NEW HORIZON
COLLEGE OF ENGINEERING

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

Department of

Computer Science and Engineering

M.TECH-CSE

Academic Year 2021-2022

Scheme & Syllabus

Semester: 3 & 4

Batch(2020-2022)

SCHEME OF MTECH THIRD SEMESTER

2020-2022

S. No	Course code	Course	BOS	Credit distribution			Overall credits	Contact Hours	Marks		
				L	T	P			CIE	SEE	TOTAL
1	20SCS31x	Interdisciplinary Elective	CSE	4	0	0	4	4	50	50	100
2	20SCS32	INTERNSHIP	CSE	-	-	-	2	-	25	25	50
3	20SCS33	SEMINAR	CSE	-	-	-	2	-	25	25	50
4	20SCS34	PROJECT PHASE-1	CSE	-	-	-	14	-	100	100	200
Total							22	4	200	200	400

INTERDISCIPLINARY ELECTIVE	
COURSE CODE	COURSE
200CS315	INDUSTRIAL IOT
20SCS316	DIGITAL IMAGE AND VIDEO PROCESSING
20SCS317	GAMING AND VIRTUAL REALITY
20SCS318	ROBOTICS AND AUTOMATION
20SCS319	BIO COMPUTATION / BIOINFORMATICS

SCHEME OF FOURTH SEMESTER

2020-2022

S. No	Course code	course	BOS	Credit distribution			Overall credits	Contact Hours	Marks		
				L	T	P			CIE	SEE	TOTAL
1	20SCS41x	SPECIALIZATION ELECTIVE -4	CSE	4	0	0	4	4	50	50	100
2	20SCS42	INTERNSHIP	CSE	-	-	-	2	-	25	25	50
3	20SCS43	SEMINAR	CSE	-	-	-	2	-	25	25	50
4	20SCS44	PROJECT PHASE-2	CSE	-	-	-	14	-	100	100	200
Total							22	4	200	200	400

Specialization Elective -4	
Course code	**course**
20SCS411	AGILE TECHNOLOGIES
20SCS412	WEB INTELLIGENCE
20SCS413	ADVANCES IN COMPUTATIONAL SECURITY
20SCS414	HIGH PERFORMANCE COMPUTING
20SCS415	BLOCKCHAIN TECHNOLOGY

THIRD SEMESTER

INDUSTRIAL INTERNET OF THINGS

Course Code : 20SCS315 **Credits : 04**
L:T:P : 4:0:0 **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 IOT with respect to Industrial IOT
CO2	Analyze various Architectures of IIOT and its components.
CO3	Apply the different sensor technologies and Interfaces for sensing real world entities and identify the applications of IoT in Industry.
CO4	Apply the role of IIoT protocols for efficient network communication.
CO5	Analyze various need of security in IIOT System
CO6	Analyze the need for Data Analytics and its Application.

Mapping of Course Outcomes to Program Outcomes

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

Module No	Module Contents	Hours	COs
1	**Introduction to IOT** What is IIOT? IOT Vs. IIOT, History of IIOT, Components of IIOT Sensors, Interface, Networks, People &Process, IOT Market, Trends& future Real life examples, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIOT in Manufacturing Processes	**10**	**CO1**
2	**Architectures** Overview of IOT components ;Various Architectures of IOT and IIOT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIOT System components: Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN.	**10**	**CO2**
3	**Sensor and Interfacing**	**10**	**CO3**

	Introduction to sensors, Transducers, Classification, Roles of sensors in IIOT Various types of sensors, Design of sensors, sensor architecture, special requirements for IIOT sensors, Role of actuators, types of actuators. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, BACNet, M2M.		
4	**Protocols, Privacy, Security and Governance** Need of protocols; Types of Protocols, Wi-Fi direct, Zigbee, Z wave , IIOT protocols –COAP, MQTT,6lowpan, AMPQ Introduction to web security, Conventional web technology and relationship with IIOT Access control, Message integrity, Non-repudiation and availability, Security model for IoT, Network security techniques Management aspects of cyber security .	**15**	**CO4 CO5**
5	**IOT Analytics and Applications** **IOT Analytics :** Role of Analytics in IOT, Data visualization Techniques, Introduction to R Programming, Statistical Methods. Internet of Things Applications : Smart Metering, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Plant Automation, Real life examples of IIOT in Manufacturing Sector	**15**	**CO6**

Text Books:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications 2. Bernd Scholz-Reiter, Florian
2. Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer

Reference Book:

1. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2 nd Edition, Willy Publications
3. Inside the Internet of Things (IoT), Deloitte University Press
4. Internet of Things- From Research and Innovation to Market Deployment; ; By Ovidiu & Peter; River Publishers Series
5. Five thoughts from the Father of the Internet of Things; by By Phil Wainewright – Kevin Ashton

.

