NEW HORIZON
COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by **NAAC** with 'A' Grade, Accredited by **NBA**

The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka
Awarded Outstanding Technical Education Institute in Karnataka-2016
Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA

Academic Year 2023-24
Department of Information Science & Engineering
Seventh and Eighth Semester
Scheme and Syllabus
Batch: 2020-24 (175 Credits)

VISION

To emerge as a Department of Eminence in Information Science and Engineering in serving the Information Technology industry and the nation by empowering students with a high degree of technical and practical competence.

MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by continuous learning and establishing a culture of research and innovation among faculty members and students, in the field of information science and engineering.
- To build long-term interaction between the academia and Information Technology industry, through their involvement in the design of curriculum and its hands-on implementation.
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

Program Education objectives (PEOs).

PEO1	Excel as Information Science Engineers with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments.
PEO2	Pursue higher studies with profound knowledge enriched with academia and industrial skill sets.
PEO3	Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges, which meet societal requirements.
PEO4	Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society.

PEO to Mission Statement Mapping

PEO Statements	M1	M2	M3
PEO 1: Excel as an Information Science Engineer with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments.	3	3	2
PEO 2: Pursue higher studies with profound knowledge enriched with academia and industrial skill sets.	3	3	2

PEO 3: Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges which meet societal requirements.	3	3	3
PEO 4: Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society.	2	2	3

Correlation: 3- High, 2-Medium, 1-Low

PSO1: The ability to understand, analyze and develop computer programs in the areas related to Algorithms, System Software, Web Design, Big Data Analytics, Machine Learning, Internet of Things, Data Science and Networking for efficient design of computer based systems of varying complexity.

PSO2: The ability to apply standard practices and strategies in software project development using innovative ideas and open ended programming environment with skills in teams and professional ethics to deliver a quality product for business success.

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	**Program Outcomes (POs)**
1	Engineering Knowledge	**PO1:** The basic knowledge of Mathematics, Science and Engineering.
2	Problem analysis	**PO2:** An Ability to analyze, formulate and solve engineering problems.
3	Design and Development of Solutions	**PO3:** An Ability to design system, component or product and develop interfaces among subsystems of computing.
4	Investigation of Problem	**PO4:** An Ability to identify, formulate and analyze complex engineering problem and research literature through core subjects of Computer Science.
5	Modern Tool usage	**PO5:** An Ability to use modern engineering tools and equipments for computing practice.
6	Engineer and society	**PO6:** An Ability to assess societal, health, cultural, safety and legal issues in context of professional practice in Computer Science & Engineering.
7	Environment and sustainability	**PO7:** The broad education to understand the impact of engineering solution in a global, economic, environmental and societal context.
8	Ethics	**PO8:** An understanding of professional and ethical responsibility.
9	Individual & team work	**PO9:** An Ability to work both as individual and team player in achieving a common goal.
10	Communication	**PO10:** To communicate effectively both in written and oral formats with wide range of audiences.
11	Lifelong learning	**PO11:** Knowledge of contemporary issues, Management and Finance.
12	Project management and finance	**PO12:** An Ability to recognize the need and thereby to engage in independent and life-long learning for continued professional and career advancement.

Mapping of POs with PEOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	2	3	-	-	-	3	-	3	-
PEO2	3	3	3	2	3	-	-	-	3	-	3	-
PEO3	3	3	3	2	3	-	-	-	3	-	3	-
PEO4	3	3	3	2	3	-	-	-	3	-	3	-

Correlation: 3- High, 2-Medium, 1-Low

Sl. No.	Course Code	Course Name	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1.	20ISE71A	Software Testing & Automation	ISE	3	0	0	0	3	3	50	50	100
2.	20ISE72A	Computer Networks	ISE	3	0	0	0	3	3	50	50	100
3.	20ISE73A	Cryptography and Information Security	ISE	3	0	0	0	3	3	50	50	100
3.	20ISE74XA	Professional Elective – 4	ISE	3	0	0	0	3	3	50	50	100
4.	20ISE75XA	Professional Elective - 5	ISE	3	0	0	0	3	3	50	50	100
5.	20NH7OX	Open Elective – 2	COE's	3	0	0	0	3	3	50	50	100
6.	20ISL76A	Software Testing & Automation Lab	ISE	0	0	1.5	0	1.5	3	25	25	50
8.	20ISL77A	Computer Networks Lab	ISE	0	0	1.5	0	1.5	3	25	25	50
9.	20ISE78A	Project Phase-1	ISE	0	0	3	0	3	4	50	50	100
Total								24	28	400	400	800

Professional Elective – 4	
Course Code	Course Name
20ISE741A	Computer Forensics
20ISE742A	Cloud Computing
20ISE743A	Cyber Law
20ISE744A	Information Theory& Coding
20ISE745A	Natural Language Processing
Professional Elective – 5	
Course Code	Course Name
20ISE751A	Social Network Analysis
20ISE752A	Digital Marketing
20ISE753A	DevOps
20ISE754A	Functional Analytics
20ISE755A	Deep Learning

Open Elective - II		
Course Code	Course	BOS

20NHOP701	Big Data Analytics using HP Vertica-1	CSE
20NHOP702	VM Ware Virtualization Essentials-1	ISE
20NHOP704	Big Data Analytics using HP Vertica-2	CSE
20NHOP705	VM Ware Virtualization Essentials-2	ISE
20NHOP707	SAP	MEE
20NHOP708	Schneider-Industry Automation	EEE
20NHOP709	Cisco-Routing and Switching-1	ECE
20NHOP710	Data Analytics	CSE
20NHOP711	Machine learning	MEE
20NHOP712	CISCO-Routing and switching - 2	ECE
20NHOP713	IIOT Embedded System	MEE
20NHOP714	Block Chain	CSE
20NHOP715	Product Life cycle management	MEE
20NHOP17A	Network Security and Cryptography	ECE
20NHOP18A	Physical Design	ECE
20NHOP19A	AI Data Analysis with Python	AI & ML

New Horizon College of Engineering
Department of Information Science and Engineering
Scheme of Eighth Semester B.E Program–AY: 2022-23 (175 Credits)

Sl. o.	Course Code	Course Name	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	TOTAL
1.	20ISE81XA	Professional Elective-6	ISE	3	0	0	0	3	3	50	50	100
2.	20ISE82A	Internship Viva	ISE	-	-	4	0	4	0	50	50	100
3.	20ISE83A	Project Phase-2	ISE	-	-	12	0	12	0	100	100	200
Total								**19**	**3**	**200**	**200**	**400**

Professional Elective – 6	
Course Code	**Course Name**
20ISE811A	Computer System Performance Analysis
20ISE812A	Software Architecture & Design Patterns
20ISE813A	Agile Software Development
20ISE814A	Management & Entrepreneurship
20ISE815A	Service Oriented Architecture

SOFTWARE TESTING AND AUTOMATION

Course Code: 20ISE71A   **Credits:03**
L:T:P:S :   3:0:0:0   **CIE Marks:50**
ExamHours:3   **SEE Marks:50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamental concepts in software testing.
CO2	Discuss the importance of Structural and Regression testing.
CO3	Understand the importance of GUI Testing and software metrics in Software Testing.
CO4	Describe the Defect Management Process.
CO5	Understand the Automation process and related tools.
CO6	Analyze the Testing Tools related to web automation and mobile automation.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	2	2	3
CO2	3	3	3	3	-	-	-	3	3	-	2	3
CO3	3	3	-	3	-	-	-	3	3	2	-	3
CO4	3	1	3	3	-	-	-	3	3	-	-	3
CO5	3	1	3	3	2	1	-	3	3	-	-	3
CO6	3	3	3	3	2	-	-	3	3	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	CO's
1	Fundamentals: What Is Software Verification and Validation? - Verification and Validation Techniques – V-Model of Testing – Software Testing - Purpose of Testing - Taxonomy of Bugs - Defect And Failure Analysis – Types of Testing	9	CO1

	Techniques – Black Box – White Box – Gray Box Testing Test Adequacy and Coverage. Functional Testing Functional testing - Boundary Value Testing - Equivalence class testing - Decision table based testing - Evaluation of the testing – Assessed exercise: Specify and design test cases.		
2	Structural Testing: Path testing - Data and Control Flow Testing – Graph Based Testing - Evaluation of the testing and summary Regression Testing: Need for Regression Testing–Impact Analysis – Regression Test Selection Techniques – Code and Model Based Techniques – Test Case Optimization Techniques.	9	CO2
3	Nonfunctional testing GUI Testing – Domain Based Testing – Performance Testing – Stress Testing – Load Testing – Acceptance Testing – Alpha, Beta, Gamma Testing – Software Acceptance Plan. Metrics: Importance of Metrics in Testing - Effectiveness of Testing – Defect Density – Defect Leakage Ratio – Residual Defect Density – Test Team Efficiency – Test Case Efficiency – Various Test Reports.	9	CO3, CO4
4	Automation testing: Basics, Significance, Components, Process of Test Automation, Strategies, Automated tests, Examples of test automation, Test Automation maintainance, Automation test frameworks-types, tools.	9	CO5
5	Web Automation: Selenium Automation Framework, Selenium IDE, Selenium Web Driver, Data driven, Keyword driven, Hybrid. Selenium basics, waits, Web Component concept, Junit4 basics, Selenium in Java, Page Object Concept, Data transfer Object Concept. Database Testing using Selenium, Cross Browser Testing. Mobile Automation: Mobile application framework, APPIUM basics.	9	CO6

Text Books:

1. M G Limaye, "Software Testing – Principles, Techniques and Tools", Tata McGraw Hill,2009.
2. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dream tech press,2003.
3. Arnon Axelrod, "Complete Guide to Test Automation by Arnon Axelrod", aPress,September 2008.

