

**Semester- III**

<b>Internet of Things and Applications</b>			
Course Code	22SAD31	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	04	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>• Explore schemes for the applications of IOT in real time scenarios</li> <li>• Examine the potential business opportunities that IoT can uncover</li> <li>• Explore the models of Internet of things to business</li> <li>• Identify different case studies to understand how IoT works.</li> </ul>			
<b>Module-1</b>			
What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples- Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, OverThe-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.			
<b>Teaching-Learning Process</b>	Chalk and board, PPT		
<b>Module-2</b>			
Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF Ipv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO			
<b>Teaching-Learning Process</b>	Chalk and board, PPT		
<b>Module-3</b>			
Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity:Ipv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,Ipv6 Protocol Overview, Ipv6 Tunnelling, Ipv6 Header Compression Schemes, Quality of Service in Ipv6, Migration Strategies to Ipv6.			
<b>Teaching-Learning Process</b>	Chalk and board, PPT		
<b>Module-4</b>			
Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.			
<b>Teaching-Learning Process</b>	Chalk and board, PPT		
<b>Module-5</b>			
Data Analytics for IoT – Introduction, Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.			
<b>Teaching-Learning Process</b>	Chalk and board, PPT		

<b>Process</b>																
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Three Unit Tests each of <b>20 Marks</b></li> <li>• Two assignments each of <b>20 Marks</b> or <b>one Skill Development Activity of 40 marks</b> to attain the COs and POs</li> </ul> <p>The sum of three tests, two assignments/skill Development Activities, will be <b>scaled down to 50 marks</b></p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ul style="list-style-type: none"> <li>• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>• Each full question will have a sub-question covering all the topics under a module.</li> <li>• The students will have to answer five full questions, selecting one full question from each module</li> </ul>																
<p>Suggested Learning Resources:</p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Building the Internet of Things with Ipv6 and MIPv6: The Evolving World of M2M Communications Daniel Minoli Wiley 2013</li> <li>2. Internet of Things: A Hands-on Approach Arshdeep Bahga, Vijay Madisetti Universities Press 2015</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. The Internet of Things Michael Miller Pearson 2015 First Edition</li> <li>2. Designing Connected Products Claire Rowland, Elizabeth Goodman et.al O'Reilly First Edition, 2015</li> </ol>																
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=WUYAjsxnwjU4&amp;list=PLE7VH8RC_N3bpVn-e8QzOAHziEgmjQ2qE">https://www.youtube.com/watch?v=WUYAjsxnwjU4&amp;list=PLE7VH8RC_N3bpVn-e8QzOAHziEgmjQ2qE</a></li> </ul>																
<p><b>Skill Development Activities Suggested</b></p> <p>The students with the help of the course teacher can take up relevant technical -activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.</p>																
<p><b>Course outcome (Course Skill Set)</b></p> <p>At the end of the course the student will be able to :</p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Blooms Level</th> </tr> </thead> <tbody> <tr> <td>C01</td> <td>Develop schemes for the applications of IOT in real time scenarios</td> <td>L3</td> </tr> <tr> <td>C02</td> <td>Manage the Internet resources</td> <td>L2</td> </tr> <tr> <td>C03</td> <td>Model the Internet of things to business</td> <td>L2</td> </tr> <tr> <td>C04</td> <td>Work with different case studies with the practical knowledge gained.</td> <td>L3</td> </tr> </tbody> </table>		Sl. No.	Description	Blooms Level	C01	Develop schemes for the applications of IOT in real time scenarios	L3	C02	Manage the Internet resources	L2	C03	Model the Internet of things to business	L2	C04	Work with different case studies with the practical knowledge gained.	L3
Sl. No.	Description	Blooms Level														
C01	Develop schemes for the applications of IOT in real time scenarios	L3														
C02	Manage the Internet resources	L2														
C03	Model the Internet of things to business	L2														
C04	Work with different case studies with the practical knowledge gained.	L3														

