E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH,IT, ECE, CIVIL)

NAGAPATTINAM – 611002

B.E. COMPUTER SCIENCE AND ENGINEERING

FINAL YEAR-SEVENTH SEMESTER

SEMESTER VII									
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
						CA	**ES**	**Total**	
Theory Course									
1902CS701	Cloud Computing	3	0	0	3	40	60	100	PC
1902CS702	Cryptography and Network Security	3	0	0	3	40	60	100	PC
1901MG701	Universal Human Values and Ethics	3	0	0	3	40	60	100	PC
	PC Elective III	3	0	0	3	40	60	100	PE
	HSS Elective III	3	0	0	3	40	60	100	HSSE
	Open Elective II	3	0	0	3	40	60	100	OE
Laboratory Course									
1902CS751	Cloud Computing Laboratory	0	0	2	1	50	50	100	PC
1902CS752	Network Security Laboratory	0	0	2	1	50	50	100	PC
1904CS753	Software Development Laboratory (Mini Project II)	0	0	2	1	50	50	100	PC
1904GE751	Life Skills: Comprehensive Viva	2	0	0	2	100	-	100	EEC
1904GE752	In plant training/Internship	-	-	-	1	100	-	100	EEC
Total		**20**	**0**	**6**	**24**	**590**	**510**	**1100**	

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1902CS701	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To familiarize with the state of the art in cloud computing.
2. To impart knowledge on the architecture, infrastructure and delivery models of cloud computing
3. To provide the main concepts, key technologies, strengths and limitations of cloud computing

Module I	**INTRODUCTION**	9 Hours

Defining cloud computing –Cloud types –Characteristic of computing– Assessing the role of Open standards – Understanding Cloud Architecture: Exploring the cloud computing Stack– Understanding services and applications by type

Module II	**VIRTUALIZATION**	9 Hours

Basics of Virtualization : Implementation Levels of Virtualization -Virtualization Structures, Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual clusters and resource management – Virtualization for Data centreautomation

Module III	**CLOUD INFRASTRUCTURE**	10 Hours

Architectural Design of Compute and Storage Clouds: A generic Cloud Architecture design- Layered Cloud Architecture Development-Virtualization support and disaster Recovery- Inter Cloud Resource Management: Extended Cloud Computing services- Resource Provisioning and Platform Deployment –Virtual machine Creation and management- Global Exchange of Cloud Resources.

Module IV	**CLOUD SOFTWARE ENVIRONMENTS**	8 Hours

Programming Support of Google App Engine- Amazon AWS and Microsoft Azure- Cloud Software Environments: Eucalyptus, Nimbus, Open Nebula, Sector/sphere and Open Stack.

Module V	**CLOUD SECURITY ISSUES**	9 Hours

Cloud Security Defence Strategies - Distributed Intrusion/Anomaly Detection-Data and software protection Techniques-Reputation-Guided Protection of data centres

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1	Identify the architecture, infrastructure and delivery models of cloud computing
CO2	Apply suitable virtualization concept for implementing the cloud services.
CO3	Choose the appropriate cloud player
CO4	Choose the appropriate Programming Models and approach for cloud services
CO5	Address the security issues in cloud computing

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012

2. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing, Inc,.2011.

3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

4. Anthony T.Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH,New Delhi,2009

5.https://nptel.ac.in/courses/106104182/

1902CS702	CRPTOGRAPY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand Cryptography Theories, Algorithms and Systems.
2. To understand the network security tools and applications
3. To impart practical knowledge on network security concepts and mechanisms.

Module I	**ELEMENTARY CRYPTOGRAPHY**	**8 Hours**

OSI Security Architecture - Security Attacks – Services – Mechanisms - Model for Network Security - Classical Encryption Techniques - Substitution – Transposition Techniques-Basic Concepts in Number Theory- Euclidean Algorithm - Modular Arithmetic.

Module II	**SYMMETRIC KEY CRYPTOGRAPHY**	**9Hours**

Symmetric Cipher Model –Block and Stream Cipher Principles - Data Encryption Standard (DES) - Advanced Encryption Standard (AES) – Structure – Round Functions - Key Expansion - AES Example -Block cipher modes of operation- Triple DES-Blowfish-RC5 algorithm.

Module III	**PUBLIC KEY CRYPTOGRAPHY AND KEY MANAGEMENT**	**10 Hours**

Prime Numbers - Fermat's Theorem-Euler‘s totient function-Euler's Theorems–Extended Euclidean algorithm-Chinese reminder theorem- Public-Key Cryptography and RSA - Diffie-Hellman Key Exchange - Key Management and Distribution: Symmetric Key Distribution Using Asymmetric Encryption - Distribution of Public Keys.