Reference Books:

1. Edward Kit, "Software Testing in the Real World - Improving the Process", Pearson Education, 2004.
2. William E. Perry, "Effective methods for software testing", 2ndEdition, John Wiley, 2000.

WEB RESOURCES:
1. "Automation Testing Tutorial", https://artoftesting.com/automation-testing
2. Tools QA,Selenium Tutorial, https://www.toolsqa.com/selenium-tutorial/
3. "Appium Tutorials", https://appium.io/tutorial.html

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

COMPUTER NETWORKS

Course Code	: 20ISE72A	**Credits**	: 03
L:T:P:S	: 3:0:0 :0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Summarize the basic concepts of computer networks, types of networks and reference models such as OSI model and TCP/IP Model, Addressing.
CO2	Describe physical layer signaling and encoding, and techniques of error detection and correction to detect and solve error bit during data transmission.
CO3	Apply IP addressing and routing algorithms to find shortest paths for network-layer packet delivery and to contrast the IPv4 and IPv6 headers.
CO4	Illustrate the essential principles of a transport layer protocol used for reliable data transfer, flow control, congestion control.
CO5	Identify the essential principles of application layer protocol
CO6	Analyze the protocols such as DNS, HTTP, FTP, SMTP, TCP, UDP, IP.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	1	-	-

CO2	3	2	2	2	-	-	-	-	-	1	-	-
CO3	3	3	2	2	2	-	-	-	-	1	-	1
CO4	3	3	3	2	2	-	-	-	-	1	-	1
CO5	3	3	3	2	2	-	-	-	-	1	-	1
CO6	3	2	2	2	-	-	-	-	-	1	-	-

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction to computer networks:** Evolution of network, Network hardware and software, Types of Networks, Network Topologies, Protocols & Standards, Reference Models: OSI Reference model, TCP/IP Reference model, Addressing.	9	CO1
2	**Physical Layer:** Analog & Digital transmission, Transmission media, **Datalink Layer:** Design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol.	9	CO2
3	**Network Layer:** Internetworking basics, IP addressing and subnet adressing, IPv4, IPv6, Transition from IPv4 to IPv6, Routing algorithms.	9	CO3
4	**Transport Layer:** User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control , Quality of services (QOS).	9	CO4
5	**Application layer overview:** Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer, World Wide Web and HTTP.	9	CO5 CO6

TEXT BOOKS:

1. Behrouz A. Forouzan,"Data Communications and Networking", 5thEdition ,Tata McGraw-Hills,2017.
2. Andrew S Tanenbaum, "Computer Networks", 4th Edition, Pearson Education,2013.

REFERENCE BOOKS:
1. WilliamStallings, "Data and Computer Communication", 10thEdition, PearsonEducation,2014.
2. James F.Kurose and Keith W.Ross, "Computer Networking",6th Edition, Pearson Education,2013.

3. Larry L. Peterson and Bruce S. Davie,"Computer Networks – A Systems Approach", 4th Edition, Elsevier, 2007.

WEB RESOURCES:
4. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf .
5. https://www.sciencedirect.com/topics/engineering/layer-network.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	5	-
Understand	10	5	5
Apply	5	5	5
Analyze	5	-	-
Evaluate	-	-	-
Create	-		-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

CRYPTOGRAPHY AND INFORMATION SECURITY

Course Code : 20ISE73A **Credits   : 03**
L:T:P:S   : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks   : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamentals of networks security and cryptography.
CO2	Apply cryptographic algorithms for information security
CO3	Apply the various Authentication schemes to simulate different applications.
CO4	Apply various digital signature schemes for information security
CO5	Analyze various Security practices and System security standards
CO6	Integrate cryptographic algorithms into software projects.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	3	3	-	-	-	-	-
CO2	3	3	3	3	3	3	3	-	-	-	-	-
CO3	3	3	3	3	3	3	3	-	-	-	-	-
CO4	3	3	3	3	3	3	3	-	-	-	-	-
CO5	3	3	3	3	3	3	3	-	-	-	-	-
CO6	3	3	3	3	3	3	3	1	1	-	1	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	CO's
1	**INTRODUCTION:** Security trends, Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies , Model of network security, Security attacks, services and mechanisms, Introduction to Plain Text, Cipher Text, Encryption and Decryption Techniques, Classical encryption techniques: substitution techniques, transposition techniques, Foundations of modern cryptography: perfect security, product cryptosystem, cryptanalysis	9	CO1
2	**SYMMETRIC ENCRYPTION:** Block cipher, Stream cipher, Data Encryption Standard (DES), Cipher Block Chaining (CBC), Multiple Encryption DES, International Data Encryption Algorithm (IDEA), Advanced Encryption Standard (AES). **ASYMMETRIC ENCRYPTION:** Asymmetric key generation techniques, Applications of asymmetric encryption methods, RSA, Elliptic Curve Cryptography .	10	CO2
3	**DIGITAL SIGNATURES:** Digital signature standards, Secure One-time Signatures, Application of Digital Signatures, DiffieHellman Key Exchange, Elliptic Curve Digital Signature algorithm. **MESSAGE AUTHENTICATION:** Authentication requirement, Authentication function, MAC, Hash function, Security of hash function and MAC, SHA, Authentication applications, Kerberos, X.509	10	CO3, CO4
4	**SECURITY PRACTICE AND SYSTEM SECURITY**: Electronic Mail security, PGP, S/MIME, IP security , Web Security, **SYSTEM SECURITY:** Intruders, Malicious software, viruses, Firewalls.	8	CO5

5	**APPLYING CRYPTOGRAPHY ALGORITHMS** - Smart cards, Mobile phone security, Electronic passports and IDcards, SDA/DDA/CDA Bank Cards, Financial Cryptography, Secure Payment Systems	8	CO6

TEXT BOOKS:
1. W. Stallings, "Cryptography and Network Security: Principles and Practice", 7th Ed. Pearson Publishers, 2017.(ISBN No.: 978-0-13-44446-11).

REFERENCE BOOKS:
1. J. H. Silverman, "A Friendly Introduction to Number Theory", 4th Ed. Boston: Pearson, 2012. (ISBN No.: 978-0-321-81619-1).
2. D. R. Stinson, "Cryptography: Theory and Practice", 3rd Ed. Boca Raton, FL: Chapman & Hall/CRC, 2005. (ISBN No.: 978-1-58-488508-5)
3. C. Kaufman, R. Perlman, and M. Speciner, "Network Security: Private Communication in a Public World", 2nd Ed. United States: Prentice Hall PTR, 2002. (ISBN No.: 978-0- 13-046019-6)

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	-	
Apply	5	10	5
Analyze	5	5	5
Evaluate	5	-	-
Create	-		-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