Mapping of COS and POs

	P01	P02		P03	P04	P05	P06	P07	P08	P09	P010
C01	x			x		x					
C02		x									
C03	x	x		x				x			
C04					x						

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**Semester- III**

<b>Image Processing</b>			
Course Code	<b>22SAD321</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>• Explain image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.</li> <li>• Demonstrate the image segmentation and representation technique</li> <li>• Explore concepts of image registration and image fusion.</li> <li>• Analyze the constraints in image processing when dealing with 3D data sets</li> </ul>			
<b>Module-1</b>			
Introduction: What is Digital Image Processing, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, A Simple Image Formation Model, Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only– Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Square Filtering, Geometric Mean Filter.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Color Fundamentals: Color Models, Pseudocolor Image Processing, Basics of FullColor Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression. Wavelets and Multiresolution Processing: Image Pyramids, Subband coding, The Haar Transform, Multiresolution Expansions, Wavelet Transforms in one Dimension, Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Image Compression Models, Error-free (Lossless) compression, Lossy Compression			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			

Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms. Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.	
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ul style="list-style-type: none"> <li>• Three Unit Tests each of <b>20 Marks</b></li> <li>• Two assignments each of <b>20 Marks</b> or <b>one Skill Development Activity of 40 marks</b> to attain the COs and POs</li> </ul> <p>The sum of three tests, two assignments/skill Development Activities, will be <b>scaled down to 50 marks</b></p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ul style="list-style-type: none"> <li>• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>• Each full question will have a sub-question covering all the topics under a module.</li> <li>• The students will have to answer five full questions, selecting one full question from each module</li> </ul>	
<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Rafael C Gonzalez and Richard E. Woods: Digital Image Processing, PHI 2nd Edition.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. S. Sridhar, Digital Image Processing, Oxford University Press India, 2011.</li> <li>2. A. K. Jain: Fundamentals of Digital Image Processing, Pearson, 2004.</li> <li>3. Scott E. Umbaugh: Digital Image Processing and Analysis, CRC Press, 2014.</li> </ol>	
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=xUCsfKA8bi0&amp;list=PLm_MSClnwm9I2iviE0YKt6PZTyQCYc8j">https://www.youtube.com/watch?v=xUCsfKA8bi0&amp;list=PLm_MSClnwm9I2iviE0YKt6PZTyQCYc8j</a></li> </ul>	
<p><b>Skill Development Activities Suggested</b></p> <p>The students with the help of the course teacher can take up relevant technical -activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.</p>	

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	Explain image formation and the role human visual system plays in perception of gray and color image data.	L2
C02	Apply image processing techniques in both the spatial and frequency (Fourier) domains.	L3
C03	Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.	L2
C04	Conduct independent study and analysis of feature extraction techniques.	L3
C05	Explain the concepts of image registration and image fusion.	L2
C06	Analyze the constraints in image processing when dealing with 3D data sets and to apply image	L3

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Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>			x		x							
<b>CO2</b>		x	x									
<b>CO3</b>			x		x							

**Semester- III**

<b>Semantic Web &amp; Social Network</b>				
Course Code	<b>22SAD322</b>		CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0		SEE Marks	50
Total Hours of Pedagogy	40		Total Marks	100
Credits	03		Exam Hours	03
<b>Course Learning Objectives:</b>				
<ul style="list-style-type: none"> <li>• To describe how the Semantic Web provides the key in aggregating information across heterogeneous sources</li> <li>• To learn Knowledge Representation for the Semantic Web</li> <li>• To analyze the social Web and the design of a new class of applications</li> </ul>				
<b>Module-1</b>				
Web Intelligence Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.				
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://www.youtube.com/watch?v=Uiql42PGW6Y">https://www.youtube.com/watch?v=Uiql42PGW6Y</a>			
<b>Module-2</b>				
Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web - Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.				
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://www.youtube.com/watch?v=rAkSY5Ha9vk">https://www.youtube.com/watch?v=rAkSY5Ha9vk</a>			
<b>Module-3</b>				
Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.				
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/rhgUDGtT2EM?list=PLvgeTuKrhSLPbYIF0gW3V2ivGqevTQICf">https://youtu.be/rhgUDGtT2EM?list=PLvgeTuKrhSLPbYIF0gW3V2ivGqevTQICf</a>			
<b>Module-4</b>				
Semantic Web Applications, Services and Technology Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods				
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://www.youtube.com/watch?v=aPlyXvEtUHM">https://www.youtube.com/watch?v=aPlyXvEtUHM</a>			
<b>Module-5</b>				
Social Network Analysis and semantic web What is social Networks analysis, Development of the social networks analysis, Electronic Sources for Network Analysis - Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.				
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://www.youtube.com/watch?v=yCXu10eDtcA">https://www.youtube.com/watch?v=yCXu10eDtcA</a>			



## Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

### Continuous Internal Evaluation:

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

### Semester End Examination:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

### Suggested Learning Resources:

#### TEXT BOOKS:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science.
2. Social Networks and the Semantic Web, Peter Mika, Springer.

#### REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group).

### Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=yCXu10eDtcA>
- <https://www.youtube.com/watch?v=O7tyi1kp33w>
- <https://www.youtube.com/watch?v=QQCWHgclGB8>
- <https://www.youtube.com/watch?v=QQCWHgclGB8&t=1474s>
- <https://www.youtube.com/playlist?list=PL3JRjVnXiTBYHhu15olX6ugN5B4oizwAb>

### Skill Development Activities Suggested

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

<b>Sl. No.</b>	<b>Description</b>	<b>Blooms Level</b>
CO1	Summarize to create ontology and knowledge representation for the semantic web	L2
CO2	Solve to build a blogs and social networks	L3
CO3	Describe the Modeling and aggregating social network data.	L2
CO4	Illustrate the Web- based social network and Ontology	L3

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<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
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9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
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**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x											
C02				x								
C03			x									
C04		x										

SAD 2022 SYLLABUS

**Semester-III**

<b>Business Intelligence and Analytics</b>			
Course Code	22SAD323	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<p><b>Course Learning objectives:</b></p> <ul style="list-style-type: none"> <li>• Explore the modelling aspects behind Business Intelligence.</li> <li>• Perceive the business intelligence life cycle and the techniques used in it.</li> <li>• To work with different data analysis tools and techniques.</li> </ul>			
<b>Module-1</b>			
BUSINESS INTELLIGENCE Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.			
<b>Teaching-Learning Process</b>	Chalk and board / PPT / Web Content		
<b>Module-2</b>			
KNOWLEDGE DELIVERY The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.			
<b>Teaching-Learning Process</b>	Chalk and board / PPT / Web Content		
<b>Module-3</b>			
EFFICIENCY Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis			
<b>Teaching-Learning Process</b>	Chalk and board / PPT / Web Content		
<b>Module-4</b>			
BUSINESS INTELLIGENCE APPLICATIONS Marketing models – Logistic and Production models – Case studies.			
<b>Teaching-Learning Process</b>	Chalk and board / PPT / Web Content		
<b>Module-5</b>			
FUTURE OF BUSINESS INTELLIGENCE: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.			
<b>Teaching-Learning Process</b>	Chalk and board / PPT / Web Content		

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**Continuous Internal Evaluation:**

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- The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Text Books:**

1. *Decision Support and Business Intelligence Systems*, Efraim Turban, Ramesh Sharda, Dursun Delen, , 9 th Edition, Pearson.
2. *Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making*, Larissa T. Moss, S. Atre, Addison Wesley,.