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks (Out of 50)	**25**	**15**	**10**
Remember	-	-	-
Understand	05	-	-
Apply	05	05	-
Analyze	05	05	05
Evaluate	05	-	05
Create	05	05	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 50)	**50**
Remember	05
Understand	05
Apply	15
Analyze	15
Evaluate	5
Create	5

DIGITAL IMAGE AND VIDEO PROCESSING

Course Code	**:20SCS316**	**Credits**	**: 04**
L: T: P	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

20SCS316.1	Demonstrate the basics of digital image processing fundamentals and transforms
20SCS316.2	Design 2D filters and apply it for image enhancement and restoration
20SCS316.3	Apply image compression and segmentation methods on digital image
20SCS316.4	Define the video formation techniques
20SCS316.5	Compile various motion techniques used in video coding
20SCS316.6	Apply the concepts of digital image, video processing and their applications

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
C02	**3**	**2**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**
CO3	**2**	**2**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**
CO4	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO5	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**
CO6	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**3**	**3**

Module No	Module Contents	Hours	COs
1	**Digital Image Fundamentals and Image Transforms:** Origin of digital image processing, Fundamental steps in digital image processing, Components of an image processing system, Structure of human eye, Image formation, Brightness adaptation and discrimination, Basic concepts in sampling and Quantization , Representing digital images, Neighbors of a pixel, Adjacency, Connectivity, Regions and Boundaries, Distance Measures, A simple image formation model, Fourier transform of sampled functions, Sampling theorem, Aliasing, Obtaining the DFT from the Continuous Transform of a Sampled Function, properties of 2D DFT –Relationship between spatial and frequency interval, Translation and Rotation, Periodicity, symmetric properties, DWT, DCT	**8**	**CO1**
2	**Image Enhancement and Restoration:** Some basic intensity transformation functions – image negatives, log transformations, Piecewise linear transformation functions, Histogram equalization, Matching, Local Histogram Processing, Using histogram statistics for image enhancement, Smoothing linear filters, Order statistics nonlinear filters, Sharpening, Singular value decomposition partial filters, Combined	**8**	**CO2**

	spatial enhancement methods, Homomorphic filtering, A model of image degradation/ restoration process, Noise models,		
3	**Image Compression and Segmentation:** Fundamentals of image compression-coding redundancy, spatial and temporal redundancy, Irrelevant information, measuring image information, image compression model, Lossless compression, Huffman coding, Arithmetic Coding, Run length coding, Lossy compression - Transform coding, Wavelet coding, mage segmentation –detection of isolated points, line detection, Edge models, Basic edge detection, Region based segmentation –region growing, Region splitting and merging, Spatial, frequency domain techniques, Texture based segmentation	**9**	**CO3**
4	**Basic Steps of Video Processing:** Analog video signals, standard, Digital video signal, standard, Digital video processing, Time varying image formation models –3D motion models, Rigid motion in Cartesian, Homogenous coordinates, Deformable motion, Geometric image formation, Perspective projection, Photometric image formation, Photometric effects of 3D motion, Observation noise, Sampling structures of analog, digital video,2D Fourier transform relations, Intra frame filtering- LMMSE filtering, Median and weighted median filtering, Motion detection based filtering	**9**	**CO4**
5	**2D Motion Estimation:**2D motion estimation – Optical flow – 2D motion vs. apparent motion, Correspondence and optical flow, Occlusion problem, Aperture problem, 2D motion field models, Block motion models-translational block motion, Generalized/ Deformable block motion, Block matching criteria, Matching procedures, Hierarchical motion estimation, Gradient based optimization, Steepest Descent method, Newton Raphson method, Transform coding , 3D waveform coding, Local vs. Global minima, Predictive coding	**9**	**CO 5, CO 6**

TEXT BOOKS:

1. Rafael C Gonzalez, Richard E Woods, “Digital Image Processing”- 3rd Edition, Pearson Education 2008.2.
2. Yao wang, JoemOstarmann and Ya – quin Zhang, ”Video processing and communication “,1st edition
. 3. M. Tekalp ,”Digital video Processing”, Prentice Hall International

REFERENCE BOOK(S):

1. A.K. Jain, “Fundamentals of Digital Image Processing”. Pearson education
2. William K Pratt, “Digital Image Processing”, John Willey (2001)

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Test**	**Assignment**	**Quiz**
Marks (Out of 50)	**25**	**15**	**10**
L1: Remember	5	5	-
L2: Understand	5	5	5
L3: Apply	5	2.5	-
L4: Analyze	5	2.5	2.5
L5: Evaluate	5	-	2.5
L6: Create	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	15
L2: Understand	15
L3: Apply	10
L4: Analyze	5
L5: Evaluate	5
L6: Create	-

GAMING AND VIRTUAL REALITY

Course Code	**: 20SCS317**	**Credits**	**: 04**
L: T:P	**: 4:0:0**	**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 basic principles and requirements of virtual reality.
CO2	Examine the Interactive Techniques used in Virtual Reality.
CO3	Analyze the fundamental design principles for Visual Computation in Virtual Reality.
CO4	Apply and analyze the development Tools and Frameworks used in Virtual Reality.
CO5	Interpret the Mechanics-Dynamics-Aesthetics (MDA) game design framework.
CO6	Develop a player-centric game design using Virtual Reality interfaces.

CO-PO MAPPING

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

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Contents of Module	Hrs	CO's
1	Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.	**9**	**CO1**
2	Multiple Models of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices.	**9**	**CO2**
3	Visual Computation in Virtual Reality: Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering.	**9**	**CO3**
4	Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools, Unity	**9**	**CO4**
5	Mechanics-Dynamics-Aesthetics (MDA) game design framework. Player-centric game design for VR interfaces. Demonstration of Digital Entertainment by VR.	**9**	**CO5, CO6**

TEXTBOOK:

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013. 4.2

REFERENCE BOOKS:

1) Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
2) The VR Book: Human-Centered Design for Virtual Reality (ACM Books) by Jason Jerald (2015).
3) Unity Virtual Reality Projects: Learn Virtual Reality by developing more than 10 engaging projects with Unity 2018, 2nd Edition 2nd Edition, Kindle Edition by Jonathan Linowes (2018).