COMPUTER FORENSICS

Course Code : 20ISE741A		**Credits**	: 03
L: T: P:S : 3:0:0:0		**CIE Marks**	: 50
Exam Hours : 3		**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamentals of computer forensics.
CO2	Apply Rules of collecting Digital Evidence, Standard collection procedures.
CO3	Describe the legal requirements for use of seized data.
CO4	Conduct data collection on backup drives.
CO5	Apply computer forensic techniques to identify the digital fingerprints associated with criminal activities.
CO6	Analyze hidden information from pictures and other files using Forensics Tools.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	1	-	-	-	-	2	-	1
CO2	3	2	2	2	1	-	-	-	-	2	-	1
CO3	3	3	3	2	2	2	-	-	2	2	-	1
CO4	3	3	3	3	3	2	1	-	2	2	-	1
CO5	3	3	3	3	3	2	1	-	2	2	-	1
CO6	3	3	3	3	3	2	1	-	2	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	CO's
1	**Computer Forensics Fundamentals**: Introduction To Computer Forensics, Use Of Computer Forensics In Law Enforcement, Computer Forensic Assistance To Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken By Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?	9	CO1
2	**Rules of collecting Digital Evidence, Standard collection procedures:** seizure, write blockers, bit-stream imaging, hashing, Chain of Custody (COC), evidence bags and SOP for collecting evidences, Source and Location of Digital Evidences, Duplicating	9	CO2

	and Preserving Digital Evidences, Importance of MAC timings, Types of System logs and Windows Registry.		
3	**Evidence Capture - Data Recovery and Data Seizure:** Data Backup and Recovery Test Disk Suite, Data-Recovery Solution, Hiding and Recovering Hidden Data,Evidence Collection and Data Seizure.	9	CO3, CO4
4	**Data Acquisition:** Understanding Storage Formats for Digital Evidence, Determining the best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisitions, and Using Remote Network Acquisition Tools.	9	CO5
5	**Current Computer Forensics Tools:** Evaluating Computer Forensic Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software. Tools (Encase) - Building software, Installing Interpreters, Working with images and File SystemsForensics.	9	CO6

TEXT BOOKS:

3. John R.Vacca, Computer Forensics Computer Crime Scene Investigation, 2nd Edition, Charles River Media, 2005.
4. Jason Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill Osborn Media, 3rd edition , 2014.
5. Nelson, Phillips, Frank, Enfinger and Steuart: Computer Forensics and Investigations,Cengage Learning, 2008.

REFERENCE BOOKS:

1. Marjie T. Britz, Computer Forensics and Cyber Crime, Pearson, 2012.
2. David Cowen, Computer Forensics: A Beginners Guide, McGraw Hill Education; 2013.
3. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition; 2014.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	-	5
Apply	5	10	5
Analyze	5	-	-
Evaluate	5	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

CLOUD COMPUTING

Course Code: 20ISE742A   **Credits: 03**
L: T: P:S   : 3:0:0:0   **CIE Marks: 50**
Exam Hours: 3   **SEE Marks: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the cloud computing model, Types and Characteristics.
CO2	Examine the cloud services, Applications and Virtualization
CO3	Explore the Cloud Services provided by the Cloud providers
CO4	Apply the Technology of the cloud computing
CO5	Describe the different services and company offerings
CO6	Analyze migrating to the cloud with services and solutions

Mapping of Course Outcomes to Program Outcomes:

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

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

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No	Module Contents	Hours	COs
1	**Introduction:** Defining Cloud Computing, Cloud Types, Cloud NIST, cloud cube models, Deployment models, service models, Examining the Characteristics of Cloud Computing, Benefits, disadvantages of cloud computing, Assessing the Role of Open Standard.	9	CO1
2	**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS	9	CO2

	Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.			
3	**Cloud Computing Architecture and Management :** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.	9	CO3 CO4
4	**Technology, Cloud Storage, Standards:** Cloud Computing Technology: Clients, Security, Network, Services. Overview of Cloud storage, Some providers of Cloud storage. Standards: Applications, Clients, Infrastructure, Service.	9	CO5
5	**Cloud Security:** Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management	9	CO6

TEXT BOOKS:
1. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing, Inc, 2011
2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata McGraw Hill.
3. K. Chandrasekhran, "Essentials of cloud Computing", CRC press, 2014

REFERENCES:
1. RajkumarBuyya , James Broberg, AndrzejGoscinski: Cloud Computing Principles and Paradigms, Willey,2014.
2. Soyata, Tolga, "Enabling Real-Time Mobile Cloud Computing through Emerging Technologies", IGI Global, 2015, ISBN: 978-1-4666-8662-5

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5		
Understand	5	5	5
Apply	5	5	5
Analyze	5	5	
Evaluate	5		
Create			

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests

Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

CYBER LAW

Course Code : 20ISE743A   **Credits   : 03**
L: T: P:S   : 3:0:0:0   **CIE Marks   : 50**
Exam Hours : 3   **SEE Marks   : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Interpret the basic concepts of cyber security,cyber law and their roles.
CO2	Understand the Regulatory Framework of Information and Technology Act 2000
CO3	Understand and remember crimes with case law.
CO4	Understand of intellectual property issues and development of the law in this regard
CO5	Understand Patents and Indian Position on Patents.
CO6	Apply the Punishments for contraventions under the Information Technology Act 2000

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2	1	2	-	2	-	1
CO2	3	3	3	2	2	2	1	2	-	2	-	1
CO3	3	3	3	2	2	2	1	2	-	2	-	1
CO4	3	3	3	2	2	2	1	2	-	2	-	1
CO5	3	3	3	2	2	2	1	2	-	2	-	1
CO6	3	3	3	2	2	2	1	2	-	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	CO's
1	**Introduction to Security Policies and Cyber Laws:** Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the it Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Design, Software License.	9	CO1
2	**Regulatory Framework of Information and Technology Act 2000:** Digital Signature, E-Signature, Electronic Records, Electronic Evidence and Electronic Governance. Controller, Certifying Authority and Cyber Appellate Tribunal.(Rules announced under the Act)	9	CO2
3	**Cr. P.C and Indian Evidence Law:** Cybercrimes under the Information Technology Act,2000 - Cybercrimes under International Law - Hacking Child Pornography, Cyber Stalking, Denial of service Attack, Virus Dissemination, Software Piracy, Internet Relay Chat (IRC) Crime, Credit Card Fraud, Net Extortion, Phishing, Cyber Terrorism- Violation of Privacy on Internet.	9	CO3
4	**Intellectual Property Rights**: Copyrights- Software – Copyrights vs Patents debate - Authorship and Assignment Issues - Copyright in Internet - Multimedia and Copyright issues - Software Piracy - Trademarks - Trademarks in Internet – Copyright and Trademark cases, Patents - Understanding Patents - Legal position on Computer related Patents - Indian Position on Patents.	9	CO4, CO5
5	**Offences and Penalties:** Offences under the Information and Technology Act 2000, Penalty and adjudication. Punishments for contraventions under the Information Technology Act 2000 (Case Laws, Rules and recent judicial pronouncements to be discussed).Limitations of Cyber Law.	9	CO6

TEXT BOOKS:

6. Craig, B. ,"Cyber Law: The Law of the Internet and Information Technology", Pearson Education
7. Sharma J. P.&Kanojia S. (2016),"Cyber Laws", New Delhi: Ane Books Pvt. Ltd.

REFERENCE BOOKS:

1. Justice Yatindra Singh: Cyber Laws, Universal Law Publishing Co., New Delhi
2. Farouq Ahmed, Cyber Law in India, Allahabad Law Agency, 2015.
3. Dr. Surya PrakashTripathi, RitendraGoyal, Praveen Kumar Shukla, KLSI. "Introduction to information security and cyber laws". Dreamtech Press. ISBN: 9789351194736, 2015.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5

Apply	10	10	5
Analyze		-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	20
Analyze	
Evaluate	
Create	

Information Theory and Coding

Course Code :20ISE744A		**Credits**	**:3**
L:T:P:S :3:0:0:0		**CIE Marks**	**:50**
Exam Hours :3		**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basics of information theory and channel capacity.
CO2	Apply different source coding techniques
CO3	Understand the notation and concepts of error control coding.
CO4	Apply linear block codes for error detection and correction.
CO5	Implementation of cyclic codes,BCH and RS for channel coding.
CO6	Analysis of error detection and correction properties of convolution code.

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	Module Contents	Hours	COs

1	**INFORMATION THEORY:**Entropy, Information rate, source coding: Shannon-Fano and Huffman coding techniques,mutual Information,channel capacity of discrete channel, Shannon-Hartley law,trade-off between bandwidth and SNR	9	CO1, CO2	
2	**ERROR CONTROL CODES:** Introduction, basic notations, coding gain, characterization of error control codes,performance of error control codes, comparison of uncoded and coded systems.	9	CO3	
3	**LINEAR BLOCK CODES:** Linear block codes and their properties, standard arrays, syndromes, weight distribution. error detection and correction properties modified linear block codes.	9	CO4	
4	**BINARY CYCLIC CODES:** Algebraic structure of cyclic codes, encoding using an (n-k) bit shift register, syndrome calculation,errordetection and correction, introduction to BCH and RS Codes	9	CO5	
5	**CONVOLUTION CODES:** Convolution encoders, Structural properties of convolution codes, trellis diagrams, Viterbi algorithm, performance analysis.	9	CO6	

TEXT BOOKS:

1. Andre Neabauer, "Coding Theory: Algorithms, Architectures & Applications", Wiley Publications, 2010.
2. K. Sam Shanmugam, John ,"Digital and analog communication systems", Wiley India Pvt.Ltd, 1996.
3. Kennedy,"Electronic Communication systems", McGraw Hill,4th Ed.,1999.