**Reference Books:**

3. *Business Intelligence: Data Mining and Optimization for Decision Making*, Carlo Vercellis ,Wiley Publications, 2009.
4. *Business Intelligence: The Savvy Manager’s Guide*, David Loshin Morgan, Kaufman Second Edition, 2012.
5. *Successful Business Intelligence: Secrets to Making BI a Killer App*, Cindi Howson, McGraw- Hill, 2007.
6. *The Data Warehouse Lifecycle Toolkit*, Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, , Wiley Publication Inc.,2007

**Web links and Video Lectures (e-Resources):**

- <https://data-flair.training/blogs/business-intelligence/>
- [https://www.tutorialspoint.com/management\\_information\\_system/business\\_intelligence\\_system.htm](https://www.tutorialspoint.com/management_information_system/business_intelligence_system.htm)

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

<b>Course outcome (Course Skill Set)</b>		
At the end of the course the student will be able to :		
<b>Sl. No.</b>	<b>Description</b>	<b>Blooms Le</b>
C01	Explain the fundamentals of business intelligence and Link data mining with business intelligence.	L1
C02	Apply various modelling techniques. (can be attained through assignment and CIE)	L3
C03	Explain the data analysis and knowledge delivery stages.	L2
C04	Apply business intelligence methods to various situations. (can be attained through assignment and CIE)	L3
C05	Decide on appropriate technique.	L2

SAD 2022 SYLLABUS

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	P02
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	P03
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	P04
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	P05
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	P06
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	P07
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	P08
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	P09
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	P010
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	P011
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	P012



**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
<b>C01</b>	x											
<b>C02</b>	x				x							
<b>C03</b>			x		x							
<b>C04</b>	x				x							
<b>C05</b>	x		x									

SAD 2022 SYLLABUS

**Semester- III**

<b>Decision Support System</b>			
Course Code	<b>22SAD324</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>Recognize the relationship between business information needs and decision making</li> <li>Appraise the general nature and range of decision support systems</li> <li>Appraise issues related to the development of DSS</li> <li>Select appropriate modeling techniques</li> <li>Analyze, design and implement a DSS</li> </ul>			
<b>Module-1</b>			
Introduction to decision support systems: DSS Defined, History of decision support systems, Ingredients of a DSS, Data and model management, DSS Knowledge base, User interfaces, The DSS user, Categories and classes of DSSs, Chapter Summary. Decisions and decision makers Decision makers: who are they, Decision styles, Decision effectiveness, How can a DSS help?, A Typology of decisions, Decision theory and simon's model of problem solving, Bounded decision making, The process of choice, Cognitive processes, Biases and heuristics in decision making, Chapter summary.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Decisions in the organization: Understanding the organization, Organizational culture. Modelling decision processes: Defining the problem and its structures, Decision models, Types of probability, Techniques for forecasting probabilities, Calibration and sensitivity, Chapter summary			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Group decision support and groupware technologies: Group Decision making, the problem with groups, MDM support technologies, Managing MDM activities, the virtual workspace, chapter summary. Executive information systems: What exactly is an EIS, Some EIS history, Why area top executives so different?, EIS components, Making the EIS work, The future of executive decision making and the EIS, chapter summary			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Designing and building decision support systems: Strategies for DSS analysis and design, The DSS developer, DSS user interface issues, chapter summary. Implementing and integrating decision support systems: DSS implementation, System evaluation, The importance of integration, chapter summary.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Creative decision making and problem solving What is creativity?, Creativity defined, The occurrence of creativity, Creative problem solving techniques, Creativity and the role of technology, chapter summary.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Text Books**

1. Decision support system. George M.Marakas. PHI, 2011.

**Reference Books:**

2. Decision Support Systems, Marakas. 2Nd Edn, Pearson India, 2015.

**Web links and Video Lectures (e-Resources):**

- <https://www.coursera.org/lecture/business-intelligence-tools/decision-support-systems-video-lecture-E8P9x>

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Appraise issues related to the development of DSS	L1
CO2	Select appropriate modeling techniques	L1
CO3	Analyze, design and implement a DSS	L2

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	P02
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	P03
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	P04
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	P05
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	P06
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	P07
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	P08
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	P09
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	P010
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	P011
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	P012