Module IV	**AUTHENTICATION AND DATA INTEGRITY**	**9 Hours**

Cryptographic Hash Functions – Applications- Secure Hash Algorithm (SHA)- Message Authentication Codes – Requirements- MACs based on Hash Functions: HMAC – Digital Signatures - Digital Signature Standard (DSS) – Kerberos-X.509 Certificates.

Module V	**SECURITY PRACTICE AND NETWORK SECURITY**	**9 Hours**

Firewalls- Viruses and worms- Secure Sockets Layer (SSL) - Transport Layer Security (TLS)-Electronic Mail Security: Pretty Good Privacy (PGP)-IP Security: Encapsulating Security Payload- Secure Electronic Transaction.

TOTAL: 45 HOURS

COURSE OUTCOMES:

CO1	Explain the fundamental principles of cryptographic techniques.
CO2	Analyze the cryptographic algorithms for symmetric ciphers.
CO3	Evaluate asymmetric key algorithms and acquire knowledge in key management.
CO4	Explain cryptographic data integrity algorithms.
CO5	Identify the issues and protocols in network security.

REFERENCES:

1. William Stallings, Cryptography and Network security Principles and Practices, 6th edition, Pearson Education, 2014
2. Behrouz A. Foruzan and DebdeepMukhopadhyay, “Cryptography and Network Security”, Tata McGraw-Hill, Second Edition, 2010.
3. William Stallings, Network security essentials – application and standards, Prentice Hall of India , 2010
4. Charles P.Fleeger, Shari Lawrence P.Fleeger, Security in computing, Prentice Hall of India, 2009
5. https://onlinecourses.nptel.ac.in/noc18_cs07/preview

1901MG701	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
2. To understand Human values, ethical theory, codes of ethics, work place responsibilities, rights, engineering experimentation, global issues and contemporary ethical issues.
3. To understand personal ethics, legal ethics, cultural associated ethics and engineer's responsibility.

Module I	HUMAN VALUES	9 Hours

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

Module II	ENGINEERING ETHICS	9 Hours

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

Module III	ENGINEERING AS SOCIAL EXPERIMENTATION	9 Hours

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

Module IV	SAFETY, RESPONSIBILITIES AND RIGHTS	9 Hours

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

Module V	GLOBAL ISSUES	9 Hours

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

	Total:	45 Hours

COURSE OUTCOMES:

	After completion of the course, Student will be able to
CO1	Articulate engineering ethics theory with sustained lifelong learning to strengthen autonomous engineering decisions.
CO2	Be an example of faith, character and high professional ethics, and cherish the workplace responsibilities, rights of others, public's welfare, health and safety.
CO3	Contribute to shape a better world by taking responsible and ethical actions to improve the environment and the lives of world commModuley.
CO4	Fortify the competency with facts and evidences to responsibly confront moral issues raised by technological activities, and serve in responsible positions of leadership.
CO5	Be Proficient in analytical abilities for moral problem solving in engineering situations through exploration and assessment of ethical problems supported by established experiments.

REFERENCES:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, NewDelhi, 2004.
3. R S Naagarazan, A text book on professional ethics and human values, new age international limited, Delhi.

1902CS751	CLOUD COMPUTING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. Be exposed to tool kits for setting up cloud environment
2. Learn to use virtual machines
3. Be familiar with cloud management applications.

LIST OF EXPERIMENTS:

1. Installation of VMware workstation to set up a private cloud
2. Create virtual machine of different configurations. Check how many virtual machines can be utilized at particular time
3. Installation of operating systems in virtual machines
4. Attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
5. Install a C compiler in the virtual machine and execute a sample program.
6. Install a storage controller and interact with it.
7. Creation of snapshot of virtual machine
8. Restoring the state of virtual machine from snapshot
9. Installation and configuration of VMware ESXI server
10. Migration of virtual machine from one node to another.

Total: 45 Hours

COURSE OUTCOMES:

	After completion of the course, Student will be able to
CO1	Install and set up private cloud.
CO2	Design and Implement applications on cloud
CO3	Manage and restore virtual machines from snapshots
CO4	Perform scaling of resources of virtual machines
CO5	Administer migration process of virtual machines

References:

1.https://www.vmware.com/in/education-services/learning-zone.html

2.Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2012

3.BarrieSosinsky, "Cloud Computing Bible", Wiley Publishing, Inc,.2011.

