configuration for sample project.
  - Run a sample application in Android Emulator.
- Create "Hello World" Application
- Develop a program which will implement Sub menu in android application.
- Develop a program to implement Context menu (Floating List of Menu Items) in android application
- Create Application by Using Widgets
  - Creating the Application by using the Activity class
    - onCreate()
    - onStart()
    - onResume()
    - onPause()
    - onStop()
    - onDestroy()
    - onRestart()
- Develop a program to implement a Custom Button and handle the displayed message on button click
- Creating the Application by using Text Edit control.
- Creating the Application Choosing Options (i) CheckBox (ii) RadioButton
- Design the Application by using
  - Linear Layout (ii) Relative Layout (iii) Absolute Layout
- Develop a program to implement the List View in android application.
- Develop a program to show how to use Date picker control of ADK in android applications.
- Develop a program to insert, delete, display, and update the employee details in Android APP

**REFERENCE BOOKS:**

- J. F. DiMarzio, Beginning Android Programming with Android Studio, Wiley India, 4thEdition, 2017.
- Wei – Meng Lee, Beginning Android 4 Application Development, Wrox, 2017.
- Paul Deital and Harvey Deital, Android How to Program, Detial Associates Publishers, 1stEdition, 2013.
- Neils Smyth, Android Stduio Development Essentials, Creative Space Independent publishing platform, 7thedition 2016.
- Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wiley