SANJIVANI RURAL EDUCATION SOCIETY'S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE CURRICULUM - 2021 PATTERN

THIRD YEAR B. TECH.

(W. e. f. Academic Year 2023-2024)

At. Sahajanandnagar, Post. Shingnapur Tal. Kopargaon Dist. Ahmednagar,

Maharashtra State, India PIN 423603

Declaration page

PROFILE

Sanjivani College of Engineering (An Autonomous Institute), Kopargaon is one among the premier technical institutes in Maharashtra state in the un-aided sector established in 1983.Department of Information Technology is established in the year 2001 with an intake of 60 students. Department is acquainted with 8 well equipped laboratories with latest hardware and Software, 3 class rooms and one tutorial Hall equipped with modern teaching aids and computing facilities. UG Program in IT department is accredited by NBA New Delhi for Second time in Academic Year 2019-2020 for three Years.

There are 15 experienced & well qualified teaching staff members & 6 supporting staff members who carry out the regular academic activities as well as curricular & extracurricular activities as per the plans prepared in advance at the beginning of every semester.

In the academic year 2019-2020 strength of students in department is 275. Apart from regular academic activities students take part in curricular & co curricular activities conducted by department organization ITERA as well as other department's organization & professional bodies in the institute like CSI, ISTE, and IEEE etc. Apart from the central library the department has its own library with a very good collection of reference book, text books and CSI magazines, IEEE magazines.

Along with regular academics Department of IT has started value added courses like SAP Certification Training Programme in collaboration with Primus Techsystems Pvt. Ltd. Pune and REDHAT Academy Centre, MBPS Infotech Pune.

IT Department has started capsule courses to improve technical skill sets of students. Department is having very good placements in various renowned and multi-national companies like TCS, Infosys, Persistent, Cognizant Wipro and many more.

Also to form well balanced Industry Interaction connect and bridge the gap between Industry and institution Department of IT has organized different events like Sanjivani Though Leader, Sanjivani I-connect and Sanjivani My Story Board.

Various personal and professional skill development programs like Communication and Soft Skill programs, Aptitude Training, Technical Skill enhancement programs, Foreign Language Certification Courses, Personal and Spiritual Development Programs, Entrepreneurship Development Activities, and Preparation courses for competitive Examinations (Gate/GRE/CAT etc.) are made available in campus. Students are given opportunities to develop and nurture their leadership qualities through Student Associations, Student Council, Professional Body activities and working as volunteers in various events organized at Department/ College level.

VISION AND MISSION
Vision of Institute
To develop world class professionals through quality education.
Mission of Institute
To create Academic Excellence in the field of Engineering and Management through Education, Training and Research to improve quality of life of people.
Vision of Department
To develop world class IT professionals through quality education.
Mission of Department
To create Academic Excellence in the field of Information Technology through Education, Industry Interaction, Training and Innovation to improve quality of life of people. We are committed to develop industry competent technocrats with life-long learning capabilities and moral values.

PROGRAM EDUCATIONAL OBJECTIVES
PEO 1:
Graduates of IT program should possess knowledge of fundamental concepts in mathematics, science, engineering and technology as well as skills in the field of Information Technology for providing solution to complex engineering problem of any domain by analyzing, designing and implementing.
PEO 2:
Graduates of IT program should possess better communication, presentation, time management and teamwork skills leading to responsible and competent research, entrepreneurship and professionals, will be able to address challenges in the field of Information Technology at global level.
PEO 3:
Graduates of IT program should have commitment to societal contributions through communities and life-long learning.

PROGRAM OUTCOMES
PO1:Engineering knowledge
Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:Design/development of solutions
Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4:Conduct investigations of complex problems
Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage
Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6:The engineer and society
Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:Environment and sustainability
Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9:Individual and team work
Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10:Communication
Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance
Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12:Life-long learning
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES
PSO1:
Attain the ability to provide software solutions by applying knowledge of Data Structures & Algorithms, Databases, Web Technology, System Software, Soft Computing and Cloud Computing.
PSO2:
Apply the knowledge of Computer Hardware & Networking, Cyber Security, Artificial Intelligence and Internet of Things to effectively integrate IT based solutions.
PSO3:
Apply the knowledge of best practices and standards of Software Engineering for Project Management.

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE AND SYLLABUS - 2021 PATTERN

THIRD YEAR B. TECH.

LIST OF ABBREVIATIONS			
Abbreviation	**Full Form**	**Abbreviation**	**Full Form**
ES	Engineering Science	HSMC	Humanity Science
PC	Professional Core	CA	Continuous Assessment
PE	Professional Elective	OR	End Semester Oral Examination
OE	Open Elective	PR	End Semester Practical Examination
ISE	In-Semester Evaluation	TW	Continuous Term work Evaluation
ESE	End-Semester Evaluation	BSC	Basic Science Course
PRJ	Project	MC	Mandatory Course

COURSE STRUCTURE - 2021 PATTERN

THIRD YEAR B. TECH. INFORMATION TECHNOLOGY

SEMESTER - V

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme - Marks					
							Theory		OR	PR	TW	Total
Cat.	Code		L	T	P		CIA	ESE				
PC	IT301	System Programming and Operating System	4	-	-	4	40	60	-	-		100
PC	IT302	Computer Network	4	-	-	4	40	60	-	-	-	100
PC	IT303	Internet of Things	3	-	-	3	40	60	-	-	-	100
PC	IT304	Theory of Computation	3	-	-	3	40	60	-	-	-	100
PE	IT305	Professional Elective-I	3	-	-	3	40	60	-	-	-	100
PC	IT306	System Programming & Operating System Lab	-	-	2	1	-	-	-	50	-	50
PC	IT307	Computer Network Laboratory	-	-	2	1	-	-	50	-	-	50
PC	IT308	Internet of Things Laboratory	-	-	2	1	-	-	-	-	50	50
PRJ	IT309	Mini Project Based on Skill Based CreditCourse	-	-	2	1	-	-	-	-	50	50
PRJ	IT310	Corporate Readiness - II	-	-	2	1	-	-	-	-	50	50
MC	MC311	Mandatory Course-V	1	-	-	0	-	-	-	-	-	Pass/ Fail
		Total	18	-	10	22	200	300	50	50	150	750

IT309	Skill Based Credit Course	Minimum 12 week course to be conducted in association with the industry on software product development.
MC311	Mandatory Course-V	Behavioral and Interpersonal skills (non-verbal skills / behaviors, nonaggression)

IT305 Professional Elective- I	
Course Code	Course
IT305A	Software Testing and Quality Assurance
IT305B	Foundation of Data Science
IT305C	Data Mining Techniques

HONORS SPECIALIZATION IN CYBER SECURITY

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme-Marks					
							Theory		OR	PR	TW	Total
Cat.	Code		L	T	P		CIA	ESE				
HSIT	IT8101	Foundation For Cyber Security	4	-	-	4	40	60	-	-	-	100
		Total	4	-	-	4	40	60	-	-	-	100

COURSE STRUCTURE - 2021 PATTERN

THIRD YEAR B. TECH. INFORMATION TECHNOLOGY

SEMESTER- VI

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme-Marks					
							Theory		OR	PR	TW	Total
Cat.	Code		L	T	P		CIA	ESE				
PC	IT311	Cryptography and Cyber Security	3	-	-	3	40	60	-	-	-	100
PC	IT312	Machine Learning	3	-	-	3	40	60	-	-	-	100
PC	IT313	Web Technology	4	-	-	4	40	60	-	-	-	100
PE	IT314	Professional Elective-II	3	-	-	3	40	60	-	-	-	100
PC	IT315	Cryptography and Cyber Security Laboratory	-	-	2	1	-	-	50	-	-	50
PRJ	PR316	IPR & EDP	2	-	-	2	20	30	-	-	-	50
PC	IT317	Machine Learning Laboratory	-	-	2	1	-	-	-	50	-	50
PC	IT318	Web Technology Laboratory	-	-	4	2	-	-	-	-	50	50
PRJ	IT319	Creational Activity#	-	-	2	1	-	-	-	-	50	50
MC	MC320	Mandatory Course-VI	1	-	-	0	-	-	-	-	-	Pass/ Fail
		Total	16	-	10	20	180	270	50	100	50	650

IT314 Professional Elective- II	
Course Code	Course
IT314A	Project Management
IT314B	Big Data Analytics
IT314C	Compiler Design

Mandatory Course-VI	
MC321	Suitable Technical / Non-Technical Activities finalized by Department

HONORS SPECIALIZATION IN CYBER SECURITY

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme-Marks					
							Theory		OR	PR	TW	Total
Cat.	Code		L	T	P		CIA	ESE				
HSIT	IT8102	Web Security	4	-	-	4	40	60	-	-	-	100
HSIT	IT8103	Web Security Tools Laboratory	-	-	2	1	-	-	-	-	50	50
		Total	4	-	2	5	40	60	-	-	50	150

IT301 : System Programming and Operating System

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: Fundamentals of Data Structures, Data Structures and Files.

Course Objectives

1. To get knwoledge of System Software.
2. To provide an understanding of basics of Compiler design.
3. To study the concepts of process management.
4. To deal with process synchronization and deadlock.
5. To learn and understand memory management techniques.
6. To get acquainted with I/O management techniques.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand the basics of System Software.	2	Understand
CO2	Analyze the working and phases of Compiler.	3	Apply
CO3	Compare the performance of process scheduling algorithms.	3	Apply
CO4	Use synchronization concepts and deadlock handling.	2	Understand
CO5	Identify the mechanism the concepts of memory management techniques.	3	Apply
CO6	Demonstrate the I/O management techniques.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1
CO2	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1
CO3	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1
CO4	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1
CO5	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1
CO6	2	3	3	3	2	1	1	1	1	1	1	2	3	1	1

Course Contents			
Unit-I	**INTRODUCTION TO SYSTEM SOFTWARE**	**No. of Hours**	**COs**
	Introduction to Systems Programming: Need, Software Hierarchy, Types of software: system software and application software. Components of Systems Programming: Assembler, Macros, Compiler, Interpreter, Loader, Linker, Debugger, Operating System and Device Driver. Assembler: Elements of Assembly Language Programming, Assembly Language statements, Benefits of Assembly Language, A simple Assembly scheme, Pass Structure of Assembler. Design of Two Pass Assembler: Processing of declaration statements, Assembler Directives and imperative statements, Intermediate code forms, Two Pass Structure of two pass Assembler.	10	CO1
Unit-II	**INTRODUCTION TO COMPILERS**	**No. of Hours**	**COs**
	Phases of Compiler. Lexical analysis: Token, patterns and Lexemes & Lexical Errors, Regular definitions for the language constructs Syntax Analysis: Grammars, Top-down v/s bottom up parsing. Semantic Analysis: SDT and dependency trees. Intermediate Code Generation: Three address code Intermediate Code forms.	10	CO2
Unit-III	**INTRODUCTION TO OS AND PROCESS MANAGEMENT**	**No. Of Hours**	**COs**
	Introduction: Types of OS, System Components, OS services, System structure- Layered Approach. Process Management: Process Concept Process states, Process control block, Threads. Process Scheduling: Types of process schedulers. Types of scheduling: Pre-emptive, Non pre-emptive, Long-term, Medium-term, Short term scheduling. Scheduling algorithms: FCFS, SJF, RR, and Priority.	10	CO3
Unit-IV	**PROCESS SYNCRONIZATION AND DEADLOCKS**	**No. of Hours**	**COs**
	Mutual Exclusion: Concurrency, Mutual Exclusion: Hardware Support, Semaphores and Mutex, Monitors. Producer and Consumer problem, Inter-process communication. Deadlocks: Introduction Handling deadlocks, Deadlock prevention, avoidance and detection, Reco	10	CO4
Unit-V	**MEMORY MANAGEMENT**	**No. of Hours**	**COs**
	Introduction: Memory Management concepts, Memory Management requirements. Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy Systems Fragmentation, Paging, Segmentation. Placement Strategies: First Fit, Best Fit, Next Fit and Worst Fit. Virtual Memory (VM): Concepts, Swapping, VM with Paging, Page Table Structure, VM with Combined paging and segmentation.	10	CO5

	Page Replacement Policies: First In First Out (FIFO), Last Recently Used (LRU), Optimal, Thrashing.		
Unit-VI	**I/O MANAGEMENT AND FILE MANAGEMENT**	**No. of Hours**	**COs**
	I/O Management: I/O Devices, Organization of I/O function, I/O Buffering, Hardware organization, Device Scheduling policies, Disk Scheduling policies: FIFO, LIFO, STTF, SCAN, CSCAN. File Management: Overview, File Organization and Access, File Directorie	10	CO6

Text Books:

1. Dhamdhere D. "Systems Programming and Operating Systems", McGraw Hill, ISBN 007-463579-43
2. Alfred V. Aho, Ravi Sethi, Reffrey D. Ullman, "Compilers Principles, Techniques, and Tools", Addison Wesley, ISBN 981-235-885-4
3. Adraham Silberschatz, Pert B. Galvin, and Greg Gagne, "Operating System Principles", 9th Edition, Wiley ISBN 978- 1-118-06333-0
4. William Stallings, "Operating System: Internals and Design Principles", Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913

Reference Books:

1. Leland Beck, "System Software: An Introduction to systems programming", Pearson
2. John R. Levine, Tony Mason, Doug Brown, "Lex & Yacc", 1st Edition, O'REILLY ISBN 81-7366-062-X.
3. D.M. Dhamdhare , 2012, Operating Systems: A Concept Based Approach, 3rd Edn.Tata McGraw-Hill, New Delhi
4. Maurice J. Bach, "Design of UNIX Operating System", PHI

eLearning Resources:

1. https://onlinecourses.swayam2.ac.in/cec21_cs20/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs101/preview

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT302 : Computer Network

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: Digital Electronic & Computer Organization.