**Mapping of COS and POs**

	<b>P01</b>	<b>P02</b>	<b>P03</b>	<b>P04</b>	<b>P05</b>	<b>P06</b>	<b>P07</b>	<b>P08</b>	<b>P09</b>	<b>P010</b>	<b>P011</b>	<b>P012</b>
<b>C01</b>	x	x										
<b>C02</b>				x						x		
<b>C03</b>		x			x							

## Semester- III

<b>Pattern Recognition</b>			
Course Code	<b>22SAM325</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning Objectives:</b>			
<ul style="list-style-type: none"> <li>• Explain pattern recognition principals</li> <li>• Develop algorithms for Pattern Recognition.</li> <li>• Develop and analyze decision trees.</li> <li>• Design the nearest neighbor classifier.</li> <li>• Apply Decision tree and clustering techniques to various applications</li> </ul>			
<b>Module-1</b>			
Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments: Estimation minimum risk estimators, problems			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Nearest Neighbour based classifiers & Bayes classifier: Nearest neighbour algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayesian belief network			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Naive Bayes classifier, Bayesian belief network, Decision Trees: Introduction, DT for PR, Construction of DT, splitting at the nodes, Over fitting & Pruning, Examples , Hidden Markov models: Markov models for classification, Hidden Markov models and classification using HMM			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, kmeans, Isodata), clustering large data sets, examples, An application: Handwritten Digit recognition			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

- Three Unit Tests each of **20 Marks**
- Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**. **CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:****Text Books:**

3. *Pattern Recognition (An Introduction)*, V Susheela Devi, M Narsimha Murthy, Universities press, 2011.
4. *Pattern Recognition & Image Analysis*, Earl Gose, Richard Johnsonbaugh, Steve Jost, PH, 1996.

**Reference Books:**

1. *Pattern Classification*, Duda R. O., P.E. Hart, D.G. Stork, John Wiley and sons, 2000.

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=mfePdDh9t6Q&list=PLbMVogVj5nJQJMLb2CYw9rry0d5s0TQRp>

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical -activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Choose algorithms for Pattern Recognition.	L1
CO2	Analyse decision tress.	L3
CO3	Design the nearest neighbour classifier.	L2

Program Outcome of this Course												
Sl. No.	Description											POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.											PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.											PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and cultural, societal, and environmental considerations.											PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.											PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations											PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.											PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.											PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.											PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.											PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.											PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.											PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.											PO12
<b>Mapping of COS and POs</b>												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			x		x							
CO2		x	x									
CO3			x		x							

**Semester- III**

<b>Data and Web Mining</b>			
Course Code	<b>22SAD331</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<p><b>Course Learning objectives:</b></p> <ul style="list-style-type: none"> <li>• To describe web mining and understand the need for web mining</li> <li>• To differentiate between Web mining and data mining</li> <li>• To explore different application areas for web mining</li> <li>• To identify different methods to introduce structure to web-based data</li> <li>• To describe Web mining, its objectives, and its benefits</li> <li>• To explore the methods of Web usage mining</li> </ul>			
<b>Module-1</b>			
<p>Introduction to Web Data Mining and Data Mining Foundations, Introduction – World Wide Web (WWW), A Brief History of the Web and the Internet, Web Data Mining-Data Mining, Web Mining. Data Mining Foundations – Association Rules and Sequential Patterns – Basic Concepts of Association Rules, Apriori Algorithm- Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports – Extended Model, Mining Algorithm, Rule Generation, Mining Class Association Rules, Basic Concepts of Sequential Patterns, Mining Sequential Patterns on GSP, Mining Sequential Patterns on PrefixSpan, Generating Rules from Sequential Patterns.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content		
<b>Module-2</b>			
<p>Supervised and Unsupervised Learning Supervised Learning – Basic Concepts, Decision Tree Induction – Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier Evaluation, Rule Induction – Sequential Covering, Rule Learning, Classification Based on Associations, Naïve Bayesian Classification , Naïve Bayesian Text Classification – Probabilistic Framework, Naïve Bayesian Model . Unsupervised Learning – Basic Concepts , K-means Clustering – K-means Algorithm, Representation of Clusters, Hierarchical Clustering – Single link method, Complete link Method, Average link method, Strength and Weakness.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content		
<b>Module-3</b>			
<p>Information Retrieval and Web Search: Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate, Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content		
<b>Module-4</b>			