4.John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

1902CS752	NETWORK SECURITY LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITES: Computer Programming knowledge

COURSE OBJECTIVES:

1. To impart practical knowledge on network security concepts and mechanisms.
2. Experiment security algorithms with efficiently implement key exchange algorithm
3. To use network security tools and vulnerability assessment tools

List of Experiments:

Module I:

1. Implement the following SUBSTITUTION and TRANSPOSITION TECHNIQUES:
   a) Caesar Cipher
   b) Playfair Cipher
   c) Rail Fence.
2. Implement the following algorithms
   a) DES
   b) RSA Algorithm
   c) Diffiee-Hellman
   e) SHA
3. Implement the Signature Scheme – Digital Signature Standard

Module II:

4. Install Jcrypt Tool (Or Any Other Equivalent) And Demonstrate Asymmetric, Symmetric Crypto Algorithm, Hash And Digital/Pki Signatures.
5. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)
6. Perform an experiment for Port Scanning with NMAP.
7. Perform an experiment to demonstrate how to sniff for router traffic by using the tool wireshark.
8. Automated Attack and Penetration Tools
   Exploring N-Stalker, a Vulnerability Assessment Tool
9. Defeating Malware
   i) Building Trojans ii) Rootkit Hunter

Total: 45 Hours

Additional Experiments:

1. Case Study on ARP Poisoning and Sniffing, Cracking with Cain and Abel.
2. Install IPCop on a Linux system and learn all the function available on the software
3. Port Scanning Tools.

COURSE OUTCOMES:

	After completion of the course, Student will be able to
CO1	Develop code for classical Encryption Techniques to solve the problems.
CO2	Gain practical experience of designing and implementing network security algorithms and protocols
CO3	Use different open source tools for network security and analysis

Software Required:

1. Java or equivalent compiler GnuPG
2. KF Sensor or Equivalent
3. Network Mapper(NMAP)
4. N Stalker
5. Wireshark
6. Snort or WinIDS AIO software pack

REFERENCES:

1. "Cryptography and Network Security" by William Stallings 6th Edition, PearsonEducation.
2. Build Your Own Security Lab, Michael Gregg, Wiley India
3. http://www.snort.org/docs/snort_manual/
4. http://ussrback.com/docs/papers/IDS/snort_rules.htm.html
5. http://www.wireshark.org/download.html

1904CS753	SOFTWARE DEVELOPMENT LABORATORY (MINI PROJECT III)	L	T	P	C
		0	0	2	1

PREREQUISITE :	
	1. Object Oriented Analysis & Design
COURSE OBJECTIVES:	
	1. To highlight the importance of Software Development and design and its limitations
	2. To show how we apply the process of software development.
	3. To provide the necessary knowledge and skills in using Software Development Tools.
LIST OF EXPERIMENTS:	
1. Identification of Use cases for each application system and SRS preparation.	
2. Formulate Domain Analysis, Elaboration through Modeling and Implementation through state of the art technology available.	
3. Coding/Customizing/Wrapping for components/subsystems	
4. Testing – Scenario testing and test case preparation for each components/subsystems	
5. Builds the spirit of team work in design process.	
6. Integration of subsystems and Testing	
7. Become proficient in the programming languages	
TOTAL:	**45 HOURS**
COURSE OUTCOMES:	
	After completion of the course, Student will be able to
CO1	Design and implement projects using Software Components
CO2	Recognize the role and function of each Development model in software System.
CO3	Apply appropriate design patterns.
CO4	Create code from design
CO5	Compare and contrast various testing techniques
REFERENCES:	
1.https://www.knowgravity.com	
2.http://www.win.tue.nl/	
3. https://www.microconsult.de	

1904GE751	LIFE SKILLS: COMPREHENSIVE VIVA	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

1. Study the concepts of data structures, algorithms and computer architecture.
2. Study the process and implementation of Operating systems and design of compilers.
3. Familiar with the database ,network and Artificial Intelligence concepts

Data Structures: Recursion. Arrays, Stacks, Queues, Linked lists, Trees, Graphs

Algorithms: Searching – Sorting - Asymptotic worst case time and space complexity – Greedy – Divide & Conquer – Dynamic Programming

Computer Organization: Digital logic,Machine instructions - Addressing modes - Hazards – Pipelining - Memory hierarchy - I/O interface

Operating System: Processes – Threads - Inter process communication - Concurrency and synchronization – Deadlock - CPU scheduling - Memory management and virtual memory - File systems

Databases: ER model - Relational model: Relational algebra, Tuple Calculus - SQL - Integrity constraints -Normal forms -Transactions and concurrency control

Computer Networks: Layering – Categories – Topology - Flow and Error control techniques – Switching - IPv4/IPv6 - Routing - TCP – UDP - Application layer protocols – Bluetooth - Wi-Fi - Network security – Firewalls - Digital signatures and certificates.