Course Objectives

1. To learn about computer network fundamentals.
2. To learn about physical and datalink layer concept.
3. To learn about routing algorithms.
4. To learn different protocols of application layer.
5. To learn transportation in network programming.
6. To learn about wireless network.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply computer network fundamentals.	3	Apply
CO2	Apply different concepts of physical and datalink layer.	3	Apply
CO3	Apply various routing algorithms.	3	Apply
CO4	Apply transportation in network programming.	3	Apply
CO5	Understand different protocols of application layer.	2	Understand
CO6	Understand wireless networks.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1	3	3	3	1	3	1	3	-
CO2	3	2	2	2	3	2	1	3	3	3	1	3	1	3	-
CO3	3	3	2	2	3	2	1	3	3	3	1	3	1	3	-
CO4	3	3	2	2	3	2	1	3	3	3	1	3	1	3	-
CO5	3	2	2	2	3	2	1	3	3	3	1	3	1	3	-
CO6	3	2	2	2	3	2	1	3	3	3	1	3	1	3	-

Course Contents			
Unit-I	**INTRODUCTION**	**No. of Hours**	**COs**
	Introduction of LAN; MAN; WAN; PAN, The OSI reference model, TCP/IP reference model, Data and transmission techniques, CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Hub, Bridge, Switch, Router, NIC, Ethernet, Network Characteristics-Bandwidth, Throughput, measuring throughput, Latency, RTT or PING, Measuring RTT using Ping utility, Jitter, Packet loss rate.	8	CO1
Unit-II	**PHYSICAL & DATALINK LAYER**	**No. of Hours**	**COs**
	Topologies: Star and Hierarchical, Transmission media: Guided media & Unguided Media, Layer design issues, services provided to network layers, Structure of the MAC address, MAC address Notations Types of MAC Addresses, Protocols – Simplex protocol, Stop-and Wait Protocol, Piggybacking. Channel Allocations, Multiple Access protocols- ALOHA, Carrier Sense Multiple Access (CSMA) with Collision Detection and Collision Avoidance.	7	CO2
Unit-III	**NETWORK LAYER**	**No. Of Hours**	**COs**
	Network Layer design issues, IP: IPv4 & IPv6, Network Address Translation (NAT). Routing algorithms and protocols: Unicast Distance Vector Routing, Link State Routing. Unicast Routing Protocols: Routing Information Protocol (RIP), Congestion Control Algorithms. N/W Layer Protocols: Address Resolution Protocol (ARP) Protocol, Reverse Address Resolution Protocol (RARP), Internet Control Message Protocol (ICMPv4), concept of virtual private network VPN.	8	CO3
Unit-IV	**TRANSPORT LAYER**	**No. of Hours**	**COs**
	Transport services, Design issues, Transport Layer Protocols: Transmission Control Protocol, Header, services. User Data Protocol: Datagram, Services. Applications: Header, Services, Features, Segment, Stream Control Transmission Protocol: Header, Servi	7	CO4
Unit-V	**APPLICATION LAYER**	**No. of Hours**	**COs**
	Domain Name System (DNS), Dynamic Host Control Protocol (DHCP), Hyper Text Transfer Protocol (HTTP). Email: Simple Mail Transfer Protocol (SMTP), Multipurpose Internet Mail Extensions (MIME), Post Office Protocol (POP3), Webmail, File Transfer Protocol (FTP), TELNET, Simple Network Management Protocol (SNMP).	8	CO5
Unit-VI	**WIRELESS NETWORKS**	**No. of Hours**	**COs**
	WLAN Technologies, Wireless Network Standards, Effects of Physical Objects on RF Signals, Antenna Types and Features. Wireless Network Topologies, Wireless Wide Area Network (WWAN), Wireless Metropolitan Area Network (WMAN), Wireless	7	CO6

	Personal Area Networ		

Text Books:

1. Andrew S. Tanenbaum, David J. Wethrall, “Computer Network”, Pearson Education, ISBN: 978-0-13-212695-3.
2. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, McGraw Hill Education, 4th Edition, ISBN: 978-0-07-070652-1.
3. Steve Rackley, “Wireless Networking Technology” Elsevier publication, Britain 2nd Edition, ISBN : 978-0-7506-6788-3

Reference Books:

1. Behrouz A. Forouzan, “Data Communication and Networking”, McGraw Hill Education, 5th Edition, ISBN: 978-1-25-906475-3.
2. Mayank Dave, “Computer Network”, Cengage Learning, ISBN: 978-81-315-0986-9.
3. T S Rappaport, “Wireless Communication” 2nd Edition, Pearson Education India, ISBN: 968-81-3273-186-4

eLearning Resources:

1. https://www.coursera.org/learn/computer-networking
2. https://www.coursera.org/specializations/computer-network-security
3. https://nptel.ac.in/courses/106105183

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT303 : Internet of Things

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Micro-processor and Micro-controller & Computer Organization.

Course Objectives

1. To understand fundamentals of Internet of Things (IoT).
2. To apply the knowledge of various IoT Sensors and its application.
3. To understand various IoT Network design methodologies.
4. To develop comprehensive approach towards building Middleware for IoT and Security Challenges.
5. To apply the Fundamental IoT Mechanism and Key Technologies.
6. To develop Cloud based IoT implementations scenarios along with its societal and economic impact using case studies.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	Descriptor
CO1	Explain the given societal challenge using IoT.	2	Understand
CO2	Apply various applications using IoT Sensors and its applications.	3	Apply
CO3	Explain IoT systems based on IoT Network design methodologies.	3	Apply
CO4	Apply available platform for stated IoT challenge.	3	Apply
CO5	Apply Fundamental IoT Mechanisms and Key Technologies for IoT specified Environment.	3	Apply
CO6	Apply real world application scenarios of IoT along with its societal and economic impact using case studies.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	0	2	2	0	2	3	0	3	2	1	3	0	3	0
CO2	2	3	2	2	0	0	0	0	0	2	2	2	2	2	0
CO3	2	2	2	2	2	2	2	1	2	2	2	2	2	2	0
CO4	3	2	2	2	0	0	0	0	2	2	2	2	2	2	0
CO5	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2
CO6	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2

Course Contents			
Unit-I	**INTRODUCTION TO IOT**	**No. of Hours**	**COs**
	IoT Definition, General Observations, Overview and Motivation, Examples of Application, Exemplary Devices: Raspberry Pi and Arduino, Types of Sensor, IPv6 Role, Areas Development and Standardization, Scope of the Present Investigation.	8	CO1
Unit-II	**TYPES OF IOT SENSORS**	**No. of Hours**	**COs**
	Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor, Blood pressure, heart rate and breathing sensor.	7	CO2
Unit-III	**NETWORKING**	**No. Of Hours**	**COs**
	A simplified IoT Architecture, The Core of IoT functional Stack, IoT Data Management and Compute Stack, SMAC Stack, IoT Protocols, Sending Data over MQTT.	8	CO3
Unit-IV	**MIDDLE WARE FOR IOT**	**No. of Hours**	**COs**
	Platform middleware – Embedded IoT Devices - communication middleware – M2M – RFID – WSN - SCADA – software middleware – Frameworks – Data standards – 5G for IoT, IoT information Security, Privacy and Governance.	7	CO4
Unit-V	**FUNDAMENTAL IOT MECHANISMS AND KEY TECHNOLOGIES**	**No. of Hours**	**COs**
	Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology.	8	CO5
Unit-VI	**CASE STUDIES**	**No. of Hours**	**COs**
	Case Studies: Smart Metering/Advanced Metering Infrastructure, e-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards Tracking (Following and Monitoring Mobile Objects).	7	CO6

Text Books:

1. Honbo Zhou, "The Internet of Things in the Cloud A Middleware Perspective", CRC Press, 2013.
2. AdrainMcEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014.
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, "IoT Fundamentals: Networking Technologies, Protocols, Use cases for the Internet of things", Cisco Press – Paperback- 16 August 2017 978-1-58714-456- 1 599.

Reference Books:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publication- 2013 978-1-118-47347-4, 466.
2. Arshdeep Bahga, Vijay K. Madisetti, "Internet of Things A Hands-on Approach", VPT, 1st Edition,

2014.
3. Rolf H. Weber, Romana Weber, “Internet of Things Legal Perspectives”, Springer 2010, ISBN 978-3-642-11709-1.

eLearning Resources:

1. https://www.coursera.org/specializations/iot
2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT304 : Theory of Computation

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Engineering Mathematics IV.

Course Objectives

1. To learn finite automata and finite state machine.
2. To study regular expression, pumping lemma and properties of regular languages.
3. To understand context free grammar and context free languages.
4. To learn pushdown automata, post machines and its construction.
5. To study turing machine and variants of turing machine.
6. To learn decidable languages and turing reducibility.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply the concepts of finite state machines to solve computing problems.	3	Apply
CO2	Solve the different regular expressions for the regular languages.	3	Apply
CO3	Apply well defined rules for verification and simplification of context free grammar.	3	Apply
CO4	Apply the basic concepts of Push Down Automata and Post Machine for construction of Machines for context free languages.	3	Apply
CO5	Understand the variants of Turing Machine for formal languages.	2	Understand
CO6	Express the understanding of the decidability and its problems.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	1	-	1	-		2	2	1	-	-
CO2	2	2	2	2	-	1	1	2	-	-	1	2	-	-	-
CO3	3	2	2	2	-	1	-	1	-	1	1	2	2	-	-
CO4	3	2	2	2	-	1	-	1	-	-	-	2	-	-	-
CO5	3	2	3	2	-	1	-	1	-	-	-	2	1	-	-
CO6	2	3	3	2	-	1	-	1	-	-	2	1	1	-	-

Course Contents			
Unit-I	**FINITE STATE MACHINE**	**No. of Hours**	**COs**
	Basic Machine and Finite State Machine.FSM without output: Definition and Construction-DFA, NFA, NFA withepsilon-Moves, Minimization Of FA, Equivalence of NFA and DFA, Conversion of NFA with epsilon moves to NFA, Conversion of NFAWith epsilon moves to DFA.FSM with output: Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.	8	CO1
Unit-II	**REGULAR EXPRESSIONS**	**No. of Hours**	**COs**
	Definition and Identities of Regular Expressions, Construction ofRegular Expression of the given L, Construction of Language from theRE, Construction of FA from the given RE using direct method,Conversion of FA to RE using Arden's Theorem, Pumping Lemma forRL, Closure properties of RLs, Applications of Regular Expressions.	7	CO2
Unit-III	**CONTEXT FREE LANGUAGES**	**No. Of Hours**	**COs**
	Introduction, Formal Definition of Grammar, Notations. Derivation Process: Leftmost Derivation, Rightmost Derivation, derivation trees,Context Free Languages, Ambiguous CFG, Removal of ambiguity,Simplification of CFG, Normal Forms, Chomsky Hierarchy, Regulargrammar, equivalence of RG(LRG and RLG) and FA.	8	CO3
Unit-IV	**PUSHDOWN AUTOMATA (PDAS)**	**No. of Hours**	**COs**
	Push Down Automata: Introduction and Definition of PDA, Construction(Pictorial/ Transition diagram) of PDA, Instantaneous Description and ACCEPTANCE of CFL by empty stack and final state, Deterministic PDA Vs Nondeterministic PDA, Closure properties of CF	7	CO4
Unit-V	**TURING MACHINES (TMS)**	**No. of Hours**	**COs**
	Formal definition of a Turing machine, Recursive Languages andRecursively Enumerable Languages, Design of Turing machines. Variants of Turing Machines: Multi-tape Turing machines, UniversalTuring Machine, Nondeterministic Turing machines. Comparisons of allautomata.	8	CO5
Unit-VI	**DECIDABILITY AND REDUCIBILITY**	**No. of Hours**	**COs**
	Decidability: Decidable problems concerning regular languages, Decidable problems concerning context-free languages, Un-decidability, Halting Problem of TM, A Turing-unrecognizable language. Reducibility: Un-decidable Problems from Language Theory, A Simp	7	CO6
Text Books:			
1. Michael Sipser, "Introduction to the Theory of Computation", CENGAGE Learning, 3 rd Edition ISBBN-13:978-81-315-2529-6.			