REFERENCE BOOKS:

1. JohnProakis,"DigitalCommunications",TMH,5thEd.,2008.
2. SimonHaykin,"CommunicationSystem",Wiley,2008.
3. JorgeCastineira,Moreira,"EssentialsofErrorControlCoding",Wiley,2006.
4. Information Theory and Coding, Hari Bhat, Ganesh Rao, Cengage, 2017.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests(25 marks)	Assignments(15 Marks)	Quizzes(10 Marks)
	25	15	10
Remember	5	-	-
Understand	5	-	-
Apply	10	10	5
Analyze	5	5	5
Evaluate	-	-	-

Create	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

NATURAL LANGUAGE PROCESSING

Course Code: 20ISE745A   **Credits: 03**
L:T:P:S   : 3:0:0:0   **CIE Marks: 50**
Exam Hours: 3   **SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Understand the basic concepts of natural language
CO2	Analyze the natural language text, speech and tag a text with basic language features
CO3	Analyze the text and extract the relations from the text
CO4	Apply text mining techniques to generate mining diagnostic reports
CO5	Apply various methods to word matching, identifying different text types and evaluate the results of the methods
CO6	Analyze the applications of NLP

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of CO v/s PSO:

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	COs
1	**Overview and language modelling:** Overview: Origins and challenges of NLP Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modelling: Various Grammar- based Language Models-Statistical Language Model.	9	CO1
2	**Words** - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models. **Speech** – Phonetics - Speech Synthesis - Automatic Speech Recognition	9	CO2
3	**Extracting Relations from Text: From Word Sequences to DependencyPaths:** Introduction, Subsequence Kernels for Relation Extraction, A Dependency-PathKernel for Relation Extraction and Experimental Evaluation. **Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles:** Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles andEvaluations.	9	CO3, CO4
4	**Evaluating Self-Explanations in iSTART: Word Matching, Latent SemanticAnalysis, and Topic Models:** Introduction, iSTART: Feedback Systems,iSTART: Evaluation of Feedback Systems, **Textual Signatures: Identifying Text-Types Using Latent Semantic Analysisto Measure the Cohesion of Text Structures:** Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions,Results of Experiments. **Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling:** Introduction, RelatedWork, Data Preparation, Document Separation as a Sequence Mapping Problem,Results.	9	CO5
5	**Applications -**Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation	9	CO6

TEXT BOOKS:

1. TanveerSiddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer-Verlag London Limited 2007.
3. Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.
4. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O'Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O'Reilly Media, 2015.
3. NitinIndurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.
4. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummingspublishing company, 1995.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

SOCIAL NETWORK ANALYSIS

Course Code : 20ISE751A   **Credits   : 03**
L:T:P:S   : 3:0:0:0   **CIE Marks : 50**
Exam Hours : 3   **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain the basic concepts and terminologies of social network analysis
CO2	Identify and represent social network data
CO3	Identify and describe types of nodes and network relationships
CO4	Apply the basics of social network analysis at the network level (density, clustering, degree distribution, etc.) and at the node level (degree, betweeness, closeness)
CO5	Discuss and Summarize various Social Media in terms of its importance and marketing
CO6	Explain how various types of analysis are carried out in Social media.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	2	-	-	2	-	1
CO2	3	3	3	2	2	-	2	-	-	2	-	1
CO3	3	3	3	2	2	-	2	-	-	2	-	1
CO4	3	3	3	2	2	-	2	-	-	2	-	1
CO5	3	3	3	2	2	-	2	-	-	2	-	1
CO6	3	3	3	2	2	-	2	-	-	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	CO's
1	**INTRODUCTION:** Understand what social networking is, history of social network analysis, social media characteristics, types of social media, core values, challenges, advantages and disadvantages, future of social networking.	9	CO1
2	**BUILDING A NETWORK:** Networks as graphs – actors, ties, networks, multiplex networks, weighted ties, group, geodesic distance, Graph connectivity, Degree of an actor – indegree and outdegree, types of nodes – carrier, transmitter, receiver, isolate, Representation of social network data – sociomatrix and edge list, matrix permutuation and blocks, network relationships & structures – reciprocity, transitivity, popularity structural equivalence, clique, star.	9	CO2
3	**NETWORK PROPERTIES:** Network density,Properties of nodes – degree centrality, closeness centrality, betweeness centrality, Eigen vector centrality, Page rank centrality	9	CO3
4	**SOCIAL MEDIA FUNDAMENTALS:** Various social networking sites - What is Social Media and Why It's Important; FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN - Why	9	CO4, CO5

	and how they matter, history, statistics, demographics, Time Spent, Key Features, Marketing - What You Need to Know		
5	**SOCIAL MEDIA ANALYSIS:** Four dimension of analysis, Criteria of effectiveness, metrics, social network analysis, semantic analysis, online sentiment analysis, tools, social media management, centrality, measures opinion mining, feature based sentiment analysis.	9	CO6

WEB RESOURCES:
1) James M Cook, University of Maine at Augusta, " What is a Social Network"
2) Robert A Hanneman, Department of Sociology, University of California, Riverside, "Introduction to Social Network methods".
3) Christina Falci, Department of Sociology, University of Nebraska, Lincoln, "Social Network Analysis"
4) Matthew Ganis&AvinashKohirkar, "Social Media Analytics"
5) Bobbi J Carothers, American Evaluation Association, Denver, Colorado, "Network Analysis from Start to finish: Techniques, Tools and Tips for Evaluating your Network."
6) Matthew Denny, Institute for Social Science Research, Universityof Massachusetts, AMHERST, "Social Network Analysis."
7) Timothy Baldwin, University of Melbourne, "Semantic Analysis of Social Media."
8) The Social Media Analytics Compass: What and How to Measure http://www.razorsocial.com/social-media-analytics-tools/
9) https://www.youtube.com/watch?v=P33xa4l4GTM
10) overview of SNA https://www.youtube.com/watch?v=fgr_g1q2ikA
11) https://www.teachengineering.org/activities/view/uno_graphtheory_lesson01_activity
12) The History of Social Media: social Networking Evolution! http://historycooperative.org/ the-history-of-social-media/
13) Social Media Fact Sheet http://www.pewinternet.org/fact-sheet/social-media/
14) https://www.meaningcloud.com/solutions/media-analysis
15) https://www.enotes.com/homework-help/what-hypotheses-social-media-intimate-relationship-488912

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20

Apply	20
Analyze	-
Evaluate	-
Create	-

DIGITAL MARKETING

Course Code : 20ISE752A		**Credits**	: 03
L:T:P:S : 3:0:0:0		**CIE Marks**	: 50
Exam Hours : 3		**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understanding Markets & Marketing Environment
CO2	Classify the Fundamentals of Marketing Management
CO3	Characterize various Consumer Behaviour
CO4	Analyze various Digital Marketing Strategies
CO5	Examine the different Digital Marketing Channels
CO6	Evaluate Digital Marketing Tools & Applications

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	-	3	-	3	-	-	3	-
CO2	3	3	3	3	-	3	-	3	-	-	3	-
CO3	3	3	3	3	-	3	-	3	1	-	3	-
CO4	3	3	3	-	-	3	-	3	-	-	-	-
CO5	3	3	3	-	-	3	-	3	-	-	-	-
CO6	3	3	3	-	-	3	-	3	-	-	-	-

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction to Digital Marketing:** Importance of marketing and Digital Marketing, Understanding Marketing and Digital Marketing Process, Increasing Visibility, Types of visibility,	9	CO1

	Visitors Engagement, Examples of engagement, Bringing Targeted Traffic,Inbound and outbound marketing,Converting Traffic into Leads, Types of Conversion , Understanding Conversion Process,Tools Needed		
2	**Website Planning Process:** Understanding domain names & domain extensions, Different types of websites, Planning& Conceptualising a Website, Booking a domain name & web hosting, Adding domain name to web Server, Adding webpages &content, Adding Plugins, Identifying objective of website, Deciding on number of pages required, Planning for engagement options Landing Pages & Optimization, Creating blueprint of every webpage	9	CO2
3	**Search Engine Optimization:** Introduction to SERP, Major functions of a search engine, Keywords-Different types of keywords, Google keyword planner tool, Keywords research process, Understanding keywords mix, Long Tail Keywords Google Search Tips & Hacks	9	CO3
4	**Search Engine Algorithms:** Why a Search Engine needs to update its Algorithm, Search Engine Penalties and Recoveries, Why a Search Engine penalizes a Website, optimize your site for Google, Hummingbird Algorithm, Google Panda Algorithm, Google Penguin, Google EMD Update	9	CO4, CO5
5	**Local SEO&SEO Project Essentials:** Google places optimization, Classified submissions, Citation, NAP, Top tools for SEO, Monitoring SEO process, Preparing SEO reports, Create SEO Strategy for your business, link juice, Importance of domain and page authority	9	CO6

TEXT BOOKS:

8. Ryan Deiss& Russ Henneberry, "Digital Marketing For Dummies", 2nd Edition,John Wiley& Sons, Inc,2020.
9. Eric Enge , Stephan Spencer , Jessie Stricchiola, "The Art of SEO: Mastering Search Engine Optimization", O'Reilly publication,2015
10. DannyStar , "Digital Marketing 2020: Grow Your Business With Digital Marketing", Amazon Asia-Pacific 2020.