	Link Analysis and Web Crawling: Link Analysis – Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery-Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities. Web Crawling – A Basic Crawler Algorithm- Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stopword Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts.
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content
<b>Module-5</b>	
	Opinion Mining and Web Usage Mining Opinion Mining – Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros and Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam. Web Usage Mining – Data Collection and Preprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns.
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content/ case study
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ol style="list-style-type: none"> <li>Three Unit Tests each of <b>20 Marks</b></li> <li>Two assignments each of <b>20 Marks</b> or <b>one Skill Development Activity of 40 marks</b> to attain the COs and POs</li> </ol> <p>The sum of three tests, two assignments/skill Development Activities, will be <b>scaled down to 50 marks</b>  <b>CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ol style="list-style-type: none"> <li>The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>The question paper will have ten full questions carrying equal marks.</li> <li>Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>Each full question will have a sub-question covering all the topics under a module.</li> <li>The students will have to answer five full questions, selecting one full question from each module</li> </ol>	

<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books:</b></p> <ul style="list-style-type: none"> <li>• <i>Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data</i> by Bing Liu (Springer Publications)</li> </ul> <p><b>References Books:</b></p> <ul style="list-style-type: none"> <li>• Data Mining: Concepts and Techniques, Second Edition Jiawei Han, Micheline Kamber (Elsevier Publications)</li> <li>• Web Mining:: Applications and Techniques by Anthony Scime</li> <li>• Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Chakrabarti</li> </ul>		
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.tutorialspoint.com/what-is-web-mining">https://www.tutorialspoint.com/what-is-web-mining</a></li> <li>• <a href="https://www.geeksforgeeks.org/web-mining/">https://www.geeksforgeeks.org/web-mining/</a></li> </ul>		
<p><b>Skill Development Activities Suggested</b></p> <p>The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.</p>		
<p><b>Course outcome (Course Skill Set)</b></p> <p>At the end of the course the student will be able to :</p>		
Sl. No.	Description	Blooms Le
C01	Analyse the characteristics of a data sets and their attributes, investigate what transformations and statistical operations can be carried out on each and identify factors that impact on data quality	L2
C02	Investigate a variety of data mining techniques, and identifying their practical applicability to various problem domains (can be attained through assignment and CIE)	L3
C03	Independently research current trends and developments in knowledge discovery related technologies and use this skill to critically analyse publications to assess the relative merits of various technologies (can be attained through assignment and CIE)	L3
C04	Investigate how web search engines crawl, index, rank web content, how the web is structured	L2
C05	Develop an in-depth knowledge of the fundamental web data mining concepts and techniques, and how previously acquired knowledge of data mining applies to the web (can be attained through assignment and CIE)	L3

SAMPLE TEMPLATE for PCC/PEC/OEC

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
<b>CO1</b>	X	x										
<b>CO2</b>	X		x									
<b>CO3</b>	x		x									
<b>CO4</b>	x	x	x									
<b>CO5</b>	x	x	x									

**Semester- III**

<b>Computer Vision</b>			
Course Code	22SAD332	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<p><b>Course Learning objectives:</b></p> <ul style="list-style-type: none"> <li>● Explore the fundamentals of computer vision.</li> <li>● Build skills to perform shape analysis and other computer vision operations.</li> </ul>			
<b>Module-1</b>			
CAMERAS: Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.			
<b>Teaching-Learning Process</b>	Chalk and board / Web Content / PPT		
<b>Module-2</b>			
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.			
<b>Teaching-Learning Process</b>	Chalk and board / Web Content / PPT		
<b>Module-3</b>			
The Geometry of Multiple Views: Two Views, Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,			
<b>Teaching-Learning Process</b>	Chalk and board / Web Content / PPT		
<b>Module-4</b>			
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.			
<b>Teaching-Learning Process</b>	Chalk and board / Web Content / PPT		
<b>Module-5</b>			