2. Vivek Kulkarni, “Theory of Computation”, Oxford University Press, 3 rd Edition, ISBN-13: 978-0-19-808458-7.

Reference Books:

1. Hopcroft Ulman, “Introduction to Automata Theory, Languages and Computations”, Pearson Education Asia, 2 nd Edition, ISBN: 9788131720479.
2. Daniel I. A. Cohen, “Introduction to Computer Theory”, Wiley-India, 2 nd Edition, ISBN: 978-81-265-1334-5
3. K.L.P Mishra, N. Chandrasekaran, “Theory of Computer Science (Automata, Languages and Computation)”, Prentice Hall India, 2 nd Edition.
4. John C. Martin, “Introduction to Language and Theory of Computation”, TMH, 3 rd Edition, ISBN: 978-0-07-066048-9
5. Kavi Mahesh, “Theory of Computation: A Problem Solving Approach”, Wiley-India, 3 rd Edition, ISBN:978-81-265-3311-4

eLearning Resources:

1. NPTEL Course: Theory of Computation https://onlinecourses.nptel.ac.in/noc21_cs83/preview
2. eBook: Theory of Computation https://www.e-booksdirectory.com/listing.php?category=98

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT305A : Software Testing and Quality Assurance (Professional Elective-I)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**
Prerequisite Course: Software Engineering		

Course Objectives

1. To comprehend the software process models.
2. To understand the types of software requirements and SRS document.
3. To describe the testing strategies and methodologies in projects.
4. To understand different types of testing for web applications.
5. To understand the concepts of STLC to achieve quality.
6. To understand automation tools used in quality management.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply basic concepts of Software Engineering and Process Models	3	Apply
CO2	Understand the Software Requirements and SRS Documents	2	Understand
CO3	Describe the testing concepts and Quality Assurance	2	Understand
CO4	Analyze different test methodologies and approaches for web applications.	4	Analyze
CO5	Apply Software Testing Life Cycle for testing an application	3	Apply
CO6	Select proper tool to perform Software Testing.	5	Evaluate

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	3	-	-	-	-	-	2	-	0	3	-	-
CO2	3	1	2	3	-	-	-	-	-	-	-	0	3	-	-
CO3	1	2	3	1	-	-	-	-	-	-	-	0	-	3	-
CO4	2	1	2	3	-	-	-	-	-	-	-	0	3	2	-
CO5	3	1	2	3	-	-	-	-	-	-	-	0	3	2	-
CO6	2	1	2	3	-	3	2	-	-	-	-	-	2	-	-

Course Contents			
Unit-I	**INTRODUCTION TO SOFTWARE ENGINEERING**	**No. of Hours**	**COs**
	Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, Process patterns, process assessment. Process models: The waterfall model, Incremental process models, Evolutionary process models.	8	CO1
Unit-II	**REQUIREMENT ANALYSIS & SOFTWARE DEVELOPMENT LIFE CYCLE**	**No. of Hours**	**COs**
	Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. SDLC Phases: Requirements Phase, Analysis Phase, Design phase, Coding Phase, Testing phase, Delivery and Maintenance Phase, SDLC Models: Waterfall Model, V Model, Agile Model, Prototype Model, Spiral Model.	7	CO2
Unit-III	**SOFTWARE TESTING**	**No. Of Hours**	**COs**
	Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Differences between Manual and Automation. Quality Assurance, Quality Control, Differences between QA & QC & Testing.	8	CO3
Unit-IV	**SOFTWARE TESTING METHODOLOGIES AND TEST APPROACHES**	**No. of Hours**	**COs**
	White Box Testing, Black Box Testing, Grey Box Testing. Static Techniques: Informal Reviews, Walkthroughs, Technical Reviews, Inspection. Dynamic Techniques: Functional Testing - Unit Testing, Integration Testing, System Testing, User Acceptance Testing,	7	CO4
Unit-V	**SOFTWARE TESTING LIFE CYCLE**	**No. of Hours**	**COs**
	Requirements Analysis/Design, Test Planning, Test Cases Design, Test Environment setup, Test Execution and Test Closure.	8	CO5
Unit-VI	**SOFTWARE TEST AUTOMATION**	**No. of Hours**	**COs**
	What is Test Automation, Terms used in automation, Skills needed for automation, What to automate, scope of automation, Introducing Selenium, Selenium Tool Suite, Selenium-IDE, Selenium RC, Selenium Webdriver, Selenium Grid.	7	CO6

Text Books:

1. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices" Pearson.
2. Daniel Galin, "Software Quality Assurance: From Theory to Implementation", Pearson Addison Wesley.
3. M G Limaye, "Software Testing Principles, Techniques and Tools", Tata McGraw Hill, ISBN: 9780070139909 0070139903.

Reference Books:

1. Roger S. Pressman, “Software Engineering”, Mc Graw Hill.
2. Aditya P. Mathur, “Foundations of Software Testing”, Pearson.
3. Paul Ammann, Jeff Offutt, “Introduction to Software Testing”, Cambridge University Press.
4. Stephen Kan, “Metrics and Models in Software Quality”, Addison Wesley, 2nd Edition.

eLearning Resources:

1. https://nptel.ac.in/courses/106/105/106105150/
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT305B : Foundation of Data science (Programme Elective- I)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Discrete Mathematics, Engineering Mathematics, Calculus and Probability.

Course Objectives

1. To introduce the data science basics.
2. To introduce the statistics and probability for data science.
3. To apply the Linear Algebra for data science.
4. To apply the Mathematical distributions on data for data understanding.
5. To apply of sampling distributions and testing of Hypothesis.
6. To apply the data visualization techniques.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand concept and process of data science.	2	Understand
CO2	Understand the statistics and probability for data science.	2	Understand
CO3	Apply the fundamentals of Linear Algebra on data.	3	Apply
CO4	Apply various mathematical distributions for data understanding.	3	Apply
CO5	Apply test of hypothesis for population parameter.	3	Apply
CO6	Apply various data visualization techniques using python libraries.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	1	-	-	-	2	-	1	1	1	-
CO2	3	3	2	2	1	-	-	-	1	-	-	1	1	-	-
CO3	2	3	-	2	-	-	-	-	-	-	-	0	1	-	-
CO4	2	3	3	3	-	-	-	-	-	-	-	0	3	-	-
CO5	2	3	1	2	-	-	-	-	-	-	-	0	1	-	-
CO6	2	2	2	2	3	-	2	-	-	-	-	-	2	-	-

Course Contents			
Unit-I	**INTRODUCTION TO DATA SCIENCE**	**No. of Hours**	**COs**
	Defining data science and big data, Recognizing the different types of data, Gaining insight into the data science process, Data Science Process: Overview, Different steps, Machine Learning Definition and Relation with Data Science.	8	CO1
Unit-II	**STATISTICS AND PROBABILITY FOR DATA SCIENCE**	**No. of Hours**	**COs**
	Introduction to Statistics, Terminologies in Statistics-Statistics for Data Science, Types of Analysis: Qualitative analysis, Quantitative analysis, Predictive analysis, Descriptive analysis. Probability : Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables: Discrete random variable, Continuous random variable.	7	CO2
Unit-III	**LINEAR ALGEBRA**	**No. Of Hours**	**COs**
	Data measurements scale: nominal scale,ordinal scale, interval scale, ratio scale. Measures of central tendency: mean, median, mode, Percentile, decile, quartile. Measures of variation: range, inter-quartile distance, variance and standard deviation. Measures of shape: skewness and kurtosis.	8	CO3
Unit-IV	**MATHEMATICAL DISTRIBUTIONS**	**No. of Hours**	**COs**
	Normal distribution, Binomial distribution, Poisson distribution, Exponential distribution, Sampling and Estimation: Population and sampling, Central Limit Theorem(CLT),	7	CO4
Unit-V	**HYPOTHESIS TESTING**	**No. of Hours**	**COs**
	Sampling distribution, null hypothesis, alternate hypothesis, testing of hypothesis, Type I error, Type II error, T-test, F-test, Chi-square test, Analysis of variance(ANOVA), One way classification, Two way classification.	8	CO5
Unit-VI	**DATA VISUALIZATION**	**No. of Hours**	**COs**
	Describing data relationship, Importing and visualization using Matplotlib/Seaborn python library: Bar charts, Pie charts, Line plots, Scatter plots, Histograms, Exploratory data Analysis(EDA) using Pandas library.	7	CO6

Text Books:

1. U Dinesh Kumar, "Business Analytics: The Science of Data - Driven Decision Making",Wiley, ISBN-978-81-265-6877-2
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007
3. Johnson. R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007.

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Third Edition ISBN:978-9355421982
2. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
3. Probability, Random Variables, Statistics, and Random Processes: Fundamentals & Applications, Ali Grami, ISBN: 978-1-119-30081-6

eLearning Resources:

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT305C : Data Mining Techniques (Professional Elective-I)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**CIA:**	**40 Marks**
	ESE:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Engineering Mathematics, Database Management Systems.

Course Objectives

1. To understand the fundamentals of Data Mining.
2. To identify the appropriateness and need of mining the data.
3. To learn the pre-processing, mining and post processing of the data.
4. To understand various methods, techniques and algorithms in data mining.
5. To study concepts of pattern based data mining for decision making.
6. To understand Data Mining needs and Application.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply basic, intermediate and advanced techniques to mine the data.	3	Apply
CO2	Analyze the output generated by the pre-processing of data.	4	Analyze
CO3	Explore the hidden patterns in the data	4	Analyze
CO4	Demonstrate the algorithms used for text mining	3	Apply
CO5	Implement mining techniques for realistic data.	3	Apply
CO6	Understand the various kinds of tools.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	3	-	-	-	-	-	2	-	0	3	-	-
CO2	3	1	2	3	-	-	-	-	-	2	-	0	3	-	-
CO3	1	2	3	1	-	-	-	-	-	-	-	0	-	3	-
CO4	2	1	2	3	-	-	-	-	-	-	-	0	3	2	-
CO5	2	1	2	3	-	-	-	-	-	-	-	0	3	2	-
CO6	2	1	2	3	-	3	2	-	-	-	-	-	2	-	-

Course Contents			
Unit-I	**INTRODUCTION**	**No. of Hours**	**COs**
	Data Mining, Data Mining Task Primitives, Data: Data, Information and Knowledge; Attribute; Types: Nominal, Binary, Ordinal and Numeric attributes, Discrete versus Continuous Attributes; Introduction to Data Pre-processing, Data Cleaning: Missing values, Noisy data; Data integration: Correlation analysis; transformation: Min-max normalization, z-score normalization and decimal; scaling; data reduction: Data Cube Aggregation, Attribute Subset Selection, sampling; and Data, Discretization: Binning, Histogram Analysis.	8	CO1
Unit-II	**ASSOCIATION RULES MINING**	**No. of Hours**	**COs**
	Market basket Analysis, Frequent item set, Closed item set, Association Rules, a-priori Algorithm, Generating Association Rules from Frequent Item sets, Improving the Efficiency of a-priori, Mining Frequent Item sets without Candidate Generation: FP Growth Algorithm; Mining Various Kinds of Association Rules: Mining multilevel association rules, constraint based association rule mining, Meta rule-Guided Mining of Association Rules.	7	CO2
Unit-III	**CLASSIFICATION**	**No. Of Hours**	**COs**
	Introduction to: Classification and Regression for Predictive Analysis, Decision Tree Induction, Rule-Based Classification: using IF-THEN Rules for Classification, Rule Induction Using a Sequential Covering Algorithm. Bayesian Belief Networks, Training Bayesian Belief Networks, Classification Using Frequent Patterns, Associative Classification, Lazy Learners-k-Nearest-Neighbour Classifiers, Case-Based Reasoning.	8	CO3
Unit-IV	**CLUSTERING**	**No. of Hours**	**COs**
	Cluster analysis, distance measures, partitioning methods – k-means, k-medoids, hierarchical methods – single-link, complete-link, centroid, average link, Agglomerative method.	7	CO4
Unit-V	**TEXT AND WEB MINING**	**No. of Hours**	**COs**
	Text mining: Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Feature vector, Bag of words, Tf-idf, Text Mining Approaches. Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.	8	CO5
Unit-VI	**REINFORCEMENT LEARNING AND BIG DATA MINING**	**No. of Hours**	**COs**
	Reinforcement learning- Introduction to reinforcement and holistic learning, Multi-perspective decision making for Big data and multi-perspective learning for big data, Advanced techniques for big data mining.	7	CO6
Text Books:			
1. Han, Jiawei Kamber, Micheline Pei and Jian, "Data Mining: Concepts and Techniques", Elsevier Publishers, ISBN: 9780123814791, 9780123814807.			

2. Parag Kulkarni, “Reinforcement and Systemic Machine Learning for Decision Making”, Wiley-IEEE Press, ISBN: 978-0-470-91999-6.

Reference Books:

1. Matthew A. Russell, "Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More", Shroff Publishers, 2nd Edition, ISBN: 9780596006068.
2. Saumen Charkrobarti, “Mining the Web Discovering Knowledge from Hypertext Data”, Morgan Kaufmann, ISBN-13978-1558607545.
3. M. Dunham, “Data mining: Introductory and Advanced topics”, Pearson Education, 2003.

eLearning Resources:

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT8101 : Foundation For Cyber Security

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	CIA:	40 Marks
	ESE:	60 Marks
Credits: 4	Total:	100 Marks
Prerequisite Course: -		

Course Objectives

1. To understand and classify different types of cybercrimes along with legal frameworks surrounding cybercrimes.
2. To set up a secure environment for testing and analyzing cybersecurity tools.
3. To understand the concepts of data confidentiality and integrity through cryptographic methods.
4. To identify and analyze various cyber threats and the methods to mitigate them.
5. To explore simulation of attacks like web jacking and develop strategies for mitigation.
6. To analyze and implement network security measures.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1	Understand and classify different types of cybercrimes along with legal frameworks surrounding cybercrimes.	2	Understand
CO2	Set up a secure environment for testing and analyzing cybersecurity tools.	3	Analyze
CO3	Understand the concepts of data confidentiality and integrity through cryptographic methods.	2	Understand
CO4	Identify and analyze various cyber threats and the methods to mitigate them.	4	Analyze
CO5	Explore simulation of attacks like web jacking and develop strategies for mitigation.	3	Analyze
CO6	Analyze and implement network security measures.	4	Analyze

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	1	1	-	-	-	1	3	-	3	-	3	-
CO2	2	-	-	1	-	-	-	-	-	2	-	2	-	3	-
CO3	1	1	3	3	2	3	1	1	3	-	-	1	-	3	-
CO4	0	3	0	3	-	-	2	-	-	1	-	2	-	3	-
CO5	0	2	0	3	-	-	-	-	-	3	2	2	-	3	-
CO6	2	-	3	1	3	2	-	1	3	-	-	1	-	3	-