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests (3)	Assignments (2)	Quizzes(2)
Marks (Out of 50)	25	15	10
L1: Remember		-	-
L2: Understand	5	-	-
L3: Apply	5	5	5
L4: Analyze	10	7.5	2.5
L5: Evaluate	5	2.5	2.5
L6: Create	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	-
L2: Understand	10
L3: Apply	18
L4: Analyze	10
L5: Evaluate	12
L6: Create	-

ROBOTICS AND AUTOMATION

Course Code : 20SCS318 **Credits : 04**
L:T:P : 4:0:0 **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 the automation potential and realizing the value in RPA.
CO2	Demonstrate good understanding RPA Platform Architecture and Components.
CO3	Demonstrate good understanding of Recorders, Editor, and various essential Commands to build simple tasks / Bots for automating simple processes.
CO4	Automating Tasks through office automation packages.
CO5	Independently develop solution for automating the tasks.
CO6	Demonstrate good understanding of RPA and its use cases.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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	-	-	-	-	-	-	3	3	-
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	-
CO6	3	3	3	3	3	-	-	-	-	-	-	3	3	-

Module No	Module Contents	Hours	COs
1	**Introduction to RPA:** Understanding Enterprise Processes Robotic Process Automation, Areas Ripe for Automation, seeking an RPA Solution, Seeing the Value in RPA, Attended and Unattended Automation, RPA improvement cycle, Introduction to RPA, Automation Anywhere Enterprise Tool – An introduction.	**9**	**CO1**
2	**Platform Architecture and Components:** Installing Automation Anywhere Enterprise A2019, Setting up a cloud-enabled deployment model for enterprise, AA Control Room Control Room Settings License Settings All Menus Theory, demonstration and hands on practice and experience on the system.	**9**	**CO2**
3	Building best practice automations: Recorder versus Design-based. Recorders: Web Recorder, Screen Recorder, Smart Recorder. AA Commands Read from CSV/Text, Excel Database Files/Folder.	**9**	**CO3**

	Practice Exercises: 1. Screen recorder 2. Simple web recorder 3. Web recorder with database automation		
4	**Building best practice automations:** Error Handling String Operation Variables Variable Operation PDF Integration Email Automation, OCR Web Recorder Properties, Workflow, Tips & Tricks. Practice Exercises: 1. Email Automation 2. FTP automation and PDF integration 3. String operation 4. Web recorder & send email 5. Smart recorder.	**9**	**CO4** **CO5**
5	**Getting smarter through Cognitive Automation:** What AI brings, Automated customer engagement – Chat bots, Voice bots, Virtual agent, Automated mails, Dynamic interactive voice response, Visual IVR. **USE-CASES:** **Advanced** a. Smart Recorder with Excel automation and database automation b. Web recorder with files and folder **Masters** a. Xml automation b. Web recorder to excel automation	**9**	**CO6**

Text Books:

1. Robotic Process Automation for dummies, NICE special edition, NICE RPA team with Steve Kaelble, ISBN: 978-1-119-45774-9 (pbk); ISBN: 978-1-119-45773-2 (ebk), 2018.
2. Automation Anywhere Enterprise Exercise Handbook.

References Books:

1. The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, Tom Taulli, ISBN: 978-1-4842-5728-9.

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25**	**15**	**10**
Remember	05	05	-
Understand	05	05	-
Apply	05	-	05
Analyze	05	-	05
Evaluate	-	-	-
Create	05	05	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Tests**
Marks (Out of 50)	**50**
Remember	05
Understand	10
Apply	15
Analyze	15
Evaluate	-
Create	05

BIOCOMPUTATION/BIOINFORMATICS

Course Code	**:20SCS319**	**Credits**	**: 04**
L: T: P	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**:3**	**SEE Marks**	**: 50**

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

CO#	Course Outcomes
20SCS319.1	Understand and Learn about how Biological insights are helpful to deal with complex computational problems.
20SCS319.2	Understand genetic information and biological sequences and analyze DNA sequences by applying various computational methods
20SCS319.3	Apply various algorithms to find patterns in sequences which are helpful for identifying mutations and opens up a path to the long way of disease discovery which is common societal problem.
20SCS319.4	Analyse Biological sequences with Hidden Markov Models which can be utilized in finding solutions for problems in health care industry.
20SCS319.5	Make use of genetic algorithm to identify and propose solutions to various real time and social impact problems.
20SCS319.6	Make use of neural network and bio-inspired algorithms to investigate and solve problems from different engineering sectors.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20SCS319.1	3			-	-	-	-	-	-	-	-	2	-	2
20SCS319.2	3	3	3	-	-	-	-	-	-	-	-	2	-	2
20SCS319.3	3	3	3	-	-	2	-	-	-	-	-	2	-	2
20SCS319.4	3	3	3	-	-	2	-	-	-	-	-	2	-	2
20SCS319.5	3	3	3	2	-	2	-	-	-	-	-	2	-	2
20SCS319.6	3	3	3	2	-	2	-	-	-	-	-	2	-	2