REFERENCE BOOKS:
1. Peter Kent, "Search Engine Optimization For Dummies",6th Edition, Wiley & Sons, Inc, 2020
2. Vikas Chawla, David Appasamy, Nandita Raman, "Decoding the Digital Jungle",Notion Press, 2020

WEB RESOURCES:
6. "The digital marketing Tutorial", https://learndigital.withgoogle.com/digitalunlocked/course/digital-marketing

7. Digital Marketing Basics, https://www.udemy.com/course/free-digital-marketing-basics-course/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	5	10	5

Analyze	5	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

DEVOPS

Course Code : 20ISE753A   **Credits: 03**
L:T:P:S   : 3:0:0:0   **CIE Marks: 50**
Exam Hours : 3   **SEE Marks: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand DevOps as a practice, methodology and process for fast collaboration, integration and communication between Development and Operations team.
CO2	Learn common Infrastructure Servers, Availability and Scalability
CO3	Describe how AWS DevOps is used for Identity Access Management.
CO4	Understand the requirements of Configuration Management using Ansible
CO5	Understand Docker Containerization, Micro service Architecture
CO6	Install and Implement the Orchestration and Automation tool -Kubernetes

Mapping of Course Outcomes to Program Outcomes:

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

CO5	3	3	3	3	3	2	-	2	2	-	3	2
CO6	3	3	3	3	3	2	-	2	2	-	3	2

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No	Module Contents	Hours	Cos
1	**Introduction to DevOps** , What is DevOps? ,History of DevOps ,Dev and Ops ,DevOps definitions ,DevOps and Software Development Life Cycle ,Why DevOps& Main objectives, Concepts of Cloud and Virtualization ,Historyand Evolution of cloud , Cloud computing concepts , Characteristics and Benefits of Cloud ,Cloud Service models ,IaaS, PaaS and SaaS, Virtualization , Virtual Machines vs Containers.	9	CO1, CO2
2	**AWS DevOps**. , Identity Access Management. , S3, Glacier and CloudFront. , EC2 , Route53 , Databases on AWS. , VPC , Deployment with EC2 and Auto Scaling. **AWS Developer Tools**, CodeStar , CodeCommit ,CodeBuild,CodeDeploy,CodePipeline	9	CO3
3	**SCM Tools** (Git&GitHub, Bitbucket), Introduction to Version Control , Configuring Git Profile on the local machine , Git Commands and Repository,Branching , Working with GitHub **Introduction toAnsible**, Introduction to YAML ,Ansible Documentation , Setup and Configuration , Ansible Playbooks ,Ansible Command line ,Ansible Modules , Ansible Command Line Usage , Ansible Roles ,Ansible Galaxy Cases: Real Time & Practical Scenarios of Playbook	9	CO4
4	**Containers - Docker** ,Docker Concepts , Installing Docker, Managing Docker Images , Build Docker Images by using Docker Commands &DockerFile, Push Docker Images to Docker Hub ,Docker Networking, Links and Volumes Cases: Real Time & Practical Scenarios	9	CO5
5	**Orchestration and Automation -Kubernetes**, K8S Concepts , Installing Kubernetes, Creating Clusters with Kubernetes, Managing and Administering Cluster via Kubernetes Cases: Real-time Implementation. **Jenkins**, Continuous Integration with Jenkins Overview	9	CO6

TEXT BOOKS:

1. The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win, by Gene Kim (Author), Kevin Behr (Author), George Spafford ,Kindle Edition,Oct 2014

2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison-Wesley Signature Series (Fowler) by Jez Humble (Author), David Farley,1st Edition ,July 2010.

REFERENCE BOOKS:

1. DevOps for DevelopersAuthors: Httermann, Michael, Publisher-Apress,1st Edition ,July 2010.
2. The Visible Ops Handbook: Implementing ITIL in 4 Practical and Auditable Steps Kindle Editionby Gene Kim (Author), George Spafford (Author), Kevin Behr ,Publisher : IT Process Institute, Inc.; Revised First Edition (15 June 2015)
3. The Goal: A Process of Ongoing Improvement Kindle Editionby Eliyahu M. Goldratt (Author), Jeff Cox ,North River Press; 3rd edition (June 1, 2012)

Web Resources:

1. http://dev2ops.org/
2. https://puppet.com/resources
3. https://devopsdays.org/
4. https://dzone.com/devops-tutorials-tools-news

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	5	5
Apply	5	5	5
Analyze	5	-	-
Evaluate	5	5	-
Create	-	-	-

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

FUNCTIONAL ANALYTICS

Course Code	**20ISE754A**	**Credits:**	**03**
L:T:P:S	**3:0:0:0**	**CIE Marks:**	**50**
Exam Hours	**03**	**SEE Marks:**	**50**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	1	-	-
CO2	3	2	2	2	-	-	-	-	-	1	-	-
CO3	3	3	2	2	2	-	-	-	-	1	-	1
CO4	3	3	3	2	2	-	-	-	-	1	-	1
CO5	3	3	3	2	2	-	-	-	-	1	-	1
CO6	3	2	2	2	-	-	-	-	-	1	-	-

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

SL. NO	CONTENTS OF MODULE	HRS	CO'S
1	**INTRODUCTION TO FUNCTIONAL ANALYTICS** Marketing Analytics as an enabler of Marketing Strategy STATISTICAL, Technology Enablers - Business Rules Management Systems, Predictive Analytics Workbenches, Optimization Systems, Pre-Configured Decision Management Systems, Data Infrastructure, A Service-Oriented Platform	9	CO1 CO6
2	**PRODUCT And CUSTOMER ANALYTICS** Pricing and Revenue Management: Point-of-sale Data - Deciding on the "Right" Pricing Approach, a.k.a Strategic Pricing - Implementing tools to support pricing strategy - Managing the prices to meet revenue goals, a.k.a. Tactical Pricing Assortment Optimization: Panel and Point-of-Sale data - Customer meets product - A retailer's nightmare: shelf-space optimization - Site-to-store - Product meets customer. Customer Lifetime Value: Loyalty Data - What is a customer's lifetime? - How can we predict it? Market Basket Analysis: Market-Basket Data - Product Affinities	9	CO2

3	**Hr Analytics:** Defining HR Analytics, Connecting HR Analytics to business benefit – Obtaining data, cleaning data and supplementing data. When to use Predictive analytics in HR – Predictive talent Models and HR Analytics, Business driven talent analytics, Integrated talent management and workforce planning. Recruiting, learning and performance measurement.	9	CO3
4	**Finance Analytics:** Analytics in Finance: Discounted Cash Flows (DCF), Profitability Analysis. Asset performance: Sharpe ratio, Calmar ratio, Value at risk (VaR), Pricing options and Black-Scholes Formula. Game Theory: Insurance loss models, Discrete time ruin models and continuous time ruin models.	9	CO4
5	**LOGISCTICS And SUPPLY CHAIN ANALYTICS:** Logistics and multinomial regression: Logistics function, Estimation of profitability using logistic regression, Deviance, Wald Test and Hosmer Lemshow Test. Integrated supply chain. Application of predictive analytics in supply chain. Forecasting: Moving average, Exponential smoothing, Trend, Cyclical and seasonality components.	9	CO5

TEXT BOOKS:

1. James Taylor, "Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics", IBM Press, 2016.
2. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.