Course Contents			
Unit-I	**INTRODUCTION TO CYBERCRIMES AND THEIR CLASSIFICATION**	**No. of Hours**	**COs**
	Understanding Cybercrimes and Their Classification, Definition of Cybercrime ,Categories of Cybercrime: Crimes against Individuals (Identity Theft, Cyberstalking), Crimes against Property (Hacking, Intellectual Property Theft) ,Crimes against Government (Cyber Terrorism, Espionage) ,Crimes against Society (Child Pornography, Trafficking), Legal Framework and Cybercrime Laws. Cyber Defamation Definition and Legal Aspects of Cyber Defamation, Types of Cyber Defamation: Slander, Libel in Cyberspace ,Case study on Cyber Defamation	8	CO1
Unit-II	**INTRODUCTION TO CYBER SECURITY TOOLS AND ENVIRONMENT**	**No. of Hours**	**COs**
	Overview of Cyber Security Introduction to Cyber Security: Definition, Importance, and Scope Key Concepts: Confidentiality, Integrity, Availability (CIA Triad) Cyber Security Tools OS: Kali or Parrot Virtual Machine: VMware Nmap: Network Scanning and Enumeration Techniques Wireshark: Packet Capture and Analysis Metasploit: Exploitation Framework Overview Cyber Security Environment Setup Setting Up a Virtual Lab for Testing and Simulation Safe Practices for Ethical Hacking and Penetration Testing	7	CO2
Unit-III	**CLASSICAL AND MODERN ENCRYPTION TECHNIQUES**	**No. Of Hours**	**COs**
	Introduction to Classical Encryption Caesar Cipher, Playfair Cipher, Rail Fence Cipher, Columnar Transposition Cipher Modern Encryption Techniques RC4 Stream Cipher, Symmetric Encryption (AES), Asymmetric Encryption (RSA) Confidentiality and Data Integrity Confidentiality in Encryption Verifying Data Integrity Using SHA-256	8	CO3
Unit-IV	**CYBER SECURITY THREATS AND MITIGATION TECHNIQUES**	**No. of Hours**	**COs**
	Phishing Techniques and Defense Mechanisms Social Engineering and Email-Based Phishing Attacks Phishing Simulation using Social Engineering Toolkit (SET) Defense Mechanisms: Email Filtering Techniques, User Awareness	7	CO4

	Programs Password Cracking Techniques		
Unit-V	**ADVANCED CYBERCRIME TECHNIQUES AND PREVENTION**	**No. of Hours**	**COs**
	Internet Time Theft Detection and Prevention Concept and Detection Methods Preventive Measures and Case Studies Understanding and Preventing Forgery in Cyberspace Cyber Forgery: Digital Document Forgery and Its Impact Tools and Methods to Prevent Forgery: Cryptography, Digital Signatures Web Jacking Simulation and Mitigation Introduction to Web Jacking: Techniques and Scenarios Tools for Simulating Web Jacking Attacks Mitigation Strategies: SSL/TLS, HSTS, Secure Coding Practices Categories of Cybercrime and Attack Scenarios Exploration of Cybercrime Categories and Attack Simulation Types of Attacks in Cybersecurity Overview of Common Cybersecurity Attacks: Phishing, SQL Injection, Buffer Overflow Defensive Mechanisms: Firewalls, Intrusion Detection Systems	8	CO5
Unit-VI	**SECURITY ATTACKS, NETWORK SECURITY, AND SECURE COMMUNICATION**	**No. of Hours**	**COs**
	Security Attacks and Defense Mechanisms Understanding Security Attacks Brute-Force Attack Using Hydra and John the Ripper Man-in-the-Middle (MitM) Attack Using Ettercap and Wireshark Network Security and Access Control Secure Network Architecture Using C	7	CO6

Text Books:

1. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security" Cengage Learning 978-0357149834
2. William Stallings "Cryptography and Network Security: Principles and Practice" Pearson, 978-0134444284
3. Dafydd Stuttard, Marcus Pinto "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" Wiley 978-1118026472

Reference Books:

1. William Stallings, Lawrie Brown "Computer Security: Principles and Practice" Pearson 978-0134794105
2. Jon Erickson "Hacking: The Art of Exploitation" 978-1593271442
3. Tanenbaum, A., “Modern Operating Systems”, Prentice-Hall of India.

eLearning Resources:

1. INTRODUCTION TO CYBER SECURITY
2. By Dr. Jeetendra Pande | Uttarakhand Open University, Haldwani https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. Microsoft Cybersecurity Analyst Professional Certificate https://www.coursera.org/professional-

certificates/microsoft-cybersecurity-analyst?utm_medium=sem&utm_source=gg&utm_campaign=b2c_india_microsoft-cybersecurity-analyst_microsoft_ftcof_professional-ce

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT306 : System Programming & Operating System Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**NA Marks**
	Practical:	**50 Marks**
	Term Work:	**NA Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Basic of Mathematics, Computer Fundamentals & Programming

Course Objectives

1. To implement basic language translator by using various needed data structures.
2. To make use of system calls and process scheduling algorithms.
3. To understand process synchronization.
4. To learn and understand I/O and memory management.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply the programming construct to Implement Assembler and lexical analyzer.	3	Apply
CO2	Use system calls and process scheduling algorithms.	3	Apply
CO3	Apply process synchronization techniques.	3	Apply
CO4	Apply the Memory management algorithms and Disk scheduling.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	1	2	-	1	-	1	1	1	2	3	-
CO2	1	2	2	-	1	2	-	1	-	1	1	1	2	3	-
CO3	1	2	2	-	1	2	-	1	-	1	1	1	2	3	-
CO4	1	2	2	-	1	2	-	1	-	1	1	1	2	3	-

Course Contents

This System Programming and Operating System Laboratory course has System Programming and Operating System as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have three hours to complete it.

The practical examination will comprise of implementation and related theory. All assignments are to be performed in C Language, C++ or Java. Use of open source platform and tools is encouraged.

Staff in-charge will suitably frame the assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C or C++ or Java Language.

	List of Assignments	No. of Hours	COs
1.	Assignment Based on Implementation of Two Pass Assembler.	2	CO1
2.	Assignment Based on lexical analyzer.	2	CO1
3.	Assignment based on use of system calls.	2	CO2
4.	Assignment based on process scheduling algorithms.	2	CO2
5.	Assignment Based on Process Synchronization.	2	CO3
6.	Assignment based on deadlock handling algorithms.	2	CO3
7.	Assignment Based on Page Replacement Algorithm.	2	CO4
8.	Assignment Based on Disk Scheduling.	2	C04
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming”, 2nd Edition SPD, ISBN: 978-93-5110-469-8.
2. Silberscharz, A. and Galvin, P. B., “Operating System Concepts”, 7th Edition, Addison-Wesley, ISBN: 978- 1-118-06333-0.

Reference Books:

1. Leland Beck, “System Software: An Introduction to systems programming”, Pearson.
2. John R. Levine, Tony Mason, Doug Brown, “Lex & Yacc”, 1st Edition, O’REILLY
3. ISBN 81-7366-062-X.
4. Adraham Silberschatz, Pert B. Galvin, and Greg Gagne, "Operating System Concepts", 8th edition, Wiley-India edition.

eLearning Resources:

1. NPTEL: https://onlinecourses.swayam2.ac.in/cec21_cs20/preview

IT307 : Computer Network Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**50 Marks**
	Practical:	**NA Marks**
	Term Work:	**NA Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Digital Electronic & Computer Organization

Course Objectives

1. To design network and routing algorithms.
2. To implement Network Address Translation and socket programming.
3. To implement client and server communication.
4. To understand wireless communication.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Design network and routing algorithms.	3	Apply
CO2	Implementation of Network Address Translation and socket programming.	3	Apply
CO3	Implementation VPN and client and server communication.	3	Apply
CO4	Design of wireless communication.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	3	1	1	1	3	3	1	3	2	2	2
CO2	1	2	3	1	3	1	1	1	3	3	1	3	2	2	2
CO3	1	2	3	1	3	1	1	1	3	3	1	3	2	2	2
CO4	1	2	3	1	3	1	1	1	3	3	1	3	2	2	2

Course Contents

This Computer Network Laboratory course has Computer Network as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus.

The teacher will frame the problem statements with due consideration that students have three hours to complete that. The practical examination will comprise of implementation and related theory. All assignments are to be performed in C Language, C++ or Java. Use of open-source platform and tools is encouraged.

Staff in-charge will suitably frame the assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C or C++ or Java Language.

	List of Assignments	No. of Hours	COs
1.	Assignment on setting up a small IP network for a department laboratory using suitable network simulator.	2	CO1
2.	Assignment of implementation of various routing algorithms.	2	CO1
3.	Assignment on configuration of Static and Dynamic Network Address Translation (NAT).	2	CO2
4.	Assignment on implementation of socket programming on Linux platform – TCP and UDP application.	2	CO2
5.	Assignment of implementing Local Proxy Server for application of VPN.	2	CO3
6.	Assignment on accessing SMTP and POP3 email server through mail client.	2	CO3
7.	Assignment of hosting HTTP, FTP server and interacting with suitable client.	2	CO4
8.	Assignment on configuring DNS and DHCP server using wireless communication.	2	CO4
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. Andrew S. Tanenbaum, David J. Wethrall, “Computer Network”, Pearson Education, ISBN: 978-0-13-212695-3.
2. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, McGraw Hill Education, ISBN: 978-0-07- 070652-1, 4th Edition.
3. Steve Rackley, “Wireless Networking Technology” Elsevier publication, Britain 2nd.

Reference Books:

1. Behrouz A. Forouzan, “Data Communication and Networking”, McGraw Hill.
2. Mayank Dave, “Computer Network”, Cengage Learning, ISBN: 978-81-315-0986-9.
3. T S Rappaport, “Wireless Communication” 2nd Edition, Pearson Education India, ISBN: 968-81-3273-186-4.

eLearning Resources:

1. https://www.coursera.org/learn/computer-networking
2. https://www.coursera.org/specializations/computer-network-security
3.
4. https://nptel.ac.in/courses/106105183

IT308 : Internet of Things Laboratory		
Teaching Scheme	**Examination Scheme**	
Lectures: 2 Hrs./Week	**Oral:**	**NA Marks**
	Practical:	**NA Marks**
	Term Work:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**
Prerequisite Course: Microprocessor and Computer Network Technology		

Course Objectives

1. To learn IoT platforms and operating system such as Raspberry -Pi/Arduino.
2. To learn web interface for IoT.
3. To learn the knowledge for communication objects.
4. To learn cloud environment for IoT.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand IoT platforms and operating system such as Raspberry-Pi/Arduino.	2	Understand
CO2	Implement the communication interface for IoT and solve Real World Problems.	3	Apply
CO3	Demonstrate data communication within the objects using IoT platforms such as Raspberry-Pi/Arduino.	3	Apply
CO4	Implement real time and cloud environment for IoT applications.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	3	2	-	1	2	3	2	2	-	3	-
CO2	2	1	3	3	3	2	-	1	2	3	2	2	-	3	-
CO3	2	1	3	3	3	2	-	1	2	3	2	2	2	3	2
CO4	2	1	3	3	3	2	-	1	2	3	2	2	2	3	2

Course Contents

This Internet of Things Laboratory course has Internet of Things as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus.

The teacher will frame the problem statements with due consideration that students have two hours to complete. The examination will comprise of implementation and related theory. All assignments are to be performed in C Language, C++ or Java. Use of open source platform and tools is encouraged.

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C or C++ or Java Language.

	List of Assignments	No. of Hours	COs
1.	Assignment based on study of Raspberry-Pi/Arduino.	2	CO1
2.	Assignment based on study of different operating systems for Raspberry-Pi/Arduino. Understanding the process of OS installation on Raspberry-Pi/Arduino.	2	CO1
3.	Assignment based on Open source prototype platform- Raspberry- Pi for Pi Camera Module Interface with Raspberry Pi using Python.	2	CO2
4.	Assignment based on Designing a web interface to control connected sensors remotely using Raspberry-Pi/Arduino.	2	CO2
5.	Assignment based on Data Streaming with Arduino/ESP8266 and Big Data Tools.	2	CO3
6.	Assignment based on RFID/NFC using Arduino.	2	CO3
7.	Assignment based on Cloud Server.	2	CO4
8.	Assignment based on Mini Project.	2	CO4
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. Vijay Madisetti, “Internet of Things: A Hands-On Approach Arshdeep Bahga”, VPT – Paperback 2015 978- 0996025515 628/- 2.
2. David Hanes, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Patrick Grossetete Cisco Press – Paperback – 16 Aug 2017 978-1-58714-456- 1 599.
3. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, Willy Publications - 2013 978-1-118- 47347-4, 466.

Reference Books:

1. Olivier Hersent, “The Internet of Things Key applications and protocols”, Willy Publications 2nd Edition 978-1-119- 99435-0.
2. Hakima Chaouchi, “The Internet of Things Connecting Objects to the Web”, Willy Publications, 978-1-84821- 140-7.
3. Agus Kurniawan, “The Internet of Things Donald Norris TAB 4 Smart Internet of Things Projects”,

PACKT.
4. Cuno Pfister, “Getting Started with the Internet of Things”, SPD O’REILL Y IOT.
5. Dr. V. K. Pachghare, “Cryptography and Information security”, PHI, 2nd Edition, ISBN- 978- 81-203-5082-3.

eLearning Resources:

1. https://www.coursera.org/specializations/iot

IT309 : Mini Project Based on Skill Based Credit Course		
Teaching Scheme	**Examination Scheme**	
Lectures: 2 Hrs./Week	**Oral:**	**NA Marks**
	Practical:	**NA Marks**
	Term Work:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**
Prerequisite Course: Object Oriented Programming, Database Management Systems.		

Course Objectives

1. To understand software requirement and design using industry standard tools.
2. To understand the agile methodology for development, testing of software products.
3. To understand sprint retrospective technology.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Demonstrate knowledge of software requirements and design using jira and Github	3	Apply
CO2	Apply the knowledge of agile methodology for implementation, testing of software products	3	Apply
CO3	Use sprint retrospective for deployment and planning	3	Apply
CO4			

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	3	1	2	1	3	3	3	2	2	2	3
CO2	2	1	3	2	3	1	2	1	3	3	3	2	2	2	3
CO3	2	1	3	2	3	1	2	1	3	3	3	2	2	2	3
CO4															

Course Contents

This Mini-Project Based on Skill Based Credit Course do not have any particular subject as its core subject. The problem statements should be framed based on assignments mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have three hours to complete that.

The practical examination will comprise of implementation and related theory. All assignments are to be performed in HTML, CSS, Javascript, PHP and MySQL. Use of open source platform and tools is encouraged.