Module No	Module Contents	Hours	COs
1	Biological computation: Biological Introduction, Models and simulations, Exercises. Introduction to Python Language: Variables and predefined Functions, Developing Python code, Developing Python programs, Object oriented programming, pre-defined classes and methods.	**8**	**CO1**
2	Cellular and Molecular Biology Fundamentals: The Cell, The Genetic Information, Genes, Human Genome, Biological Resources and Databases. Basic Processing of Biological Sequences, Exercises and programming Projects.	**8**	**CO2**
3	Finding Patterns in Sequences, Exercises and Programming Projects. Hidden Markov Models, Exercises and Programming Projects.	**10**	**CO3,CO4**

4	Evolutionary Biology and Evolutionary Computation: Genetic Algorithms, Example Applications, Analysis of Behavior of Genetic Algorithms, Genetic Programming, A second look at the Evolutionary process. Exercises.	**10**	**CO5**
5	Artificial Neural Networks: The perceptron, Learning in a multilayered network, Associative memory, Unsupervised learning, Exercises. Swarm Intelligence, Artificial Immune System, Artificial Life, Systems Biology.	10	CO6

Text Book(s):

1. Biological Computation, Ehud Lamm and Ron Unger, CRC press 2011
2. Bioinformatics Algorithms, Design and Implementation in Python, Miguel Rocha, Pedro G Ferreira, Academic Press

Reference Book(s):

1. Bioinformatics, The Machine Learning Approach, Pierre Baldi and Soren Brunak, 2nd Edition, MIT press
2. Biomedical Informatics, Computer Applications in Healthcare and Biomedicine, Editors: Edward H.Shortliffe and James J.Cimino , 4th Edition, Springer

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Tests**	**Assignments**	**Quizzes**	**Co-Curricular**	**Other**
Marks (Out of 50)	**25**	**10**	**5**	**10**	**-**
L1: Remember	5	-	-		-
L2: Understand	5	-	-	5	-
L3: Apply	5	5	5	5	-
L4: Analyze	5	5	-	-	-
L5: Evaluate	5	-	-	-	-
L6: Create	-	-	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	10
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	-

INTERNSHIP

Course Code	**:20SCS32**	**Credits**	**: 02**
L:T:P	**:0:0:0**	**CIE Marks**	**: 25**
Exam Hours	**:3 hrs.**	**SEE Marks**	**: 25**

	Course outcomes
CO1	Understand industry/Organization customs and practices
CO2	Demonstrate professional and technical skills that pertain directly to the internship experience
CO3	Demonstrate effective listening skills verbal and written communication skills
CO4	Demonstrate appropriate workplace attitudes and individual responsibility
CO5	Participate well as a team member, allocate time effectively and build professional network
CO6	Demonstrate effective management of personal behaviour, ethics and attitudes and practice ethical standards appropriate to the internship site

Mapping of Course Outcomes to Program Outcomes:

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

Internship Guidelines:

1. All the student shall have to undergo the mandatory internship during their 3rd/4th semester .
2. The internship can be carried out in any industry related to their discipline through NHCE or on their own effort.
3. Each student will be allocated to a internal faculty guide and a reviewer.
4. Student shall report the progress of the internship to the guide in the regular interval to seek his/her advice.
5. The internship shall be completed within the specified time.

6. After the completion of internship, student should submit a report with attendance certificate to the HOD with the approval of both internal and external guide.
7. The student should present his/her work in the PPT format to his/her guide and reviwer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes for each review.
8. There will be 3 reviews and CIE marks will be allocated based on the review.
9. Hard copy of the report should be submitted during the final presentation.
10. SEE will be conducted for internship.

Expected Course Outcome: At the end of the course graduate will be able to:

1. Develop or improve his/her skill to work in industry.
2. Develop the skills required for effective team work.
3. Identify the industry needs and apply their knowledge to solve problem using recent trends and technology.
4. Help them to do their final year project with the practical knowledge.

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

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Taxonomy	**Internship**
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	5
Create	5

SEE – Semester End Examination (25 marks)

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

SEMINAR

Course Code : 20SCS33 **Credits : 02**
L:P:T:S : 0:0:0 **CIE Marks : 25**
Exam Hours: 3 Hrs **SEE Marks : 25**

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

CO #	COURSE OUTCOMES
CO1	Identify research papers for understanding a new field to summarize and review them.
CO2	Identify promising new directions of various cutting-edge technologies.
CO3	Acquire the basic skills for conducting literature survey and paper presentation.
CO4	Develop and apply the skills required for justifying the methodology of a chosen topic.
CO5	Identify an engineering problem, analyze it, and propose a work plan to solve it.
CO6	Improve oral and written communication skills.

Course Outcomes to Program Outcomes Articulation Matrix

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

Seminar Guidelines:

1. The student should choose topic in recent trend /technology from IEEE or renowned journal.
2. Each student will be allocated to a internal faculty guide and reviewer.
3. Student should get approval from the guide for his/her chosen topic within the stipulated time.
4. The student should present his/her work in the PPT format to his/her guide and reviewer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes.
5. Hard copy of the report should be submitted during the final presentation.
6. CIE marks will be considered based on the topic chosen, knowledge about the topic, communication skills, and levels of confidence, time management, questions, and answer session.
7. SEE will be conducted for technical seminar.