<p>Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.</p>	
<p><b>Teaching-Learning Process</b></p>	<p>Chalk and board / Web Content / PPT</p>
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ol style="list-style-type: none"> <li>1. Three Unit Tests each of <b>20 Marks</b></li> <li>2. Two assignments each of <b>20 Marks</b> or <b>one Skill Development Activity of 40 marks</b> to attain the COs and POs</li> </ol> <p>The sum of three tests, two assignments/skill Development Activities, will be <b>scaled down to 50 marks</b></p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ol style="list-style-type: none"> <li>1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>2. The question paper will have ten full questions carrying equal marks.</li> <li>3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>4. Each full question will have a sub-question covering all the topics under a module.</li> <li>5. The students will have to answer five full questions, selecting one full question from each module</li> </ol>	
<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. <i>Computer Vision – A Modern Approach</i>, David A. Forsyth and Jean Ponce PHI Learning 2009</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>2. <i>Computer and Machine Vision – Theory, Algorithms and Practicalities</i>, E. R. Davies Elsevier 4 th edition, 2013</li> </ol>	
<p><b>Web links and Video Lectures (e-Resources):</b></p>	

- <https://www.projectpro.io/data-science-in-python-tutorial/computer-vision-tutorial-for-beginners>
- <https://www.javatpoint.com/computer-vision>

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Le
C01	Implement fundamental image processing techniques required for computer vision	L3
C02	Perform shape analysis	L2
C03	Implement boundary tracking techniques	L3
C04	Apply chain codes and other region descriptors	L3
C05	Apply Hough Transform for line, circle, and ellipse detections.	L2

SAMPLE TEMPLATE for PCC/PEC/OEC

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12



**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
<b>CO1</b>	x		x									
<b>CO2</b>	x	x										
<b>CO3</b>	x		x									
<b>CO4</b>	x		x									
<b>CO5</b>	x	x										

Semester- III

<b>Artificial Intelligence in Cyber Security</b>				
Course Code	<b>22SAD333</b>		CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0		SEE Marks	50
Total Hours of Pedagogy	40		Total Marks	100
Credits	03		Exam Hours	03
<b>Course Learning objectives:</b>				
<ul style="list-style-type: none"> <li>• Explore cyber threats and limitations of machine learning in security.</li> <li>• Apply supervised learning algorithms for anomaly detection.</li> <li>• Explore feature generation and the theory of network defense.</li> <li>• • Explore types of web abuse and supervised learning for abuse problems.</li> </ul>				
<b>Module-1</b>				
Cyber threats and landscape, The cyber attack’s economy, What is Machine learning?, Real-world uses of Machine learning in Security, Spam fighting: an iterative approach, Limitations of machine learning in Security, Training algorithms to learn.				
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content			
<b>Module-2</b>				
Supervised classification algorithms, Practical consideration in classification, Clustering, When to use anomaly detection versus supervised learning, Intrusion detection with Heuristics, data-driven methods, feature engineering for anomaly detection, anomaly detection with data and algorithms, Challenges of using machine learning in anomaly detection.				
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content			
<b>Module-3</b>				
Understanding malware, feature generation, from features to classification, Theory of Network defense, machine learning and network security, building a predictive model to classify network attacks.				
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content			
<b>Module-4</b>				
Monetizing the consumer web, types of abuse and the data that can stop them, Supervised learning for abuse problems, clustering abuse, further direction in clustering, defining machine learning system maturity and scalability.				
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content			
<b>Module-5</b>				
Data quality, model quality, performance, maintainability, monitoring and alerting, Security and reliability, feedback and usability.				
<b>Teaching-Learning Process</b>	Chalk and talk/ PPT/ Web Content/ case study			

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**  
**CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Text Books:**

1. Machine Learning and Security by Clarence Chio, David Freeman ,Released February 2018  
 Publisher(s): O'Reilly Media, Inc.