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date.All the assignments should be conducted in HTML, CSS, Javascript, PHP and MySQL

	List of Assignments	No. of Hours	COs
1.	Introduction (software development process, mvp, etc), handing out projects, squad formations, roles & responsibilities, how to make design document, plan for app development, Jira introduction, Q&A, highlight what students can adopt, define future course of action, Presentations on design documents by groups	8	CO1
2.	Development process best practices (by instructor) , (Agile, Jira continuation, Git, unit testing, automation test tools, coding best practices) (Local development, sprint planning for 1 group), Sprint demo local deployment by groups	8	CO2
3.	Sprint planning & sprint retrospective any 1 group at random, building a pipeline 30 mins, (by instructor) Sprint demo: Cloud deployment by groups, sprint planning & sprint retrospective any 1 group at random, how do you iterate, change management. Final sprint demo cloud deployment by groups, sprint retrospective any 1 group at random, closing comments by instructor	8	CO3
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. NA

Reference Books:

1. Mumshad Mannambeth, “Docker for the Absolute Beginner - Hands-On”, Packt Publishing, ISBN:

9781788991315. https://learning.oreilly.com/videos/docker-for-the/9781788991315/

eLearning Resources:

1. "Docker Engine installation overview", https://docs.docker.com/engine/install/
2. "Gitlab", https://docs.gitlab.com/ee/gitlab-basics/
3. "Jira for Agile team management" https://www.youtube.com/watch?v=TsG3OWTDAFY
4. "Selenium", https://www.youtube.com/watch?v=oo8hakhidQM (Selenium installation on your machine and basic test automation) https://www.youtube.com/watch?v=_lBaedX4UAE (Selenium docker setup) https://www.youtube.com/watch?v=esb1v_d5-™ (Selenium running tests via containers)

IT310 : Corporate Readiness - II		
Teaching Scheme	**Examination Scheme**	
Lectures: 2 Hrs./Week	**Oral:**	**NA Marks**
	Practical:	**NA Marks**
	Term Work:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**
Prerequisite Course: Quantitative aptitude, Verbal and non verbal communication.		

Course Objectives

1. To develop clarity in the exploration process of student career and to match his skills and interests with a chosen career path.
2. To develop required aptitude skills.
3. To design the functional and chronological resume.
4. To demonstrate the importance of critical thinking ability and expression in group discussions.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	To develop clarity in the exploration process of student career and to match his skills and interests with a chosen career path.	1	Remember
CO2	To develop required aptitude skills.	2	Understand
CO3	To design the functional and chronological resume.	3	Apply
CO4	To demonstrate the importance of critical thinking ability and expression in group discussions.	4	Analyze

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	--	--	--	--	--	0	--	2	0	2	1	1	--	--	--
CO2	--	--	--	--	--	--	--	2	3	3	3	1	--	--	--
CO3	--	--	--	--	--	--	--	1	3	3	2	1	--	--	--
CO4	1	1	0	--	0	0	--	--	--	1	1	0	--	--	--

Course Contents			
	List of Assignments	**No. of Hours**	**COs**
1.	UNIT I: Placement Awareness Discussion over Different Companies for recruitment, their eligibility criteria and placement procedures. Discussion over Different Competition organised by companies & other platforms, Revision and Assessment of Verbal reasoning.	5	CO1
2.	UNIT II: Resume Writing Keywords, resume examples for industry, professional font, active language, important achievements, Proofread and edit. Innovative resume building- video resume.	3	CO2
3.	UNIT III: Group Discussion and Presentation skills Why GDs are implemented commonly, Aspects which make up a Group Discussion, Tips on group discussion, do's and don'ts of GD and Presentation skills.	4	CO3
4.	UNIT IV: Logical Reasoning I Coding and Decoding (Visual Reasoning and series), Statement & Conclusions (Syllogisms), Relationships (Analogy), Data arrangements, Crypt arithmetic.	5	CO4
5.	UNIT V: Logical Reasoning II Data Interpretation & Data Sufficiency, Blood relation and dices, Clocks and Calendar, Direction sense and cubes, Logical connectives.	6	CO5
6.	UNIT VI: Preparation for Job Interviews Prepare for Different Types of Job Interviews, Most Common Interview Questions, Prepare for Best Practices before & after the Job Interview, Expected Technical Questions, Strategic Questions at the end of the Job Interview.	3	CO6
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Agarwal.
2. Reasoning verbal and Non-Verbal by B. S. Sijwali.
3. Master the Group Discussion & Personal Interview - Complete Discussion on the topics asked by reputed B-schools & IIMs by Sheetal Desarda.

Reference Books:

1. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical).
2. Analytical Reasoning by M. K. Panday.
3. Logical and analytical reasoning by K. Gupta.

4. Multi-dimensional reasoning by Mishra & Kumar Dr. Lal.

eLearning Resources:

1. E- Books :
2. https://themech.in/quantitative-aptitude-and-logical-reasoning-books/
3. https://www.thelocalhub.in/2021/01/reasoning-competitive-exams-pdf.html
4. E-learning Resources/MOOCs/ NPTEL Course Links:
5. https://www.practiceaptitudetests.com/non-verbal-reasoning-tests/
6. https://www.educationquizzes.com/11-plus/non-verbal-reasoning/
7. https://www.livecareer.com/resume/examples/web-development/e-learning-develope

MC311 : Mandetoary Course - V	
Teaching Scheme	**Examination Scheme**
Lectures: 1 Hrs./Week	**Oral: NA Marks**
	Practical: NA Marks
	Term Work: NA Marks
Credits: 0	**Total: 50 Marks**
Prerequisite Course:	

Course Objectives

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1			
CO2			
CO3			
CO4			

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															

IT311 : Cryptography and Cyber Security

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**40 Marks**
	End-Sem Exam:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Basic of Mathematics, Computer Fundamentals & Programming.

Course Objectives

1. To understand the security fundamentals and use different substitution/ transportation cipher techniques.
2. To use the different cryptographic algorithms for implementing security.
3. To use the different Message digest algorithms to obtain unique code.
4. To understand various protocols for network security to protect against the threats in the networks.
5. To understand different cyber-attacks and safety measures to provide security.
6. To use different tools to provide security measures in an organization.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand the security fundamentals and apply different substitution/transportation cipher techniques.	3	Apply
CO2	Apply different cryptographic algorithms for implementing security.	3	Apply
CO3	Apply the different Message digest algorithms to obtain unique code.	3	Apply
CO4	Understand various protocols for network security to protect against the threats in the networks.	2	Understand
CO5	Understand different cyber-attacks and safety measures to provide security.	2	Understand
CO6	Apply different tools to provide security measures in an organization.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	2	2	2	1	1	1	2	2	3	1
CO2	3	2	2	2	3	2	2	2	1	1	1	2	2	3	1
CO3	3	2	2	2	3	2	2	2	1	1	1	2	2	3	1
CO4	1	2	2	2	2	2	2	2	1	1	1	2	2	3	1
CO5	1	2	2	2	2	2	2	2	1	1	1	2	2	3	1
CO6	2	2	2	2	3	3	2	2	1	1	2	2	2	3	1

Course Contents			
Unit-I	**SECURITY FUNDAMENTALS**	**No. of Hours**	**COs**
	Introduction, CIA Triad, Threats and Attacks, Security Services, Security Mechanisms, Model for Network Security, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques, Block Ciphers, Stream Ciphers.	8	CO1
Unit-II	**CRYPTOGRAPHY**	**No. of Hours**	**COs**
	Symmetric Key Algorithms: Data Encryption Standards, Advanced Encryption Standard, Linear Cryptanalysis and Differential Cryptanalysis, Public Key Cryptosystems, Conventional and Public-Key Encryption, RSA algorithm, Diffie-Hellman Key Exchange Algorithm.	7	CO2
Unit-III	**MESSAGE DIGEST AND KEY MANAGEMENT**	**No. Of Hours**	**COs**
	Cryptographic Hash Functions, Applications of Cryptographic Hash Functions- Message Authentication, Digital Signatures, Two Simple Hash Functions, MD5 algorithm, SHA-1 algorithm. Key Management: Introduction, Generations, Distribution, Updation, Digital Certificate, Kerberos 5.0.	8	CO3
Unit-IV	**NETWORK SECURITY**	**No. of Hours**	**COs**
	IPSEC: Introduction, AH and ESP, Tunnel Mode, Transport Mode, Security Associations. SSL- Introduction, Handshake Protocol, Record Layer Protocol. IKE-Internet Key Exchange Protocol.	7	CO4
Unit-V	**INTRODUCTION TO CYBER SECURITY**	**No. of Hours**	**COs**
	Introduction, Definition and origin, Cybercrime and Information Security, Classification of Cybercrimes, The Legal Perspectives, Indian Perspective, Global Perspective, Categories of Cybercrime, Types of Attacks, Social Engineering, Cyber stalking. Case Study: Cyber stalking, social engineering, Identity Theft, Online Scams, Cyber-attacks on Indian sites.	8	CO5
Unit-VI	**TOOLS AND METHODS USED IN CYBERCRIME**	**No. of Hours**	**COs**
	Introduction, Phishing, Password Cracking, Key-loggers, Spywares, Types of Virus, Worms, DoS and DDoS, SQL injection. Cyber laws- Indian context, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and Cybercrime Scenario in India, Indian IT Act and Digital Signatures. Case Study: Phishing, Password cracking, Virus attacks.	7	CO6

Text Books:

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education/PHI, 2006, ISBN: 978-1-292-15858-7.
2. Atul Kahate, "Cryptography and Network Security", McGraw Hill, ISBN: 9780070494831.
3. Nina Godbole, Sunit Belapure, “Cyber Security- Understanding Cyber Crimes, Computer Forensics and

Legal Perspectives", Wiely India Pvt. Ltd, ISBN- 978-81-265-2179-1.

Reference Books:

1. Nina Godbole, "Information Systems Security", Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6.
2. Willaim Stallings, "Computer Security: Principles and Practices", Pearson Ed. ISBN:978-81-317-3351-6.
3. Mark Merkow, "Information Security-Principles and Practices", Pearson Ed. 978-81-317-1288-7.
4. CK Shyamala, et al., "Cryptography and Security", Wiley India Pvt. Ltd, ISBN 978-81-265-2285-9.
5. Berouz Forouzan, "Cryptography and Network Security", 2nd Edition, TMH, ISBN :9780070702080.

eLearning Resources:

1. Cyber Security: https://onlinecourses.swayam2.ac.in/cec23_cs03/preview
2. Fundamentals of Cryptography:
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666884706803712703_shared/overview
4.
5. Cryptography with Python:
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094409461669888178 3_shared/overview
7.

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT312 : Machine Learning

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**40 Marks**
	End-Sem Exam:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Linear Algebra, Calculus and Probability, Statistics, Foundation of Data Science.

Course Objectives

1. To understand Machine Learning concepts.
2. To explore the different types of Classification algorithm.
3. To explore the Regression techniques.
4. To acquire the knowledge of Clustering techniques.
5. To acquire the knowledge of Association rules and Dimensionality Reduction.
6. To understand the Deep Learning concept.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Recognize the characteristics of machine learning that makes it useful to real-world problems.	2	Understand
CO2	Apply different classification algorithms for various machine learning applications.	3	Apply
CO3	Apply the Regression methods.	3	Apply
CO4	Apply Clustering technique.	3	Apply
CO5	Apply the Association rule and Principle Component Analysis.	3	Apply
CO6	Understand the Deep learning.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1
CO2	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1
CO3	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1
CO4	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1
CO5	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1
CO6	3	2	2	3	3	2	1	1	1	2	1	1	2	3	1

Course Contents			
Unit-I	**INTRODUCTION TO MACHINE LEARNING**	**No. of Hours**	**COs**
	Introduction: Definition, Real life applications, Introduction to Data in Machine Learning. Types of Learning: Supervised Learning Unsupervised Learning, Semi-Supervised Learning, Reinforcement Learning, Concept of Feature, Feature construction, Feature Selection and Transformation, Curse of Dimensionality. Dataset Preparation: Training Vs. Testing Dataset, Dataset Validation Techniques – Hold-out, k-fold Cross validation, Leave-One-Out Cross- Validation (LOOCV).	8	CO1
Unit-II	**REGRESSION**	**No. of Hours**	**COs**
	Linear Regression, Logistic Regression, Ridge Regression, Lasso Regression, Polynomial Regression, Types of Regression. Performance Metrics, Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Ab- solute Error (MÆ), R^2 (R-Squared).	7	CO2
Unit-III	**CLASSIFICATION**	**No. Of Hours**	**COs**
	Sigmoid function, Classification Algorithm in Machine Learning: Decision Trees, Ensemble Techniques: Bagging and boosting, Adaboost and gradient boost, Random Forest, Naïve Bayes Classifier, Support Vector Machines. Performance Evaluation: Confusion Matrix, Accuracy, Precision, Recall, AUC-ROC Curves, F-Measure.	8	CO3
Unit-IV	**CLUSTERING**	**No. of Hours**	**COs**
	Euclidean Distance, Manhattan, Hamming, Minkowski Distance, Metric, Different clustering methods (Distance, Density, Hierarchical), K-means clustering Algorithm-with example, k-medoid algorithm-with example. Performance Measures- Rand Index, K-Nearest Neighbour algorithm.	7	CO4
Unit-V	**ASSOCIATION AND DIMENSIONALITY REDUCTION**	**No. of Hours**	**COs**
	Association Rules-Market Basket Analysis, The Apriori Algorithm, Performance Measures – Support, Confidence, Lift. Dimensionality Reduction: Principal Component Analysis, Partial Least Squares Subset Selection, Feature Reduction/Dimensionality reduction, Principal components analysis (Eigen values, Eigen vectors, Orthogonality)	8	CO5
Unit-VI	**DEEP LEARNING**	**No. of Hours**	**COs**
	Introduction to ANN, McCulloch Pitts Neuron, Perceptron and its Learning Algorithm, Sigmoid Neuron, Activation Functions: Tanh, ReLu. Multi- layer Perceptron Model – Introduction, learning parameters: Weight and Bias, Loss function: Mean Square Error, Back Propagation Learning.	7	CO6

	Convolutional Neural Network, Building blocks of CNN, Transfer Learning, R-CNN,Auto encoders, LSTM Networks, Recent Trends in Deep Learning.		