CIE – Continuous Internal Evaluation: Theory (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
Marks (Out of 50)	**25**
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	15
L5: Evaluate	
L6: Create	

SEE – Semester End Examination: Theory (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	15
L5: Evaluate	
L6: Create	

PROJECT PHASE- I

Course Code	**: 20SCS34**	**Credits**	**: 14**
L: T: P	**: 0:0:0**	**CIE Marks**	**: 100**
Exam Hours	**: 3**	**SEE Marks**	**: 100**

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

20SCS34.1	Prepare the students to solve/work on the real world/ Practical/Theoretical problems involving issues in computer science and Engineering
20SCS34.2	Able to summarize their work by proper Software Engineering Documents after evaluating the testing plans.
20SCS34.3	Practice presentations, Communications and team work skills
20SCS34.4	Able to learn and develop new concepts in multidisciplinary area
20SCS34.5	Use different Programming languages/software tools/ Hardware technologies
20SCS34.6	Apply algorithmic strategies while solving problems

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20SCS34.1	3	3	3	3	3	2	3	3	3	3	3	2	3	3
20SCS34.2	3	3	3	3	3	2	3	3	3	3	3	2	3	3
20SCS34.3	3	3	3	3	3	-	-	3	3	3	3	2	3	3
20SCS34.4	3	3	3	3	3	2	3	3	3	3	3	2	3	3
20SCS34.5	3	3	3	3	3	2	-	3	3	3	3	2	3	3
20SCS34.6	3	3	3	3	3	-	-	3	3	3	-	2	3	3

This course will be conducted largely as group of 2-4 student members under the direct supervision of a member of academic staff.

Students will be required to

1) Identify the Problem and choose the specific project topic which will reflect the common interests and expertise of the student and supervisor.
2) Perform a literature search to review current knowledge and developments in the chosen technical area.
3) Conduct a Feasibility study of the Project.
4) Submit the main Project Proposal.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Project**
Marks (Out of 50)	
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	**Project**
Marks (Out of 50)	
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

SEMESTER 4

AGILE TECHNOLOGIES

Course Code	**: 20SCS411**	**Credits**	**: 04**
L:T:P	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

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

CO1	Understand the basics of Agile technology and its usage
CO2	Identify the XP Lifecycle, XP Concepts, Adopting XP
CO3	Illustrate concepts of Pair Programming, Root-Cause Analysis, Retrospectives
CO4	Build on Planning, Incremental Requirements, Customer Tests
CO5	Implement Concepts of agile values principles to Eliminate Waste
CO6	Understand Universal Design Principles and Principles in Practice

Mapping of Course Outcomes to Program Outcomes

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

Module No	Module Contents	Hours	COs
1	**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	**8**	**CO**

2	**Understanding XP:** The XP Lifecycle, The XP Team, XP Concepts, **Adopting XP:** Is XP Right for Us?, Go!, Assess Your Agility	**7**	**CO2**
3	**Practicing XP:** **Thinking:** Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, **Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, **Releasing:** "Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. **Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. **Developing:** Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing	**11**	**CO3** **CO4**
4	**Mastering Agility** **Values and Principles:** Commonalities, About Values, Principles, and Practices, Further Reading, **Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules, **Rely on People :**Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, **Eliminate Waste :**Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput	**9**	**CO5**
5	**Deliver Value:** Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence :**Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery	**9**	**CO6**

Text Books:

1. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007

Reference Books:

1. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
2. "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks (Out of 50)			
L1: Remember			
L2: Understand	5		
L3: Apply	5	7.5	5
L4: Analyze	5	7.5	5
L5: Evaluate	5		
L6: Create	5		

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	10

WEB INTELLEGENCE

Course Code : 20SCS412 | **Credits : 04**
L:T:P : 4:0:0 | **CIE Marks :50**
Exam Hours : 3 | **SEE Marks : 50**

Course Outcomes: At the end of the course, students able

CO #	COURSE OUTCOME
20SCS412.1	Summarize different approaches, Evaluation, document representation in web Intelligence.
20SCS412.2	Analyze ontology techniques, data mining techniques and Layered model.
20SCS412.3	Apply web log analysis, classification and association in analysis of data.
20SCS412.4	Interpret web crawlers, search engines and extraction of multimedia.
20SCS412.5	Analyze page ranking algorithms and HITS technique in different web content mining and web structure mining techniques.
20SCS412.6	Analyze random walks on web, social networks using of Web Intelligence.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20SCS412.1	3	-	-	-	2	-	-	-	-	-	-	2	-	3
20SCS412.2	3	-	-	-	-	-	-	-	-	-	-	2	-	3
20SCS412.3	3	-	-	-	-	-	-	-	-	-	-	3		3
20SCS412.4	3	2	-	-	-	-	-	-	-	-	-	3		3
20SCS412.5	3	3	2	-	-	-	-	2	-	-	-	3		3
20SCS412.6	3	-	-	-	-	-	-	-	-	-	-	3		3

Module	Contents of the Module	COs	Hours
1	**Introduction to Web Intelligence:** What is Web intelligence, Benefits of Intelligent Web, Ingredients of Web Intelligence, Topics of Web Intelligence, Related Technologies, Information Retrieval, Document representation, Retrieval Models, Evaluation of Retrieval performance.	**CO1**	**8**