Compiler Design: Theory of Computation - Lexical analysis, parsing, syntax directed translation - Runtime environments - code generation

Artificial Intelligence: Knowledge representation, Knowledge representation using Predicate logic, Use of predicate calculus, Planning with state-space search – partial-order planning, Backward chaining, Forward chaining,

Total: 30 Hours

COURSE OUTCOMES: After completion of the course, Student will be able to

CO1.Explain all fundamentals of computer science subjects

CO2: Solve the complex problems

REFERENCES:

1. M.A.Weiss, Data Structures and Algorithm Analysis in C, Pearson Education Asia, 2015.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, Computer Organization, McGraw-Hill, Third Reprint 2015.
3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne,"Operating System Principles", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2013.

1904GE752	INPLANT / INTERNSHIP TRAINING PRESENTATION	L	T	P	C
		0	0	0	1

In order to provide the experiential learning to the students, the students undergo in-plant training or internship during summer / winter vacation between III and VII semesters. A presentation based on in-plant training / internship shall be made in this semester and suitable credit may be awarded.

Internal Assessment Only

Test	40
Presentation / Quiz / Group Discussion	40
Report	20

PC Elective III

1903CS010	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

PREREQUISITE Basic Programming Knowledge, Computer Architecture

COURSE OBJECTIVES:

1. Study the concept of Microprocessor and Microcontrollers
2. Study what is Internet of Thing and learning concepts
3. Get basic knowledge of RFID technology, sensor technology and satellite technology
4. Students aware of resource management and security issues in Internet of Things
5. Study the concept of Internet of Things in the real world scenario

UNIT I	INTRODUCTION TO IOT	9 Hours

What is the Internet of Things? : History of IoT, About IoT, Overview and Motivations, Examples of Applications,Internet of Things Definitions and Frameworks: IoT Definitions, IoT Architecture, General Observations, ITU-TViews, Working Definition, IoT Frameworks, Basic Nodal Capabilities

UNIT II	IOT PROTOCOLS	9 Hours

Sensors - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols –Issues with IoT Standardization – Unified Data Standards

UNIT III	CASE STUDY	9 Hours

IEEE 802.15.4 – BACNet Protocol– Modbus – KNX – Zigbee Architecture - Software & Management Tools forIoT

UNIT IV	BUILDING IOT WITH RASPBERRY PI AND GALILEO/ARDUINO	9 Hours

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services - Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs and Hacks – path planning – obstacle avoidancetechnique

UNIT V	EXPERIMENTS USING IOT	9 Hours

Home Automation – Cities – Environment – Energy – Retail – Logistics - Agriculture - Industry - Health and Lifestyle - IoT and M2M

REQUIREMENTS: Raspberry PI and Arduino Tool Kit

TOTAL: 45 Hours

COURSE OUTCOMES	At the end of this course, students will able to,
CO1	Apply microprocessor and microcontrollers concepts to solve various IoT problems
CO2	Explain the concepts of IoT and protocols
CO3	Illustrate various case studies and protocol architecture
CO4	Develop a portable IOT using Arduino or equivalent boards and relevant protocols.
CO5	Analyze applications of IOT in real time scenario.

REFERENCES:

1. Romesh Gaonkar , “Microprocessor Architecture, Programming, and Applications with the 8085”, PenramInternational Publishing (India) LTD, 2017
2. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture,Programming and Design”, Second Edition, Prentice Hall of India, 2014.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and EmbeddedSystems: Using Assembly and C”, Second Edition, Pearson Education, 2013.
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2MCommunications”, ISBN: 978-1-118-47347-4, Willy Publications. 2017
5. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer.,2016
6. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
7. http://nptel.ac.in/&http://coursera.org/

HSS ELECTIVE III

1901HS005	Social Entrepreneurship	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. Shift the status quo of the world's greatest challenges, fueled by inspiring examples of social entrepreneurship in action
2. Think like a social entrepreneur to tackle problems across public, private, and nonprofit sectors
3. Carve your own path for making change, whether that be founding an enterprise, serving on a board, or supporting social entrepreneurs in other creative ways