Text Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", PHI 4th Edition-2020 ,The MIT Press,ISBN:9780262043793.
2. Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press ISBN:97802620356133.
3. Machine Learning, Tom M. Mitchell, McGraw Hill, 1997 ISBN: 0071154671, 9780071154673

Reference Books:

1. Peter Flach, “Machine Learning The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press India.ISBN 13: 9781107422223
2. Pattern Recognition and Machine Learning. Christopher Bishop. Springer. 2006, ISBN-13: 978-1493938438
3. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. CambridgeUniversity Press. 2017. ISBN:978-1-107-05713-5.
4. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012. ISBN 978-0-262-01802-9

eLearning Resources:

1. http://imlab.postech.ac.kr/dkim/class/csed514_2019s/DeepLearningBook.pdf
2. https://kkpatel7.files.wordpress.com/2015/04/alppaydin_machinelearning_2010.pdff
3. https://nptel.ac.in/courses/106106139
4. https://nptel.ac.in/courses/106/106/106106202

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT313 : Web Technology

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**Continuous Assessment:**	**40 Marks**
	End-Sem Exam:	**60 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: IT for Engineers and Database Management System.

Course Objectives

1. To understand the basics of web applications and website development.
2. To apply the various client side technologies for web development.
3. To apply the concepts of PHP and MySQL for storing and retrieving the data.
4. To understand the different CMS tools for the development of websites.
5. To apply the concept of servlets for solving the real world problems.
6. To use the basics of JSP and struts for web development.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand the basics of web applications and website development.	2	Understand
CO2	Apply the various client side technologies for web development.	3	Apply
CO3	Apply the concepts of PHP and MySQL for storing and retrieving the data.	3	Apply
CO4	Understand the different CMS tools for the development of websites.	2	Understand
CO5	Apply the concept of servlets for solving the real world problems.	3	Apply
CO6	Apply the basics of JSP and struts for web development.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	1	2	1	1	1	3	3	--	--
CO2	2	2	3	2	3	2	2	2	2	1	2	3	3	--	2
CO3	2	2	3	2	3	2	2	2	2	1	2	3	3	--	2
CO4	2	2	3	2	3	2	2	2	2	1	2	3	3	--	1
CO5	2	2	3	2	3	2	2	2	2	1	2	3	3	--	2
CO6	2	2	3	2	3	2	2	2	2	1	2	3	3	--	2

Course Contents			
Unit-I	**INTRODUCTION**	**No. of Hours**	**COs**
	Web Development History, Motivation, Categories of Web Applications, Web Applications Characteristics. Web Architecture, Phases of Website Development, World Wide Web: Introduction to TCP/IP, HTTP and FTP. Introduction to Browser and search engines. Introduction to Web Servers: Features of web servers, caching, case study-XAMPP, Apache, Configuring web servers.	10	CO1
Unit-II	**CLIENT SIDE TECHNOLOGIES**	**No. of Hours**	**COs**
	JavaScript: Introduction to JavaScript, JavaScript in perspective, basic syntax, variables and data types, statements, operators, literals, functions, objects, arrays, built in objects, JavaScript debuggers. DOM: Introduction to Document Object Model, DOM history and levels, intrinsic event handling, modifying element style, the document tree, DOM event handling, jQuery. Angular JS: Overview of Angular JS, Introduction to Angular JS, MVC Architecture.	10	CO2
Unit-III	**PHP**	**No. Of Hours**	**COs**
	PHP: Introduction to PHP, uses of PHP, general syntactic characteristics, Primitives, operations and expressions, output, control statements, arrays, functions, pattern matching, form handling, files, cookies, session tracking. Using MySQL with PHP, Create Database, Insert, Update, Delete, Read and Search data using PHP.	10	CO3
Unit-IV	**CONTENT MANAGEMENT SYSTEM**	**No. of Hours**	**COs**
	Introduction to CMS: advantages using CMS, CMS development tools: Wordpress, Drupal, Joomla. Wordpress: content and conversion, directory, file structure, local working, component administration, core, loop, data management, Wordpress as CMS, Wordpress in enterprise. Website Deployment: Domain registration, Domain hosting, parking websites, uploading data using FTP, email configuration.	10	CO4
Unit-V	**JAVA SERVLET**	**No. of Hours**	**COs**
	Servlet: Servlet architecture overview, A “Hello World” servlet, Servlets generating dynamic content, Servlet life cycle, parameter data, sessions, cookies. URL rewriting, other Servlet capabilities, data storage, Servlets concurrency, databases (MySQL) and Java Servlets. AJAX: Introduction, Working of AJAX.	10	CO5
Unit-VI	**JSP AND STRUTS**	**No. of Hours**	**COs**
	JSP: Introduction to Java Server Pages, JSP and Servlets, running JSP applications, Basic JSP, JavaBeans classes and JSP, Support for the Model-view-controller paradigm, JSP related technologies.	10	CO6

	Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.		

Text Books:

1. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035
2. Robert W. Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson education, 2008
3. Jason Hunter, “Java Servlet Programming”, 2nd Edition, O'reilly Publications

Reference Books:

1. Roger S. Pressman, David Lowe, “Web Engineering”, Tata Mcgraw Hill Publication, 2007
2. Kogent Learning Solution Inc., “Web Technologies” HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black Book, Dream Tech Press, 2014
3. Jim Keogh, “J2EE: The Complete Reference”, 1st Edition , Tata McGraw Hill Pulishing Company, ISBN: 978-0-07-052912-0
4. Marty Hall, Larry Brown,"Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930

eLearning Resources:

1. NPTEL: http://www.nptelvideos.in/2012/11/internet-technologies.html
2. NPTEL: http://www.nptelvideos.com/php/php_video_tutorials.php
3. Coursera: https://www.coursera.org/programs/faculty-development-program-v4v5h/skills/web-development?query=web%20Technology&source=search
4. Infosys Springboard: https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT314A : Project Management (Professional Elective-II)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**40 Marks**
	End-Sem Exam:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Software Engineering.

Course Objectives

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle.
3. To learn about the activity planning.
4. To learn about the risk management principles.
5. To manage software projects and control software deliverables.
6. To develop skills to manage the various phases involved in project management, people management.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand Project Management principles while developing software.	2	Understand
CO2	Understand extensive knowledge about the basic project management concepts, framework and the process models.	2	Understand
CO3	Obtain adequate knowledge about software process models and software effort estimation techniques.	2	Understand
CO4	Understand Estimate the risks involved in various project activities.	2	Understand
CO5	Understand the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.	2	Understand
CO6	Understand staff selection process and the issues related to people management.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	0	-	-	1	1	3	1	-	-	3
CO2	1	-	-	-	-	0	-	-	1	1	3	1	-	-	3
CO3	1	-	-	-	-	-	-	-	1	1	3	1	-	-	3
CO4	1	-	-	-	-	-	-	-	1	1	3	1	-	-	3
CO5	1	-	-	-	-	-	-	0	1	1	3	1	-	-	3
CO6	1	-	-	-	-	-	-	0	1	1	3	1	-	-	3

Course Contents			
Unit-I	**PROJECT EVALUATION AND PROJECT PLANNING**	**No. of Hours**	**COs**
	Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	8	CO1
Unit-II	**PROJECT LIFE CYCLE AND EFFORT ESTIMATION**	**No. of Hours**	**COs**
	Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II – a Parametric Productivity Model.	7	CO2
Unit-III	**ACTIVITY PLANNING**	**No. Of Hours**	**COs**
	Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method.	8	CO3
Unit-IV	**RISK MANAGEMENT**	**No. of Hours**	**COs**
	Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.	7	CO4
Unit-V	**PROJECT MANAGEMENT AND CONTROL**	**No. of Hours**	**COs**
	Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.	8	CO5
Unit-VI	**STAFFING IN SOFTWARE PROJECTS**	**No. of Hours**	**COs**
	Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Working in teams – Decision making – Communications genres – Leadership.	7	CO6

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", 5th Edition, Tata McGraw Hill, New Delhi, 2012.

Reference Books:

1. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, 2011.
2. Walker Royce, "Software Project Management", Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, "Managing Global Software Projects", McGraw Hill Education (India), 14th Reprint 2013.

eLearning Resources:

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT314B : Big Data Analytics (Professional Elective-II)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	Continuous Assessment:	40 Marks
	End-Sem Exam:	60 Marks
Credits: 3	Total:	100 Marks

Prerequisite Course: Engineering mathematics, Database Management Systems, Foundation of data science.

Course Objectives

1. To introduce big data analytics process in detail.
2. To introduce association rules, regression, classification for big data.
3. To introduce Apache Hadoop and MapReduce for big data.
4. To introduce Hadoop Eco System for big data.
5. To introduce Apache Spark concepts for big data.
6. To introduce Data Visualization concepts for analytics.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1	Understand the process of big data analytics.	2	Understand
CO2	Apply classification, association rule, regression in big data analytics.	3	Apply
CO3	Apply Apache Hadoop and MapReduce concept in big data.	3	Apply
CO4	Apply Hadoop Eco System tools in big data.	3	Apply
CO5	Apply Apache Spark concepts	3	Apply
CO6	Apply Data Visualization concepts	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	1	1	1	1	3	1	3	3	3	2
CO2	2	2	3	2	3	1	1	1	1	1	1	3	3	3	2
CO3	1	1	1	1	2	1	1	1	2	3	1	3	2	3	2
CO4	3	3	2	1	3	1	2	1	3	3	1	3	2	3	2
CO5	2	2	3	2	3	1	1	1	1	1	1	3	3	3	2
CO6	1	2	3	2	3	1	1	1	1	1	1	3	2	3	2

Course Contents			
Unit-I	**BIG DATA ANALYTICS LIFE CYCLE**	**No. of Hours**	**COs**
	Introduction to Big Data, sources of Big Data, Data Analytic Lifecycle: Introduction, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model Building, Phase 5: Communication results, Phase 6: Operationalize.	8	CO1
Unit-II	**ADVANCED ANALYTICAL THEORY AND METHODS USING PYTHON**	**No. of Hours**	**COs**
	Introduction to Scikit-learn, Installations, Dataset, matplotlib, filling missing values, Regression and Classification using Scikit-learn. Association Rules: FP growth, Regression: Linear Regression, Logistic Regression, Classification: Naïve Bayes classifier	7	CO2
Unit-III	**INTRODUCTION TO APACHE HADOOP AND MAPREDUCE**	**No. Of Hours**	**COs**
	History of Hadoop, Apache Hadoop, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Anatomy of a Map Reduce Job Run, Task Execution, Map Reduce Types and Formats, Map Reduce Features	8	CO3
Unit-IV	**HADOOP ECO SYSTEM**	**No. of Hours**	**COs**
	Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.	7	CO4
Unit-V	**APACHE SPARK**	**No. of Hours**	**COs**
	Apache Spark. Spark programming. (Python and PySpark) ,Spark - Resilient Distributed Dataset (RDDs). Spark - RDDs, DataFrames, Spark SQL ,PySpark , NumPy , SciPy, Code Optimization, Cluster Configurations , Linear Algebra Computation in Large Scale.,Distributed File Storage Systems	8	CO5
Unit-VI	**DATA VISUALIZATION**	**No. of Hours**	**COs**
	Introduction to Data Visualization, Challenges to Big data visualization, Types of data visualization, Data Visualization Techniques, Visualizing Big Data, Tools used in Data Visualization, Analytical techniques used in Big data visualization. Data Visualization using Python: Line plot, Scatter plot, Histogram, Density plot, Box- plot.	7	CO6

Text Books:

1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publication, 2012, ISBN0-07-120413-X.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Spark - The Definitive Guide: Chambers and Zaharia

Reference Books:

1. Data Science & Big Data Analytics - Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services", Wiley Publication
2. DT Editorial Services, "Big Data, Black Book", DT Editorial Services, ISBN: 9789351197577, 2016 Edition
3. J. Hurwitz, et al., "Big Data for Dummies", Wiley, 2013.
4. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hill, 2012.

eLearning Resources:

1. https://www.coursera.org/specializations/big-data

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT314C : Compiler Design (Professional Elective-I)

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**40 Marks**
	End-Sem Exam:	**60 Marks**
Credits: 3	**Total:**	**100 Marks**

Prerequisite Course: Theory of Computations.