REFERENCES

1. EfraimTurban , Jay E. Aronson , Ting-Peng Liang, "Decision Support Systems & Intelligent Systems", 9th edition, Prentice Hall, 2016.
2. Data, data everywhere, "Special report on managing information, Economist", February 27th, 2016.
3. Liberatore and Luo, "The Analytics Movement, Interfaces, Articles in Advance"

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	5	-
Understand	10	5	5
Apply	5	5	5
Analyze	5	-	-
Evaluate	-	-	-

Create	-		-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

DEEP LEARNING

Course Code : 20ISE755A		**Credits**	**03**
L:T:P:S : 3:0:0:0		**CIE Marks**	**50**
Exam Hours : 3		**SEE Marks**	**50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2	Derive a simple Feed forward Neural Network (DNN)
CO3	Apply DNN to real-life problems
CO4	Understand how to frame problems in the NN framework
CO5	Apply Back propagation algorithms to get the best performance
CO6	Evaluate the various Deep neural networks

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	2	-	1	-	-	2	-	1
CO2	3	3	3	1	2	-	1	-	-	2	-	1
CO3	3	3	3	1	2	-	1	-	-	2	-	1
CO4	3	3	3	1	2	-	1	-	-	2	-	1
CO5	3	3	3	1	2	-	1	-	-	2	-	1
CO6	3	3	3	1	2	-	1	-	-	2	-	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	CO's
1	History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron,Thresholding Logic, Perceptrons, Perceptron Learning Algorithm, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks	9	CO1
2	Feed Forward Neural Networks, Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigen values and eigenvectors, Eigenvalue Decomposition, Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition	9	CO2
3	Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive auto encoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout	9	CO3
4	Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization, LearningVectorial Representations Of Words, Convolutional Neural Networks, LeNet, AlexNet, ZF-Net,VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolution Neural Networks	9	CO4, CO5
5	Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images	9	CO6

TEXT BOOKS:
1. Ian Goodfelllow, YoshuaBenjio, Aaron Courville, , "Deep Learning", The MIT Press , 2017

REFERENCE BOOKS:
1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", John Wiley & Sons Inc.,2018
2. François Chollet, " Deep Learning with Python" ,Manning Publications, 2017

WEB RESOURCES:
1. https://onlinecourses.nptel.ac.in/noc20_cs62/
2. https://onlinecourses.nptel.ac.in/noc20_cs50/
3. https://www.coursera.org/learn/intro-to-deep-learning/home/welcome
4. https://www.coursera.org/learn/neural-networks-deep-learning/home/welcome

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)

Remember	5	-	-
Understand	5	-	5
Apply	5	10	5
Analyze	5	-	-
Evaluate	5	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

SOFTWARE TESTING AND AUTOMATION LABORATORY

Course Code : 20ISL76A   **Credits   : 1.5**
L:T:P:S   : 0:0:1.5:0   **CIE Marks   : 25**
Exam Hours : 3   **SEE Marks   : 25**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Derive the test cases for a given problem using testing approaches such as decision table approach, Equivalence class testing and Boundary Value Analysis method
CO2	Derive test cases for UI of web applications.
CO3	Illustrate automated testing of web applications using selenium automation framework
CO4	Illustrate mobile app testing using APPIUM

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	-	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3

CO3	3	3
CO4	3	3

Experiment No.	Experiment
PART-A	
1	Design and develop a program in a language of your choice tosolve the triangle problem defined as follows: Accept threeintegers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle,isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on decision table approach, execute the test cases anddiscuss the results
2	Design, develop, code and run the program in any suitablelanguage to solve the commission problem. Analyze it from theperspective of boundary value testing, derive different test cases,execute these test cases and discuss the test results.
3	Design, develop, code and run the program in any suitableLanguage to implement the NextDate function. Analyze it from theperspective of equivalence class value testing, derive different testcases, execute these test cases and discuss the test results.
4	Design front-endfor anyweb application and derive the test cases as applicable. Validate the UI elements using JavaScript.
5	Write a program for matrix multiplication."Introspect the causes for its failure and write down the possiblereasons". Analyze the Positive test cases and Negative Test cases.
6	Implement test script in Selenium IDE using recording, playingback/executing and saving processes. Use Selenium IDECommands Assertions and Actions to directly interact with pageelements.
PART-B	
7	Using Selenium IDE, create a test suite containing minimum 4test cases (for any two web sites).
8	Demonstrate selenium server installation using JAVA
9	Illustrate automated testing using selenium to perform tests on login web page.

10	Use selenium to test a program that updates 10 student records into a table from Excel file.
11.	Write and test a program to provide total number of objects presenton a web page using selenium.
12	Demonstrate mobile app testing using APPIUM.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%

                                  Conduction   – 60%

                                  Viva – Voce   – 20%

- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	5
Apply	10
Analyze	10
Evaluate	-
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	5
Apply	10
Analyze	10
Evaluate	-
Create	-

COMPUTER NETWORKS LABORATORY

Course Code : **20ISL77A**   **Credits** : **1.5**
L:T:P:S : **0:0:1.5:0**   **CIE Marks** : **25**
Exam Hours : **3**   **SEE Marks** : **25**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Implement different network protocols
CO2	Be familiar with the various routing algorithms
CO3	Learn to communicate between two desktop computers
CO4	Learn and use simulation tools

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	2	-	-	-	-	-	2
CO2	3	3	3	-	3	3	3		2	-	-	2
CO3	3	3	3	3	3	3	3	3		-	-	-
CO4	3	3	3	3	3	3	3	3	3		3	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3

Experiment No.	Experiment
	PART-A
1	Write a program for error detecting code using CRC-CCITT (16- bits).
2	Write a program for distance vector algorithm to find suitable path for transmission.
3	Implementation of Stop and Wait Protocol.
4	Write a program for congestion control using leaky bucket algorithm.
5	Implement the data link layer framing methods such as character, character stuffing and bit stuffing.

6	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
PART-B	
7	Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and varythe bandwidth and find the number of packets dropped.
8	Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
9	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
10	Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
11.	Simulate the transmission of ping messages over a network topologyconsisting of 6 nodes and find the number of packets dropped due to congestion.
12	Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction   – 60%
  Viva – Voce   – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	
Understand	
Apply	10
Analyze	
Evaluate	
Create	15

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	
Understand	
Apply	10
Analyze	
Evaluate	
Create	15

PROJECT PHASE-1

Course Code	: 20ISE78A	**Credits**	: 3
L:T:P:S	: 0:0:3:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify a issue and derive problem related to society, environment, economics, energy and technology
CO2	Formulate and Analyze the problem and determine the scope of the solution chosen
CO3	Determine , dissect, and estimate the parameters, required in the solution and Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics.
CO4	Compile the report and take part in present / publishing the finding in a reputed conference / publications

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	3	2	2	3	3	3	3	2	3
CO2	3	3	2	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	3	3	3	3	3	3	3
CO4	1	2	3	3	1	2	1	3	3	3	2	3

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

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

- Project: Carried out at the Institution or at an Industry.
- Project work shall preferably be batch wise, the strength of each batch shall have minimum of two and maximum of four students
- For Project Phase –I and Project Phase –II, the CIE shall be 50 and 100 respectively.
- Project activities to be communicated to the guide on regular basis.
- The CIE marks of Phase-1 shall be based on the evaluation based on the reviews by a committee consisting of the Head of the concerned Department and the panel members of the Department, one of whom shall be the project guide.
- Minimum requirement of CIE marks for Project work shall be 50% of the maximum marks.
- Students failing to secure a minimum of 50% of the CIE marks in Project work shall not be eligible for the Project examination conducted by the University and they shall be considered as failed in that/those Course/s. However, they can appear for University examinations conducted in other Courses of the same semester and backlog Courses if any. Students after satisfying the prescribed minimum CIE marks in the Course/s when offered during subsequent semester shall appear for SEE.
- Improvement of CIE marks shall not be allowed in Project where the student has already secured the minimum required marks
- For a pass in a Project/Viva-voce examination, a student shall secure a minimum of 40% of the maximum marks prescribed for the University Examination.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (50 Marks)
Remember	-
Understand	05
Apply	15
Analyze	10
Evaluate	-
Create	20

SEE – Semester End Examination (50 Marks)

Bloom's Category	Tests (50 Marks)
Remember	-
Understand	-
Apply	20
Analyze	-
Evaluate	-
Create	30

COMPUTER SYSTEM PERFORMANCE ANALYSIS

Course Code : 20ISE811A   **Credits   03**
L:T:P:S   : 3:0:0:0   **CIE Marks   50**
Exam Hours : 3   **SEE Marks   50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Interpret the Evaluation Methods needed for performance evaluation of computer systems
CO2	Illustrate the metrics used for Real world workloads
CO3	Analyze the Accounting logs of computer systems
CO4	Implement 2k factorial designs and benchmarking
CO5	To appreciate the use of smart scheduling and introduce the students to analytical techniques for evaluating scheduling policies
CO6	Analyze the students to develop new queuing analysis for both simple and complex systems