Module I	**Introduction to Social Entrepreneurship**	**12 Hours**

Social Entrepreneurship – Introduction to Donors Choose, Samasource, Aravind Eyecare, Transformative change, Starting with a Crazy Idea, Activity : Life Map, Identify Mission – Identify a social problem, Understand problem, Understand Customer, Activity : Passion Skill Problem

Module II	**Change & Sustainability**	**12 Hours**

Understand a theory of change, Framework for measuring impact, Measurement approach, Impact approach for your own enterprise, Activity : Develop a theory of change; Sustainability – Planning for impact, Achieving financial sustainability, Building financial sustainability, Social Enterprises Revenue Engine, Activity : Solutions Map

Module III	**Bring an Idea to Scale**	**5 Hours**

Think about Scale, Scaling impact, Tips to scale smart, Ways to scale, Activity : Build a launch plan, Reflection

Module IV	**Lean Startup Principles for Social Sector**	**8 Hours**

Lean mindset, Lean startup principles, Build-Measure-Learn loop, Doing Lean, Lean Principles for Social Sector, Activity : Develop your value proposition, Hypothesis Generation

Module V	**Business Models for Social Enterprise**	**8 Hours**

Introduction to Business model canvas, Integrating Impact model and business model, Types of business models, Innovations in social entrepreneurship model, Activity : Business model canvas sprints

TOTAL: 45 HOURS

COURSE OUTCOMES:

1. Explain Social Entrepreneurship Principles and solving biggest problems
2. Demonstrate Solutions for social problems using Change methods & Sustainability Maps
3. Build a Scale model for an Idea to solve a social problem
4. Apply Lean Principles in Social Sector to provide solutions
5. Design a Business Model for a Social Problem

REFERENCES:

1.Social Entrepreneur's Playbook: Pressure Test, Plan, Launch and Scale Your Social Enterprise Book by Ian C MacMillan and James D. Thompson

2.Social Entrepreneurship in India: Quarter Idealism and a Pound of Pragmatism Book by MadhukarShukla

3. Getting Beyond Better: How Social Entrepreneurship Works Book by Roger Martin and Sally R. Osberg

4. Lean Startups for Social Change: The Revolutionary Path to Big ImpactBook by Michel Gelobter

OPEN ELECTIVES

1903CS021	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:	
	1. Understand the state-of-the-art in network protocols, architectures and applications.
	2. Gain knowledge about the functions of different network layers.
	3. Familiarize in the various aspects of computer networks.

MODULE I	INTRODUCTION	9 Hours
Data Communications – Network Criteria - Components of Networks -Types of Connection - Direction of Data Flow - Network Topologies– Protocols and standards-Categories of Networks –Network Models: The OSI Model - TCP/IP Protocol Suite - Addressing - Networking Devices.		
MODULE II	**PHYSICAL AND DATA LINK LAYER**	**10 Hours**
Physical Layer-Media Access Control: CSMA, CSMA/CD, CSMA/CA-Ethernet-Wireless LAN-Bluetooth - Flow Control-Error Control - Error Detection Techniques		
MODULE III	**NETWORK LAYER**	**9 Hours**
Internetworking - IPv4 - IPv6 –Network Layer: Routing Protocols - IP Protocols: ARP and RARP, BOOTP, ICMP, DHCP		
MODULE IV	**TRANSPORT LAYER**	**9 Hours**
Overview of Transport layer, TCP, UDP,– TCP Connection Management - Flow Control – Congestion Control		
MODULE V	**APPLICATION LAYER**	**8 Hours**
Domain Name System (DNS): Domain Name Space - DNS in the Internet - HTTP – Email: SMTP, POP3and IMAP -Web Services.		
	Total:	**45 Hours**

COURSE OUTCOMES:	
	After completion of the course, Student will be able to
CO1	Describe the basics of computer networks and protocols
CO2	Apply the functions of different layers and in depth knowledge of data link layer
CO3	Analyze the different protocols and network layer components.
CO4	Identify the basic functions of transport layer and congestion in networks.
CO5	Explain the working of application layer

REFERENCES:

1.BehrouzA.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2013
2.James F.Kurose and Keith W.Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2017
3.Larry L.Peterson and Bruce S.Davie, Computer Networks, Elsevier, 2009
4.Andrew S.Tanenbaum, Computer Networks, Pearson Education, 2010
5.William Stallings, Data and Computer Communication, Pearson Education, 2007
6.profameencse.weebly.com
7.http://nptel.ac.in/courses/106105081/1