Course Objectives

1. To understand the theory and practice of compiler implementation.
2. To study finite state machines and lexical scanning
3. To learn context free grammars, compiler parsing techniques.
4. To learn construction of abstract syntax trees and symbol tables.
5. To understand Intermediate machine representations.
6. To learn actual code generation and code optimization.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand the different phases of compiler and compiler construction tools.	2	Understand
CO2	Design and Implement lexical analyzer and syntax analyzer.	3	Apply
CO3	Apply the concepts of grammars and compiler parsing techniques.	3	Apply
CO4	Implement abstract syntax trees and symbol tables using syntax directed translation.	3	Apply
CO5	Understand the intermediate code generation phase.	2	Understand
CO6	Understand code generation and to identify the sources of optimization.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	-	1	-	1	-	0	2	2	1	-	-
CO2	3	2	3	2	-	1	1	2	-	0	1	2	-	-	-
CO3	2	2	3	1	-	1	-	1	-	1	1	2	2	-	-
CO4	3	1	2	2	-	1	-	1	-	0	-	2	-	-	-
CO5	3	2	2	2	-	1	-	1	-	0	-	2	1	-	-
CO6	2	2	2	1	-	1	-	1	-	0	2	1	1	-	-

Course Contents			
Unit-I	**INTRODUCTION**	**No. of Hours**	**COs**
	Introduction: Compilers Analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases, Bootstrapping and Compiler construction tools, Symbol Table. Introduction to Finite Automata and Regular Expression. Introduction to Grammar.	8	CO1
Unit-II	**LEXICAL ANALYSIS**	**No. of Hours**	**COs**
	Lexical Analysis: Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, From Regular expression to Automata and Design of Lexical Analysis generator.	7	CO2
Unit-III	**SYNTAX ANALYSIS**	**No. Of Hours**	**COs**
	Role of the parse, Writing Grammars, Context-Free Grammars, Ambiguous Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedence Parsing, LR Parsers, SLR Parser, Canonical LR Parser, LALR Parser.	8	CO3
Unit-IV	**SYNTAX DIRECTED TRANSLATION**	**No. of Hours**	**COs**
	Syntax Directed Translation: Syntax Directed Definitions, Application of SDT (Syntax Directed Translation) and SDT schemes.	7	CO4
Unit-V	**INTERMEDIATE CODE GENERATION**	**No. of Hours**	**COs**
	Intermediate Code Generation: Directed acyclic graphs, three-address code Intermediate languages - Declarations, Assignment Statements, Boolean Expressions, Array references, Back patching.	8	CO5
Unit-VI	**CODE GENERATION AND OPTIMIZATION**	**No. of Hours**	**COs**
	Code generation and Optimization: Issues, Basic Blocks and Flow Graphs, DAG representation of Basic Blocks, Optimization of basic Blocks, Peephole Optimization, Principal Sources of Optimization, Loop Optimization, Global Data Flow Analysis.	7	CO6

Text Books:

1. V Aho, R Sethi, J D Ullman, “Compilers: Principles, Techniques, and Tools", Pearson 2nd Edition, ISBN 81-7758-590-8.
2. Dick Grune, Bal, Jacobs, Langendoen, “Modern Compiler Design”, Wiley, 2nd Edition, ISBN 81-265-0418-8.

Reference Books:

1. Anthony J. Dos Reis, “Compiler Construction Using Java”, JavaCC and Yacc Wiley, 1st Edition, ISBN 978-0-470-94959-7.
2. K Muneeswaran, “Compiler Design", Oxford University Press, 1st Edition, ISBN 0-19-806664-3.
3. J R Levin, T Mason, D Brown, “Lex and Yacc", O'Reilly, 2000, 2nd Edition, ISBN 81-7366-061-X.

eLearning Resources:

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

PR316 : IPR & EDP

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	End-Sem Exam:	**30 Marks**
Credits: 2	**Total:**	**50 Marks**

Prerequisite Course: Nil.

Course Objectives

1. To introduce the basic concepts of IPR.
2. To teach patent and Design as an IPR.
3. To teach copy right and trademark as an IPR.
4. To make aware the selection type of IPR for appropriate inventions.
5. To identify the Skill sets required to be an entrepreneur.
6. To understand the Role of supporting agencies and Governmental initiatives to promote Entrepreneurship.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Interpret the need and importance of intellectual property rights.	2	Understand
CO2	Elaborate the process for Patent and Design registration.	2	Understand
CO3	Explain the process for copy right and trademark registration.	2	Understand
CO4	Select the IPR tool for protection of invention.	3	Apply
CO5	Evaluating the Entrepreneurial abilities within an Individual.	5	Evaluate
CO6	Creating a Detailed Project Report with a due consideration to various supporting agencies and Governmental initiatives to promote Entrepreneurship.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
CO2	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
CO3	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
CO4	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
CO5	0	0	0	0	0	0	0	0	2	3	3	3	0	0	0
CO6	0	0	0	0	0	0	0	0	2	3	3	3	0	0	0

Course Contents			
Unit-I	**INTRODUCTION TO IPR**	**No. of Hours**	**COs**
	Introduction to Concept of Property, Types of Property, General Characteristics of Property Rights, Need of Intellectual property. Introduction to Intellectual Property, Philosophy of IPR, Different forms of Intellectual Property, IPR in India : Genesis and Development, International Organizational and Treaties, WIPO and its Role, International Treaties.	6	CO1
Unit-II	**PATENT AND DESIGN**	**No. of Hours**	**COs**
	Definition of Patents, Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter, Anticipation, Registration Procedure, Time Frame and Cost, Rights and Duties of Patentee, International Protection, Commercialization, Infringement, Patent Databases, IP protection of Semiconductors and Integrated Circuits, Case studies. What is a Design, Difference from Patent, how can Designs be protected, Procedure for Registration, Effect of Registration and Term of Protection, Non-Patentable Subject Matter, Infringement, Patenting biotechnological invention, Case studies.	6	CO2
Unit-III	**COPYRIGHTS AND TRADEMARKS**	**No. Of Hours**	**COs**
	Introduction to Copyright, what is covered by Copyright, How long does copyright last, Why Protect Copyright, Registration Procedure, Term of protection, Ownership of copyright, Related Rights - Distinction between related rights and copyrights, Infringement. Difference between copyrights and other IPRs, Case studies. Introduction to Trademarks, Different kinds of marks: brand names, logos.	8	CO3
Unit-IV	**TRADE SECRETS AND IP REGIME**	**No. of Hours**	**COs**
	What are trade secrets; how trade secrets are to be maintained; how trade secrets are used in trade and businesses, Case studies. Need of IP Valuation, IPR as an Instrument of Development, Impact of Intellectual Property System on Economic Growth, Role of Intellectual Property in Technology Transfer, Introduction to Biopiarcy and popular cases, Career opportunities in IPR.	6	CO4
Unit-V	**ENTREPRENEURSHIP: INTRODUCTION**	**No. of Hours**	**COs**
	Concept and Definitions: Entrepreneur & Entrepreneurship, Entrepreneurship and Economic Development, A Typology of Entrepreneurs. Entrepreneurial Competencies: The Entrepreneur's Role. Entrepreneurial Skills: creativity, problem solving, decision making, communication, leadership quality; Self-Analysis, Culture & values, Risk-taking ability, Technology knowhow. Factor Affecting Entrepreneurial Growth: Economic & Non-Economic Factors, EDP Programmes. Steps in Entrepreneurial Process:	6	CO5

	Deciding Developing Moving Managing Recognizing.		
Unit-VI	**DPR & VARIOUS SUPPORT SYSTEMS FOR ENTREPRENEURSHIP**	**No. of Hours**	**COs**
	Project Report Preparation: Specimen Format of Project Report; Project Planning and Scheduling using PERT / CPM, Methods of Project Appraisal – Feasibility Study both Economic and Market Preparation projected financial statement. Role of Support Institutions and Management of Small Business: Director of Industries, DIC, SIDO, SIDBI, Small Industries Development Corporation (SIDC), SISI, NSIC, NISBUED, State Financial Corporation (SFC). EPC, ECGC. 6.3 Various Governmental Initiatives: Make in India Start Up India Stand Up India Digital India Skill India 6.4 Case Studies of Successful Entrepreneurs	8	CO6

Text Books:

1. Watal, Jayashree " Intellectual Property Rights in The WTO And Developing Countries ", Oxford University Press.
2. R. Anita Rao & Bhanoji Rao, Intellectual Property Rights- A Primer, Eastern Book Co
3. Shiv Sahai Singh, The Law of Intellectual Property Right, Eastern Book Co
4. Prabuddha Ganguli Intellectual property right – Unleashing the knowledge economy, , Tate McGraw Hill Publishing company ltd.

Reference Books:

1. Subbaram N.R, " Handbook of Indian Patent Law and Practice, S. Viswanathan Printers and Publishers Pvt. Ltd.,1998.
2. Indian Patent Act, 1970 (With recent Amendments)
3. The Design Act 2020 (With recent Amendments)
4. The trademarks Act 1999 (With recent Amendments)
5. Copy right act 1957 ((With recent Amendments)

eLearning Resources:

1. https://www.coursera.org/learn/introduction-intellectual-property

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT8102 : Web Security

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	Continuous Assessment:	40 Marks
	End-Sem Exam:	60 Marks
Credits: 2	Total:	100 Marks
Prerequisite Course: -		

Course Objectives

1. To study and practice fundamental techniques in developing secure web based applications.
2. To identify the vulnerabilities of web based applications and to protect those applications from attacks.
3. To impart familiarity with the security techniques that provides web security.
4. To find vulnerabilities of web based applications and various attacks.
5. To identify wide range of web security vulnerabilities and issues.
6. To learn fundamentals and advanced concept of session management and SQL injection.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1	Understand security-related issues in Web-based systems and applications.	2	Understand
CO2	Understand the fundamental mechanisms of securing a Web-based system.	2	Understand
CO3	Implement security mechanisms to secure a Web-based application.	3	Apply
CO4	Evaluate a Web-based system with respect to its security requirements.	5	Evaluate
CO5	Analyze the various categories of threats, vulnerabilities, countermeasures in the area of Web security.	4	Analyza
CO6	Describe the inner-workings of today's real time Web application security.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO2	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO3	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO4	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO5	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO6	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1

Course Contents			
Unit-I	**INTRODUCTION**	**No. of Hours**	**COs**
	Introduction - Evolution of Web Applications – Web Application Security - Core Defense Mechanisms - Handling User Access - Handling User Input- Handling Attackers Security and its building blocks, Security related definition and its categories. XSS, XSS attacks, types of XSS, XSS mitigation and prevention.	8	CO1
Unit-II	**WEB APPLICATION TECHNOLOGIES**	**No. of Hours**	**COs**
	Web Functionality Encoding Schemes Mapping the Application, Sanitizing user input, validating input, client side encoding, blacklisting and white listing input, Rules for the browser, Default directives and wildcards, The nonce attribute and the script hash.	7	CO2
Unit-III	**CREDENTIALS MANAGEMENT**	**No. Of Hours**	**COs**
	Authentication Fundamentals- Two Factor and Three Factor Authentication - Password Based, Built-in HTTP, Single Sign-on Custom Authentication- Secured Password Based Authentication: Attacks against Password, Importance of Password Complexity, Broken authentication and session management, Password: strength, transit and storage, login authentication, hashing, Password: recovery.	8	CO3
Unit-IV	**SESSION MANAGEMENT**	**No. of Hours**	**COs**
	What is session, Need for Session Management Weaknesses in Session Token Generation Weaknesses in Session Token Handling Securing Session Management, Anatomy of session attacks, session hijacking, session without cookies, session ids using hidden form fields and cookies, session hijacking using session fixation, session hijacking counter measures, session hijacking: sedejacking, XSS, malware.	7	CO4
Unit-V	**SQL INJECTION**	**No. of Hours**	**COs**
	SQLi working, Anatomy of a SQLi attack - unsanitized input and server errors, Anatomy of a SQLi attack - table names and column names, Anatomy of a SQLi attack - getting valid credentials for the site, Types of SQL injection, SQLi mitigation - parameterized queries and stored procedures, SQLi mitigation- Escaping user input, least privilege, whitelist validation.	8	CO5
Unit-VI	**WEB APPLICATION VULNERABILITY**	**No. of Hours**	**COs**
	Understanding Vulnerabilities in Traditional Client Server Application and Web Applications, Cross Domain Attack: XSRF (Cross-Site Request Forgery), XSRF with GET and POST parameters, XSRF mitigation - The referer, origin header and the challenge response, XSRF mitigation.	7	CO6
Text Books:			
1. B. Sullivan, V. Liu, and M. Howard, “Web Application Security, A B Guide”, New York: McGraw-Hill. (ISBN No.: 978-0-07-177616-5). 2. D. Stuttard and M. Pinto, “The Web Application Hackers Handbook: Finding and Exploiting Security			

Flaws", 2nd Edition, Indianapolis, IN: Wiley, John Sons, 2011 (ISBN No. : 978-1-118-02647-2).

Reference Books:

1. Hanqing and L. Zhao, "Web Security: A Whitehat Perspective", United Kingdom: Auerbach Publishers, (ISBN No.: 978-1-46-659261-2).
2. M. Shema and J. B. Alcover, "Hacking Web Apps: Detecting and Preventing Web Application Security Problems", Washington, DC, United States: Syngress Publishing, (ISBN No. 978-1-59-749951-4)
3. Hanqing Wu, Liz Zhao "Web Security: A WhiteHat Perspective" CRC press.

eLearning Resources:

1. Udemy: Web Security: Common Vulnerability and their Mitigation.
2. Udemy: Web Application Security.
3. Coursera: Security for the Web.

Note: Number of hours allocated to units includes actual teaching hours, continuous internal assessment hours and experiential learning.

IT315 : Cryptography and Cyber Security Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**50 Marks**
	Practical:	**Marks**
	Term Work:	**Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Basic of Mathematics, Computer Fundamentals & Programming.

Course Objectives

1. To use the different cryptographic algorithms for implementing security.
2. Use the different Message digest algorithms to obtain unique code.
3. Use different tools to provide security solutions in an organization.
4.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply the different cryptographic algorithms for implementing security.	3	Apply
CO2	Apply the different Message digest algorithms to obtain unique code.	3	Apply
CO3	Apply different tools to provide security solutions in an organization.	3	Apply
CO4			

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	2	1	2	3	2	3	1
CO2	3	2	3	2	2	2	1	2	2	1	2	3	2	3	1
CO3	3	2	3	2	2	2	1	2	2	1	2	3	2	3	1
CO4															

Course Contents

This Cryptography and Cyber Security Laboratory course has Cryptography and Cyber Security as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus.

The teacher will frame the problem statements with due consideration that students have two hours to complete that. The practical examination will comprise of implementation of assignments and related theory. All assignments are to be performed in C, C++, Java or Python. Use of open-source platform and tools is encouraged.

Staff in-charge will suitably frame the assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition; code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C or C++ or Java or Python Language.