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	3	-	3	-	-	-	3
CO2	3	3	3	-	-	3	-	3	-	-	-	3
CO3	3	3	3	-	-	3	-	3	-	-	-	3
CO4	3	3	3	-	-	3	-	3	-	-	-	3
CO5	3	3	3	-	-	3	-	3	-	-	-	3
CO6	3	3	3	-	-	3	-	3	-	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	CO's
1	**Introduction:** Need for Performance Evaluation in Computer Systems – Overview of Performance Evaluation Methods Common Mistakes in Performance Evaluation, A Systematic Approach to Performance Evaluation, Selecting an Evaluation Technique, Selecting Performance Metrics	9	CO1
2	**Workloads, Real-World Workloads:** Types of Workloads, Instruction mixes, **Work load Selection:** Services exercised, level of detail; Representativeness; Timeliness **Real-World Workloads:** Case Study of Real-world Workloads – Phase-Type	9	CO2

	Distributions and Matrix-Analytic Methods, Networks with Time-Sharing Servers		
3	**Monitors, Program Execution Monitors and Accounting Logs: Monitors:** Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.	9	CO3
4	**Capacity Planning and Benchmarking:** Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; **Experimental Design and Analysis: Introduction:** Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts	9	CO4
5	**Markov Chains And Simple Queues:** Discrete-Time Markov Chains – Ergodicity Theory – Real World Examples – Google, Aloha – Transition to Continuous-Time Markov Chain – M/M/1.	9	CO5

TEXT BOOKS:

1. K. S. Trivedi, ―Probability and Statistics with Reliability, Queueing and Computer Science Applications‖, John Wiley and Sons, 2001.
2. Krishna Kant, ―Introduction to Computer System Performance Evaluation‖, McGraw-Hill, 1992.

REFERENCE BOOKS:

3. MorHarchol - Balter, ―Performance Modeling and Design of Computer Systems – Queueing Theory in Action, Cambridge University Press, 2013.
4. Paul J. Fortier and Howard E. Michel, ―Computer Systems Performance Evaluation and Prediction, Elsevier, 2003.
5. Raj Jain, ―The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and Modeling‖, Wiley-Interscience, 1991.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	5	
Apply	10	5	5
Analyze	5	-	-

Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

SOFTWARE ARCHITECTURE & DESIGN PATTERNS

Course Code : 20ISE812A   **Credits   : 03**
L:T:P:S   : 3:0:0:0   **CIE Marks : 50**
Exam Hours : 3   **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To learn the architecture business cycle
CO2	To interpret the architectural styles and Process Control
CO3	To learn quality attributes for functionalities and architecture
CO4	To evaluate architectural patterns
CO5	To learn designing software architecture
CO6	To learn documentation of software architecture

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	1	1	-
CO3	2	2	2	-	-	-	-	-	-	2	2	-
CO4	2	3	3	-	-	-	-	-	-	3	3	-
CO5	2	3	3	-	-	-	-	-	-	3	3	-
CO6	2	3	3	-	-	-	-	-	-	3	3	-

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2

CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	CO's
1	**Introduction**: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.	9	CO1
2	**Architectural Styles**: Architectural styles, Pipes and filters;Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures.	9	CO2
3	**Quality**: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics	9	CO3
4	**Architectural Patterns**: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel; Reflection	9	CO4
5	**Designing and Documenting Software Architecture**: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.	9	CO5, CO6

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, Re print 2019
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, Reprint 2018.
3. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, Re print2019.

REFERENCE BOOKS:
1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object-Oriented Software, Pearson Education , Re print2012.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests(25 marks)	Assignments (10)	Quizzes(5)	Self-Study(10)
Remember	5	-	-	-
Understand	5	-	-	-
Apply	5	-	-	-
Analyze	5	5	-	10
Evaluate	5	5	5	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

AGILE SOFTWARE DEVELOPMENT

Course Code: 20ISE813A   **Credits: 03**

L:T:P:S   : 3:0:0   **CIE Marks: 50**

Exam Hours: 3   **SEE Marks**

Course Outcomes: At the end of the Course, the Student will be able to:

		Understand the importance and roadmap to mastery of agile technologies and its
CO1		Understand the importance and roadmap to mastery of agile technologies and its fundamentals
CO2		Understand agile development importance, major agile Frameworks and common agile roles
CO3		Understand Agile practices, extreme programming, Design planning, iteration planning and testing in agile
CO4		Mastering scrum framework, scrum practices and sprint planning
CO5		Understanding advanced scrum applications
CO6		Understand case studies in agile framework model: scrum, scrum tools

Mapping of Course Outcomes to Program Outcomes:

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

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

	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	1	3
CO5	1	3
CO6	1	3

Module No.	Module Contents	Hours	COs
1	**Introduction** What is Agile? The history of Agile, The Agile Manifesto. The Foundations of Agile: The Agile Mindset, Delivery environment and	9	CO1

	Agile suitability, the life cycle of product development, The iron Triangle, Working with uncertainty and volality, Empirical and defined processes. Agile myths. Why Agile? – Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility. How to Be Agile – Agile Methods, Don't Make your own Method, The Road to Mastery, Find a Mentor. Agile in a Nutshell: Deliver Something of Value Every Week, How Does Agile Planning Work? Done means Done, Three Simple Truths. Meet your Agile Team: How are Agile Projects Different? What makes an Agile Team Tick, Roles We Typically See, Tips for Forming Your Agile team.		
2	**Agile Design and Frameworks** Symptoms of Poor Design, Principles, Smells and Principles, what is Agile Design? What Goes Wrong with Software? How did the Agile Developers Know What to Do? Keeping the Design As Good As It Can Be. A Generic Agile Framework: Generic Agile Process, Common Agile Roles: The Customer, The Team, The Agile Lead, The Stakeholders. Major Agile Frameworks: Dynamic system development method(DSDM), Agile Project Management, Kanban, Lean Software Development, Lean Start-up, Scaled Agile Framework (SAFe).	9	CO2
3	**Agile Development** Agile Practices – The Agile Alliance, Principles. Overview of Extreme Programming: Practices, Customer Team Member, User Stories, Short Cycles, Pair Programming, Collective Ownership, Continuous Integration, The Planning Game, Simple Design. Planning: Initial Exploration, Release Planning, Iteration Planning, Task Planning, Iterating. Testing: Test Driven Development (TDD), Acceptance tests, Exploratory testing. Refactoring. Developing: Incremental requirement	9	CO3
4	**Mastering Scrum** Introduction: What is Scrum? Scrum origins, Why Scrum? Get Ready for Scrum: Scrum is Different, Self-Organization, Incremental product Delivery. Scrum Roles: Product Owner, Scrum Master, Development Team, Manager, Scrum practices: The ScrumMaster, product Backlog, Scrum Teams, Daily Scrum Meetings, Sprints, Sprint Planning Meeting, Sprint Review. Applying Scrum: Implementing Scrum, Business value through Collaboration, Empirical Management, managing a Sprint, Managing a release.	9	CO4
5	**Applications in Scrum** Why Scrum? Noisy Life, Noise in System Development Projects, Why Current System Development Methodologies Don't Work? Why Does Scrum Works? Advanced Scrum Applications: Applying Scrum to Multiple Related Projects, Applying Scrum to Larger projects, Scrum	9	CO5, CO6

	Values: Commitment, Focus, Openness, Respect, and Courage, Casestudies in role of scrum in project development, Scrum tools		

TEXT BOOKS:

1. Agile Foundations: Principles, Practices and frameworks, Peter Measey and Radtac, Viva Books Private Limited
2. Agile Software Development: Principles, Patterns, and Practices, Robert C. Martin with contributions by James W. Newkirk and Robert S. Koss, Pearson Education
3. Essential Scrum, A Practical Guide to the Most Popular Agile Process

REFERENCES:

1. Agile Software Development with Scrum, Ken Schwaber and Mike Beedle, Pearson Indian Edition.
2. The Agile Samurai, How Agile Masters Deliver Great Software, Jonathan Rasmusson, Shroff Publishers & Distributors Pvt. Ltd.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes	SSA
Marks (Out of 50)	25	10	5	10
Remember	5	-	-	-
Understand	10	5	-	-
Apply	10	5	5	10
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SEE – Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

MANAGEMENT AND ENTREPRENEURSHIP

Course Code	:	**20ISE814A**		**Credits**	:	**3**
L:T:P:S	:	**3:0:0:0**		**CIE Marks**	:	**50**
Exam Hours	:	**3**		**SEE Marks**	:	**50**

Course Outcomes :

CO1	Use the basic principles and concepts of management.
CO2	Analyze the internal/external factors affecting a business/organization to evaluate business opportunities.
C03	Manage people, processes, and resources within a diverse organization.
C04	Demonstrate the functions, types and roles of an entrepreneur.
C05	Describe the features of small scale industries and understand the institutional support provided for entrepreneurship.
C06	Summarize the preparation of project report, need significance of report. Also to explain about industrial ownership

Mapping of Course Outcomes to Program Outcomes :