2	**Semantic Web:** The Layered-Language Model, Metadata and Ontologies, Ontology Languages for the Web Data Mining Techniques: Classification and Association, Clustering	**CO2**	**9**
3	**Web Usage Mining:** Web-Log Processing, Analyzing Web Logs, Applications of Web Usage Mining- Clustering of Web Users, Classification Modeling of Web Users, Association Mining of Web Usages, Sequence-Pattern Analysis of Web Logs.	**CO3**	**9**
4	**Web Content Mining:** Web Crawlers, Search engines, Personalization of Web Content, multimedia Information Retrieval.	**CO4**	**9**
5	**Web Structure Mining:** Modelling Web Topology- PageRank Algorithm, Hyperlink-Induced Topic Search (HITS), Random Walks on the Web, Social Networks.	**CO5, CO6**	**9**

Text Book(s):

1. Akerkar, R. &Lingras, P. (2008). Building an Intelligent Web: Theory and Practice. Jones and Bartlett Publishers, Sudbury, Massachusetts.
2. Data Mining Concepts &Techniques –by Jaiwei Han ,Micheline Kamber,Jian Pei 3rd Edition,MK publisher.

References:

1. Juan D.Vel´asquez and Lakhmi C. Jain (Eds.): Advanced Techniques in Web Intelligence – 1, Springer, Sep-2010.
2. Ning Zhong: Web Intelligence Research and Development, Springer,2001.
3. Richi Nayak, NikhilChalkaranje, Lakhmi C. Jain: Evolution of the Web in Artificial Intelligence Environments,Springer,2008.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**
Marks (out of 50)	25	15	10
Remember	5	-	-
Understand	5	--	5
Apply	5	7.5	5
Analyze	10	7.5	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination: Theory (50 Marks)

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

ADVANCES IN COMPUTATIONAL SECURITY

Course Code :20SCS413 | **Credits: 04**
L:T:P : 4:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**

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

CO#	Course Outcomes
20SCS413.1	Analyze the importance of data security and cryptographic techniques
20SCS413.2	Analyze the various threats to database security and to evaluate the security requirements
20SCS413.3	Analyze the security requirements for the operating system design.
20SCS413.4	Analyze the importance of cloud computing
20SCS413.5	Analyze the various cloud security techniques
20SCS413.6	Evaluate the models and standards for security.

Mapping of Course Outcomes to Program Outcomes

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

Sl. No	Module Contents	Hours	Cos
1	**Introduction to Cryptography and Data Security:** Data Security ,Cryptographic Systems- Public-Key Systems, Digital Signatures , Information Theory -Entropy and Equivocation , Perfect Secrecy ,Unicity Distance ,Complexity Theory - Algorithm Complexity Problem. Complexity and NP-Completeness ,Ciphers Based on Computationally Hard Problems, Number Theory - Congruence and Modular Arithmetic, Computing Inverses, Computing in Galois Fields	9	CO1
2	**Security In Databases:** Security requirements of database systems – Reliability and Integrity in databases –Redundancy – Recovery – Concurrency/ Consistency – Monitors	8	CO2

	– Sensitive Data – Types of disclosures – Inference-finding and confirming sql injection		
3	**Security in Operating System:** Security in the Design of Operating System-- Simplicity of Design - Layered Design - Kernelized Design- Reference Monitor- Correctness and Completeness- Secure Design Principles-Trusted Systems - Trusted System Functions- The Results of Trusted Systems Research, Rootkit -Phone Rootkit - Rootkit Evades Detection - Rootkit Operates Unchecked - Sony XCP Rootkit - TDSS Rootkits - Other Rootkits	**9**	**CO3**
4	**Cloud Security:** Cloud Computing Concepts- Service Models - Deployment Models- Moving to the Cloud - Risk Analysis-Cloud Provider Assessment- Switching Cloud Providers- Cloud as a Security Control , Tools and Techniques Data Protection in the Cloud - Cloud Application Security - Logging and Incident Response- Cloud Identity Management -Security Assertion Markup Language- OAuth- OAuth for Authentication - Securing IaaS - Public IaaS Versus Private Network Security	**9**	**CO4,** **CO5**
5	**Security Models And Standards:** Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.	**9**	**CO6**

Text Books:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.
2. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.
3. Cryptography and data security, Dorothy Elizabeth Rob, ling Denning, Addison-Wesley.

Reference Books:

1. William Stallings, "Cryptography and Network Security : Principles and Practices", Fifth Edition, Prentice Hall, 2010.
2. Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc GrawHill Osborne Media, 2009.
3. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	25	15	10
L1: Remember		-	-
L2: Understand		-	-
L3: Apply	10		5
L4: Analyze	10	7.5	2.5
L5: Evaluate	5	2.5	2.5
L6: Create	-		-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	
L2: Understand	5
L3: Apply	20
L4: Analyze	15
L5: Evaluate	10
L6: Create	-

HIGH PERFORMANCE COMPUTING

Course Code	**: 20SCS414**	**Credits: 04**	
L:T:P	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

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

CO#	Course Outcomes
20SCS414.1	Understand the basic concepts of cluster computing
20SCS414.2	Design and set up an HPC cluster
20SCS414.3	Apply Process Scheduling, Load Sharing and Balancing techniques on Clusters
20SCS414.4	Analyse the working environment of grid computing
20SCS414.5	Analyse the architecture of cloud computing environments.
20SCS414.6	Analyze the state-of-the-art platforms used in cloud computing