	List of Assignments	No. of Hours	COs
1.	Assignment based on implementation of RSA algorithm for key generation and cipher verification.	0	CO1
2.	Assignment based on implementation of Diffie Hellman Key Exchange algorithm.	2	CO1
3.	Assignment based on implementation of MD5 and SHA-1 algorithm using Libraries (API).	2	CO2
4.	Assignment based on implementation of DES and AES algorithm using Libraries (API).	2	CO2
5.	Assignment based on configuration and demonstration the use of vulnerability assessment tool such as NESSUS.	2	CO3
6.	Assignment based on implementation of web security with Open SSL tool kit.	2	CO3
7.	Assignment based on password cracking tools.	2	CO3
8.	Assignment based on SQL injection.	2	CO3
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education/PHI, 2006.
2. Atul Kahate, "Cryptography and Network Security", McGraw Hill.
3. Nina Godbole, Sunit Belapure, “Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiely India Pvt. Ltd., ISBN- 978-81-265-2179-1.

Reference Books:

1. Nina Godbole, “Information Systems Security”, Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6.
2. William Stallings, “Computer Security: Principles and Practices”, Pearson Ed. ISBN:978-81-317-3351-6.
3. Mark Merkow, “Information Security-Principles and Practices”, Pearson Ed. 978-81-317-1288-7.

4. CK Shyamala et el., “Cryptography and Security”, Wiley India Pvt. Ltd, ISBN 978-81-265-2285-9.
5. Berouz Forouzan, “Cryptography and Network Security”, 2 edition, TMH, ISBN :978007070208.

eLearning Resources:

IT317 : Machine Learning Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**- Marks**
	Practical:	**50 Marks**
	Term Work:	**- Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Python Programming Language.

Course Objectives

1. To perform data preprocessing for Exploratory Data Analysis(EDA) and apply regression techniques.
2. To implement supervised classification Machine Learning algorithms in Python.
3. To implement Ensemble Techniques for classification algorithms using bagging and boosting.
4. To implement Clustering techniques and Deep learning concept for image classification in Python,

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	Descriptor
CO1	Perform data preprocessing for EDA and apply regression techniques.	3	Apply
CO2	Implement Supervised classification algorithms in Python Programming Language.	3	Apply
CO3	Implement Ensemble Techniques for classification algorithms using bagging and boosting.	3	Apply
CO4	Implement Clustering techniques and Deep learning Concept for Image classification in Python.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	1	1	1	1	1	2	2	3	2	1
CO2	3	3	2	3	3	1	1	1	1	1	2	2	3	2	1
CO3	3	3	2	3	3	1	1	1	1	1	2	2	3	2	1
CO4	3	3	2	3	3	1	1	1	1	1	2	2	3	2	1

Course Contents

1. The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

2. All the assignments should be implemented using python programming language

3. Implement all assignments

4. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.

5. The instructor may frame multiple sets of assignments and distribute them among batches of students.

6. All the assignments should be conducted on multicore hardware and 64-bit open-sources software

Staff in-charge will suitably frame the assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition; code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in Python Language.

	List of Assignments	No. of Hours	COs
1.	Exploratory Data Analysis(EDA):Downloading the dataset and perform cleaning of data. Data Analysis & visualization-using NumPy, pandas matplotlib/Seaborn, SciPy.	2	CO1
2.	Assignment based on Linear regression using python.Assess the performance of model using evaluation metrics.	4	CO1
3.	Assignment based on Logistic Regression for classification using python.Assess the performance of model using evaluation metrics.	4	CO2
4.	Assignment based on Naive Bayes Classifier using python.Assess the performance of model using evaluation metrics.	4	CO2
5.	Assignment based on Decision Tree Algorithm using python.Assess the performance of model using evaluation metrics.	4	CO3
6.	Assignment based on Random Forest Algorithm using python.Assess the performance of model using evaluation metrics.	4	CO3
7.	Assignment based on K-means Clustering Algorithm using python for Mall Customer Segmentation. Download the Mall Customer Segmentation dataset. https://www.kaggle.com/datasets/krishnaraj30/mall-visiting- customer-data.	4	CO4
8.	Assignment based on Deep Learning Implement Convolutional Neural Network (CNN) for Image Classification. Download the Image dataset and Evaluate the model with Accuracy.	4	CO4
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

Reference Books:
1. Peter Flach, "Machine Learning The Art and Science of Algorithms that Make Sense of Data", Cambridge 2. University Press India.ISBN 13: 9781107422223. 3. Ethem Alpaydin, Introduction to Machine Learning,PHI 4th Edition-2020 ,The MIT Press, ISBN:9780262043793.
eLearning Resources:

IT318 : Web Technology Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**Oral:**	**50 Marks**
	Practical:	**- Marks**
	Term Work:	**- Marks**
Credits: 2	**Total:**	**50 Marks**

Prerequisite Course: Database Managament System Laboratory.

Course Objectives

1. To understand and apply the importance of website planning and website design issues.
2. To apply client side technologies for web application development.
3. To use server side technologies and database for web application development.

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Apply the importance of website planning and website design issue.	3	Apply
CO2	Apply client side technologies for web application development.	3	Apply
CO3	Use server side technologies and database for web application development.	3	Apply
CO4		3	

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	1	2	2	2	2	1	2	3	3	-	-
CO2	2	2	3	2	3	2	2	2	2	1	2	3	3	-	1
CO3	2	2	3	2	3	2	2	2	2	1	2	3	3	-	1
CO4															

Course Contents

This Web Technology Laboratory course has Web Technology as a core subject. The problem statements should be framed based on mentioned assignments in the syllabus for conduction of oral examination.

Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals, effective and efficient implementations in term work. Oral examination should be jointly conducted by the internal examiner and external examiner. All assignments are to be performed in Java Script, Servlet, JSP and PHP Language.

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of a journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in Java Script, Servlet, JSP and PHP Language.

	List of Assignments	No. of Hours	COs
1.	Case study: Before coding of the website, planning is important, students should visit different websites (Min. 5) for the different client projects and note down the evaluation results for these websites, either good website or bad website in following format. From the evaluation, students should learn and conclude different website design issues, which should be considered while developing a website.	6	CO1
2.	Implement a web page index.html for any client website (e.g., a mobile shop website, Educational website or Clothes shop website) using following: a) HTML syntax: heading tags, basic tags and attributes, frames, tables, images, lists, links for text and images, forms etc. b) Use of Internal CSS, Inline CSS, External CSS.	6	CO2
3.	Implement an application in Java Script using following: a) Design UI of application using HTML, CSS etc. b) Include Java script validation. c) Use of prompt and alert window using Java Script. e.g., Design and implement a simple calculator using Java Script for operations like addition, multiplication, subtraction, division, square of number etc. d) Design calculator interface like text field for input and output, buttons for numbers and operators etc. b) Validate input values. c) Prompt/alerts for invalid values etc.	6	CO2
4.	Design an application using Angular JS. e.g., Design registration (first name, last name, username, password) and login page using Angular JS.	6	CO2
5.	Implement the sample program demonstrating the use of Servlet. e.g., Create a database table ebookshop (book_id, book_title, book_author, book_price, quantity) using database like Oracle/MySQL etc. and display (use SQL select query) the table content using servlet.	6	CO3
6.	Implement the program demonstrating the use of JSP. e.g., Create a database table students_info (stud_id, stud_name, class, division, city) using database like Oracle/MySQL etc. and display (use SQL select query) the table content using JSP.	6	CO3
7.	Build a dynamic web application using PHP and MySQL. a. Create database tables in MySQL and create connection with PHP. b. Create the add, update, delete and retrieve functions in the PHP web app interacting	6	CO3

	with MySQL database.		
8.	Design a login page with entries for name, mobile number email id and login button. Use struts and perform following validations. a. Validation for correct names b. Validation for mobile numbers c. Validation for email id d. Validation if no entered any v	6	CO3
9.	Design a website using Content management system of WordPress. Make the use of different plugins and themes of the WordPress.	6	CO3
10.	Study of advanced tools: UI/UX(Figma), Laravel, Ruby on Rails, etc.	6	CO3
11.			
12.			
13.			
14.			

Text Books:

1. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035.
2. Robert W. Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson education, 2008.
3. Jason Hunter, “Java Servlet Programming”, 2nd Edition, O'reilly Publications.

Reference Books:

1. Roger S. Pressman, David Lowe, “Web Engineering”, Tata Mcgraw Hill Publication, 2007.
2. Kogent Learning Solution Inc., “Web Technologies” HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black Book, Dream Tech Press, 2014
3. Jim Keogh, “J2EE: The Complete Reference”, 1st Edition , Tata McGraw Hill Pulishing Company, ISBN: 978-0-07-052912-0.
4. Marty Hall, Larry Brown,"Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.

eLearning Resources:

IT319 : Creational Activity#

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**Marks**
	Practical:	**Marks**
	Term Work:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Soft-skills and Technical Skills.

Course Objectives

1. To showcase talent through participating in events at college, state and national level.
2. To acquire organizing abilities by organizing professional bodies events.(IEEE/CSI/ISTE).
3. To help society through NSS activities, social awareness and/or welfare activities.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Showcase their talent through participating in events at college, state and national level.	3	Apply
CO2	Demonstrate their organizing abilities through professional bodies events.(IEEE/CSI/ISTE).	3	Apply
CO3	Demonstrate their ability to help society through NSS activities, social awareness and/or welfare activities.	3	Apply
CO4			

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	2	2	2	3	3	3	3	3	-	-	-
CO2	-	-	-	-	2	2	2	3	3	3	3	3	-	-	-
CO3	-	-	-	-	2	3	2	3	3	3	3	3	-	-	-
CO4															

Course Contents
Students are expected to participate in the events like at programming competition, quiz competition, paper presentation competition, mini-project competition, debate competition, sports, etc at college level/ state level/national level/international level. Students may also be part of organizing committees of events or executive members of professional organizations like IEEE/CSI/ISTE that organizes events. Students may also participate in social awareness activities and/or social welfare activities. Students will be evaluated based on the level of their participation /organization and evidences produced.

	List of Assignments	No. of Hours	COs
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:
Reference Books:
eLearning Resources:

MC320 : Mandatory Course-VI	
Teaching Scheme	**Examination Scheme**
Lectures: 1 Hrs./Week	**Oral: - Marks**
	Practical: - Marks
	Term Work: - Marks
Credits: 0	**Total: 50 Marks**
Prerequisite Course: -	

Course Objectives
2. -
3. -
4. -

Course Outcomes (COs):

After successful completion of the course, student will be able to

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1	-	0	-
CO2	-	0	-
CO3	-	0	-
CO4	-	0	-

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CO4	-	-	0												

Course Contents			
assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in Java Script, Servlet, JSP and PHP Language.			
	List of Assignments	**No. of Hours**	**COs**
1.	Quizzes		
2.	Expert Lecture.		
3.	Programming Event.		Aptitude
4.			
5.	Bling Coding.		
6.	Surf & Presentation.		
7.	Group Discussion.		
8.	Bug Finding.		
9.			
10.			
11.			
12.			
13.			
14.			
Text Books:			
Reference Books:			
eLearning Resources:			

IT8103 : Web Security Tools Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Oral:**	**NA Marks**
	Practical:	**NA Marks**
	Term Work:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Basic Security Tools

Course Objectives

1. To install different software and set up Operating System for Web Security.
2. To analyze different Vulnerabilities in a web application and networks.
3. To implement SQL injection to find Vulnerabilities.
4. To understand the basics of Cross site Scripting.

Course Outcomes (COs):

After successful completion of the course, student will be able to

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	Understand the fundamental mechanisms of securing a Web-based system.	2	Understand
CO2	Analyze different Vulnerabilities in a web application and networks.	4	Analyze
CO3	Implement security mechanisms to secure a Web-based application.	3	Apply
CO4	Implement SQL injection to find Vulnerabilities.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO2	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO3	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1
CO4	2	3	1	1	2	2	-	2	1	1	1	2	-	3	1

Course Contents

This Web Security Tools Laboratory course has Web Security as a core subject. The problem statements should be framed based on mentioned assignments in the syllabus for conduction of practical examination.

The teacher will frame the problem statements with due consideration that students have three hours to complete that the assignment. The practical examination will comprise implementation and related theory. All assignments are to be performed in C++ Language.

Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of a journal. Each assignment has to be well documented with problem definition, code documented with comments.

Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C++ Language.

	List of Assignments	No. of Hours	COs
1.	Assignment on Vulnerability scanning	2	CO1
2.	Assignment on Cookie Stealing with cross site scripting	2	CO2
3.	Assignment on XSS and SQL injections	2	CO3
4.	Assignment on SQL injection	2	CO2, CO4
5.	Assignment on Password security	2	CO4
6.	Assignment on Browser security	2	CO5
7.	Assignment on Cross site scripting	2	CO6
8.	Assignment on Cross site scripting		
9.			
10.			
11.			
12.			
13.			
14.			

Text Books:

1. B. Sullivan, V. Liu, and M. Howard, Web Application Security, A B Guide. New York: McGraw-Hill, (ISBN No.: 978-0-07-177616-5).
2. D. Stuttard and M. Pinto, The Web Application Hackers Handbook: Finding and Exploiting Security Flaws, 2nd ed. Indianapolis, IN: Wiley, John Sons, 2011, (ISBN No. : 978-1-118-02647-2).

Reference Books:

1. Hanqing and L. Zhao, “Web Security: A Whitehat Perspective”, United Kingdom: Auerbach Publishers, (ISBN No.: 978-1-46-659261-2).
2. M. Shema and J. B. Alcover, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, Washington, DC, United States: Syngress Publishing, (ISBN No. 978-1-59-749951-4).
3. Hanqing Wu, Liz Zhao “Web Security: A WhiteHat Perspective”, CRC press.

eLearning Resources:

1. Udemy: Web Security: Common Vulnerability and their Mitigation.
2. Udemy: Web Application Security.
3. Coursera: Security for the Web.