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

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

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

Module No.	Module Contents	Hours	COs
1	Introduction – Meaning, nature and characteristics of management, scope and functional areas of management, goals of management, levels of management, brief overview of evolution of management. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, typesof organization.	9	CO1
2	Staffing- meaning, process of recruitment and selection. Directing and controlling- meaning and nature of directing, leadership styles, motivation theories. Controlling- meaning, steps in controlling, methods of establishing control,	9	CO3
	Communication- Meaning and importance, Coordination- meaning and importance		
3	Entrepreneur – meaning of entrepreneur, types of entrepreneurship, stages of entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India, barriers to entrepreneurship. Identification of business opportunities- market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.	9	CO2, CO4
4	Marketing Management - Definition of Marketing, Marketing Concept, Objectives and Functions of Marketing. Marketing Research - Meaning; Definition; Objectives; Importance; Limitations; Process. Advertising - Meaning of Advertising, Objectives, Functions, Criticism.	9	CO6
5	Financial Management - Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the Concept of Capital Structure and Various Sources of Finance.	9	CO6

TEXT BOOKS :

1. Ramaswamy, "Marketing Management: Global Perspective Indian Context", Macmillan Publications (UNIT IV)
2. Khan and Jain, "Financial Management" Tata McGraw-Hill Education.f (UNIT V)
3. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.
4. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House. 3. Entrepreneurship Development -Small Business Enterprises -Poornima M Charantimath Pearson Education – 2006.
5. Management and Enterpreneurship- Kanishka Bedi- Oxford University Press-2017

REFERENCE BOOKS :

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.

2. Entrepreneurship Development -S S Khanka -S Chand & Co.

CIE-Continuous Internal Evaluation (50 Marks)

Create	-	-	-	-
Bloom's Category	**Tests (25)**	**Assignments (10)**	**Quizzes (5)**	**Self Study(10)**
Remember	5	-	-	-
Understand	5	5	5	-
Apply	5	-	-	5
Analyze	5	5	-	5
Evaluate	5	-	-	-

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

SERVICE ORIENTED ARCHITECTURE

Course Code: 20ISE815A   **Credits:03**
L:T:P:S   :3:0:0:0   **CIE Marks:50**
ExamHours:3   **SEE Marks:50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Compare different IT architecture
CO2	Analyze and design of SOA based applications
CO3	Implement web service and realize of SOA
CO4	Implement REST full services
CO5	Design and implement of SOA based Application Integration using BPEL
CO6	Design and implement of web services with SOA-J.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	2	2	3
CO2	3	3	3	3	-	-	-	3	3	-	2	3
CO3	3	3	-	3	-	-	-	3	3	2	-	3
CO4	3	1	3	3	-	-	-	3	3	-	-	3
CO5	3	1	3	3	2	1	-	3	3	-	-	3
CO6	3	3	3	3	2	-	-	3	3	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2

CO1	2	3
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	CO's
1	SOA BASICS:Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.	9	CO1
2	SOA ANALYSIS AND DESIGN: Service-oriented Analysis and Design – Design of Activity,Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA –stakeholder OBJECTIVES – benefits of SPA – Cost Savings.	9	CO2
3	SOA GOVERNANCE:SOA implementation and Governance – strategy – SOA development –SOA governance – trends in SOA – event-driven architecture – software as a service – SOAtechnologies – proof-of-concept – process orchestration – SOA best practices.	9	CO3
4	SOA IMPLEMENTATION:SOA based integration – integrating existing application –development of web services – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding.	9	CO4, CO5
5	APPLICATION INTEGRATION:JAX –WS 2.0 client side/server side development –Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J – related software – integration through service composition (BPEL) – case study - current trends.	9	CO6

Text Books:

Service–Oriented Architecture for Enterprise Applications, Shankar Kambhampaly,Wiley 2008.

Reference Books:

1. SOA using Java Web Services Mark D. Hansen Practice Hall 2007.
2. SOA-Based Enterprise Integration Waseem Roshen Tata McGraw-HILL 2009

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

INTERNSHIP

Course Code	: 20ISE82A	**Credits**	: 4
L:T:P:S	: 0:0:4:0	**CIE Marks**	: 100
Exam Hours	: 3	**SEE Marks**	: 100

Objectives

1. Students should be able to understand advanced application development concepts
2. Students should be able to implement technical module/unit as project as per industry requirements

Description:

The student shall be capable of identifying a problem related to the field of Information Science and Engineering and carry out an internship on the problem defined. The code developed during the internship will be reviewed by a panel of experts. Plagiarized implementation will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of an internship the student will submit a report, which will be evaluated by duly appointed examiner(s).

Evaluation Stages:

Activity	Evaluation Attribute
Abstract Submission	Problem Statement

Review-I	Algorithm and outline design
Review-II	Partial code development and or partial execution
Review-III	Final Implementation PPT(10-12 slides) + Results verification + Report Submission in defined format

Recommended Application domains:

1) Data Sciences
2) Cyber Security
3) Data Mining
4) Societal Issues
5) Healthcare
6) Surveillance and security
7) Enterprise Resource Planning
8) Data Management & application
9) Interdisciplinary application, etc.,

IE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Internship
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	Internship
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

PROJECT PHASE-2

Course Code : 20ISE83A		**Credits**	: 12
L:T:P:S : 0:0:12:0		**CIE Marks**	: 100
Exam Hours : 3		**SEE Marks**	: 100

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify a issue and derive problem related to society, environment, economics, energy and technology
CO2	Formulate and Analyze the problem and determine the scope of the solution chosen
CO3	Determine, dissect, and estimate the parameters, required in the solution and Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics.
CO4	Compile the report and take part in present / publishing the finding in a reputed conference / publications

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	3	2	2	3	3	3	3	2	3
CO2	3	3	2	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	3	3	3	3	3	3	3
CO4	-	2	3	3	1	2	1	3	3	3	2	3

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

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

- Project: Carried out at the Institution or at an Industry.
- Project work shall preferably be batch wise, the strength of each batch shall have minimum of two and maximum of four students
- Viva-voce examination in project work shall be conducted batch-wise.
- For Project Phase –I and Project Phase –II, the CIE shall be 50 and 100 respectively.
- 100% of CIE Marks should be awarded based on the performance in reviews and thesis.
- Minimum requirement of CIE marks for Project work shall be 50% of the maximum marks.
- Students failing to secure a minimum of 50% of the CIE marks in Project work shall not be eligible for the Project examination conducted by the University and they shall be considered as failed in that/those Course/s. However, they can appear for University examinations conducted in other Courses of the same semester and backlog Courses if

any. Students after satisfying the prescribed minimum CIE marks in the Course/s when offered during subsequent semester shall appear for SEE.

- Improvement of CIE marks shall not be allowed in Project where the student has already secured the minimum required marks.
- For a pass in a Project/Viva-voce examination, a student shall secure a minimum of 40% of the maximum marks prescribed for the University Examination.
- Plagiarism Check is mandatory and student can take print of the thesis only after clearing the plagiarism check. Similarity Index should not exceed 25%.

CIE - Continuous Internal Evaluation (100 Marks)

Bloom's Category	Tests (100 Marks)
Remember	-
Understand	-
Apply	30
Analyze	20
Evaluate	-
Create	50

SEE – Semester End Examination (100 Marks)

Bloom's Category	Tests (100 Marks)
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	30
Create	70

APPENDIX A
Outcome Based Education

Outcome-based education (OBE) is an educational theory that bases each part of aneducational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes.

There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degreeprogram are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduateattributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of theprogram curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes

COURSE OUTCOME
↓
PROGGRAM OUTCOME
↓
PROGRAM EDUCATIONAL OBJECTIVES
↓
DEPARTMENTAL MISSION
↓
DEPARTMENTAL VISION
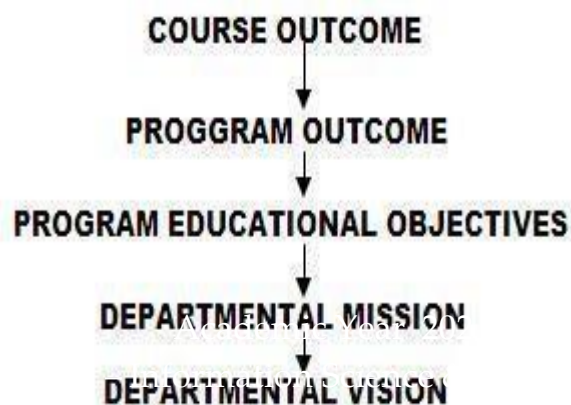
APPENDIX B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems anddesign 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.

Conduct investigations of complex problems: The problems that cannot be solved bystraightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

Modern tool usage: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineeringsolutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with theengineering 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.

Project management and finance: Demonstrate knowledge and understanding of theengineering 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.

Life-long learning: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish differentlevels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.