Mapping of Course Outcomes to Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO6	3	3	3	3	3	-	-	-	-	-	-	3	3	3

Sl. No	Module Contents	Hours	Cos
1	**Cluster Computing** Introduction, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware, Resource Management and Scheduling, Programming Environments and Tools, Cluster Applications, Setting up the Cluster, Security, Resource Sharing, Cluster Architectures, Detecting and Masking Faults, Recovering from Faults, Lightweight Messaging Systems, Lightweight Communication Mechanisms, Kernel-Level Lightweight Communications, User-Level Lightweight Communications ,Congestion Management.	**8**	**CO1, CO2**

2	**Process Scheduling, Load Sharing and Balancing on Clusters** Components and Architecture of Job and Resource Management Systems, State-of-the-Art in RMS, Scheduling Parallel Jobs on Clusters, Rigid Jobs with Process Migration, Malleable Jobs with Dynamic Parallelism, Communication-Based Coscheduling, Batch Scheduling, Load Sharing in Cluster Computing, Integration of Load Sharing and Fault Tolerance, Scheduling Tasks to Machines Connected via Fast Networks, Scheduling Tasks to Arbitrary Processors Networks, Dynamic Load Balancing (DLB), Mapping and Scheduling, Static Scheduling and Dynamic Scheduling, Load Balancing Issues.	**9**	**CO3**
3	**Grid Computing** Building blocks of the grid, Anatomy of the grid, Grid Architecture, Relationship with other technologies, Open grid service architecture, Legion grid Architecture, Condor and the grid, Autonomic computing and the grid, Virtualization Services for Data Grids, Peer to Peer Grids, Grid Programming Issues, Programming Support, Distributed Object Based Grid Computing Environments, Meta computing	**9**	**CO4**
4	**Cloud Computing** Introduction, Building cloud computing environments, Parallel vs. distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing, Virtualization, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Cloud Computing Architecture, The cloud reference model, Types of clouds, Open challenges	**9**	**CO5**
5	**Cloud Computing** Concurrent Computing, Introducing parallelism for single-machine computation, Programming applications with threads, High-Throughput Computing, Task computing, Task-based application models, Data-Intensive Computing, Technologies for data-intensive computing, Cloud Platforms in Industry, Amazon web services, Google AppEngine, Microsoft Azure, CloudApplications, Energy efficiency in clouds, Management of clouds, Federated clouds/InterCloud, Third-party cloud services.	**9**	**CO6**

Text Books:

1. R. Buyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
2. Grid Computing: Making The Global Infrastructure a Reality: John Wiley & Sons
3. R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann, Elsevier, 2013.

Reference Books:

1. A. Chakrabarti, Grid Computing Security, Springer, 2007.
2. B. Sosinsky, Cloud Computing Bible, Wiley, 2011
3. Ronald Krutz, Cloud Security, Wiley India.

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignment 1	Assignment 2	Quiz 1	Quiz 2
Marks (Out of 50)	25	7.5	7.5	5	5
L1: Remember		-	-	-	
L2: Understand	5	-	-	-	
L3: Apply	10	2.5	2.5	3	3
L4: Analyze	5	2.5	2.5	2	2
L5: Evaluate		-	-	-	-
L6: Create	5	2.5	2.5	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	
L2: Understand	10
L3: Apply	20
L4: Analyze	10
L5: Evaluate	-
L6: Create	10

Blockchain

Course Code	**: 20SCS415**	**Credits**	**: 4**
L:T: P	**: 4:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO #	COURSE OUTCOME
21SCS415.1	Analyze the fundamentals of Blockchain Technology
21SCS415.2	Apply and analyze the various cryptographic mechanisms used in Blockchain
21SCS415.3	Examine the concept of bitcoin and mathematical background behind it
21SCS415.4	Analyze the various decentralization concepts and consensus algorithms
21SCS415.5	Design smart contracts using solidity with EVM
21SCS415.6	Analyze the various permissioned blockchain and its uses cases

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21SCS415.1	3	3	-	-	3	-	-	-	-	-	-	3	-	3
21SCS415.2	3	3	3	-	3	-	-	-	-	-	-	3	3	3
21SCS415.3	3	3	3	-	3	-	-	-	-	-	-	3	3	3
21SCS415.4	3	3	3	-	3	-	-	-	-	-	-	-	3	-
21SCS415.5	3	3	3	-	3	-	-	-	-	-	-	-	3	-
21SCS415.6	3	3	3	-	3	-	-	-	-	-	-	-	3	-

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Module Contents	Hours	Cos
1	Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. Cryptographic basics for crypto currency - a short overview of Hashing, Hash pointer and Merkle tree, cryptographic algorithm – SHA 256,signature schemes, encryption schemes and elliptic curve cryptography	10	CO1,CO2
2	A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin. Bitcoin, the challenges, and solutions, Block propagation and block relay	9	CO3

3	Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations ,Consensus introduction, Distributed consensus in open environments-Consensus in a Bitcoin network Types of consensus algorithm: Proof of Work (PoW), Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- , Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Proof of Burn, Proof of Elapsed Time	10	CO4
4	Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts. Some attacks on smart contracts	9	CO5
5	Permissioned Blockchain and use cases – Hyperledger, Corda , Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, and others	7	CO6

Reference Books:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran,2017.

2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.

Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks (Out of 50)			
Remember			
Understand	5		5
Apply	10	7.5	5
Analyze	5	7.5	
Evaluate	5		
Create			

SEE – Semester End Examination: Theory (50 Marks)

Bloom's Taxonomy	**Tests**
Marks (Out of 50)	
Remember	
Understand	10
Apply	20
Analyze	10
Evaluate	10
Create	

INTERNSHIP

Course Code	**:20SCS42**	**Credits**	**: 02**
L:T:P	**:0:0:0**	**CIE Marks**	**: 25**
Exam Hours	**:3 hrs.**	**SEE Marks**	**: 25**

	Course outcomes
CO1	Understand industry/Organization customs and practices
CO2	Demonstrate professional and technical skills that pertain directly to the internship experience
CO3	Demonstrate effective listening skills verbal and written communication skills
CO4	Demonstrate appropriate workplace attitudes and individual responsibility
CO5	Participate well as a team member, allocate time effectively and build professional network
CO6	Demonstrate effective management of personal behaviour, ethics and attitudes and practice ethical standards appropriate to the internship site

Mapping of Course Outcomes to Program Outcomes:

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

Internship Guidelines:

1. All the student shall have to undergo the mandatory internship during their 3rd/4th semester .
2. The internship can be carried out in any industry related to their discipline through NHCE or on their own effort.
3. Each student will be allocated to a internal faculty guide and a reviewer.
4. Student shall report the progress of the internship to the guide in the regular interval to seek his/her advice.
5. The internship shall be completed within the specified time.
6. After the completion of internship, student should submit a report with attendance certificate to the HOD with the approval of both internal and external guide.

7. The student should present his/her work in the PPT format to his/her guide and reviwer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes for each review.
8. There will be 3 reviews and CIE marks will be allocated based on the review.
9. Hard copy of the report should be submitted during the final presentation.
10. SEE will be conducted for internship.

Expected Course Outcome: At the end of the course graduate will be able to:
1. Develop or improve his/her skill to work in industry.
2.Develop the skills required for effective team work.
3.Identify the industry needs and apply their knowledge to solve problem using recent trends and technology.
4.Help them to do their final year project with the practical knowledge.

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

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Taxonomy	**Internship**
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	5
Create	5

SEE – Semester End Examination (25 marks)

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

SEMINAR

Course Code	**: 20SCS43**	**Credits**	**: 02**
L:T:P	**: 0:0:0**	**CIE Marks**	**: 25**
Exam Hours	**: 3 Hrs**	**SEE Marks**	**: 25**

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

CO #	COURSE OUTCOMES
CO1	Identify research papers for understanding a new field to summarize and review them.
CO2	Identify promising new directions of various cutting-edge technologies.
CO3	Acquire the basic skills for conducting literature survey and paper presentation.
CO4	Develop and apply the skills required for justifying the methodology of a chosen topic.
CO5	Identify an engineering problem, analyze it, and propose a work plan to solve it.
CO6	Improve oral and written communication skills.

Course Outcomes to Program Outcomes Articulation Matrix

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

Seminar Guidelines:

1. The student should choose topic in recent trend /technology from IEEE or renowned journal.

2. Each student will be allocated to a internal faculty guide and reviewer.

3. Student should get approval from the guide for his/her chosen topic within the stipulated time.

4. The student should present his/her work in the PPT format to his/her guide and reviewer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes.

5. Hard copy of the report should be submitted during the final presentation.

6. CIE marks will be considered based on the topic chosen, knowledge about the topic, communication skills, and levels of confidence, time management, questions, and answer session.

7. SEE will be conducted for technical seminar.

CIE – Continuous Internal Evaluation: Theory (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
Marks (Out of 50)	**25**
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	15
L5: Evaluate	
L6: Create	

SEE – Semester End Examination: Theory (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	15
L5: Evaluate	
L6: Create	

PROJECT PHASE II

Course Code	**: 20SCS44**	**Credits**	**: 14**
L: T: P	**:0:0:0**	**CIE Marks**	**: 100**
Exam Hours	**: 3**	**SEE Marks**	**: 100**

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

20SCS44.1	Prepare the students to solve/work on the real world/ Practical/Theoretical problems involving issues in computer science and Engineering
20SCS44.2	Summarize their work by proper Software Engineering Documents after evaluating the testing plans
20SCS44.3	Practice presentations, Communications and team work skills.
20SCS44.4	Learn and develop new concepts in multidisciplinary area
20SCS44.5	Use different Programming languages/software tools/ Hardware technologies
20SCS44.6	Apply algorithmic strategies while solving problems

Mapping of Course Outcomes to Program Outcomes

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

This course will be conducted largely as group of 2-4 student members under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student and supervisor.

Students will be required to

1) Undertake the detailed technical work in the chosen area.
2) Design the Architecture of the System
3) Produce progress reports or maintain a professional journal to establish work completed, and to schedule additional work within the time frame specified for the project.
4) Prepare an interim report describing the work undertaken and results obtained so far
5) Demonstrate the Complete working of the Project with results of all modules.
6) Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Project**
Marks (Out of 50)	
Remember	
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	**Project**
Marks (Out of 50)	
Remember	
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10