**References Books:**

1. Hands-On Artificial Intelligence for Cybersecurity by Alessandro Parisi Released August 2019  
 Publisher(s): Packt Publishing.

**Web links and Video Lectures (e-Resources):**

- [https://www.youtube.com/watch?v=Ipa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4\\_](https://www.youtube.com/watch?v=Ipa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_)
- [https://www.youtube.com/watch?v=4jmsHaJ7xEA&list=PL9ooVrP1hQOGHNaCT7\\_fwe9AabjZI1RjI](https://www.youtube.com/watch?v=4jmsHaJ7xEA&list=PL9ooVrP1hQOGHNaCT7_fwe9AabjZI1RjI)

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

SAMPLE TEMPLATE for PCC/PEC/OEC

<b>Course outcome (Course Skill Set)</b>		
At the end of the course the student will be able to :		
<b>Sl. No.</b>	<b>Description</b>	<b>Blooms Le</b>
C01	Identify cyber threats and limitations of machine learning in security.	L1
C02	Apply machine learning methods to detect anomalies.	L3
C03	Apply feature generation and the theory of network defense	L2
C04	Apply supervised learning for abuse problems.	L3

SAMPLE TEMPLATE for PCC/PEC/OEC

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
<b>CO1</b>	X	x										
<b>CO2</b>	X		x									
<b>CO3</b>	x		x									
<b>CO4</b>	x	x	x									

## Semester- III

<b>Cyber Security and Cyber law</b>			
Course Code	22SAD334	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>• Define cyber security, cyber law and their roles</li> <li>• Demonstrate cyber security cybercrime and forensics.</li> <li>• Infer legal issues in cybercrime,</li> <li>• Demonstrate tools and methods used in cybercrime and security.</li> <li>• Illustrate evidence collection and legal challenges</li> </ul>			
<b>Module-1</b>			
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			

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 Semiconductor Layout and Design, Software License.	
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ol style="list-style-type: none"> <li>1. Three Unit Tests each of <b>20 Marks</b></li> <li>2. Two assignments each of <b>20 Marks</b> or <b>one Skill Development Activity of 40 marks</b> to attain the COs and POs</li> </ol> <p>The sum of three tests, two assignments/skill Development Activities, will be <b>scaled down to 50 marks</b></p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ol style="list-style-type: none"> <li>1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>2. The question paper will have ten full questions carrying equal marks.</li> <li>3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>4. Each full question will have a sub-question covering all the topics under a module.</li> <li>5. The students will have to answer five full questions, selecting one full question from each module</li> </ol>	
<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. <i>Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives.</i> Sunit Belapure and Nina Godbole. Wiley India Pvt Ltd. 2013.</li> <li>2. <i>Introduction to information security and cyber laws.</i> Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla. Dreamtech Press. 2015.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. <i>Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions.</i> Thomas J. Mowbray. John Wiley &amp; Sons,</li> <li>2. <i>Cyber Security Essentials.</i> James Graham, Ryan Olson, Rick Howard. CRC Press, 2010.</li> </ol>	
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.udemy.com/course/cybersecurity-law-policy/">https://www.udemy.com/course/cybersecurity-law-policy/</a></li> <li>• <a href="https://www.youtube.com/watch?v=BS5v5Rr-oVo&amp;list=PL-JvKqQx2Atelbm-z4X709scVr9OaHpIY">https://www.youtube.com/watch?v=BS5v5Rr-oVo&amp;list=PL-JvKqQx2Atelbm-z4X709scVr9OaHpIY</a></li> </ul> <p>Cybersecurity Law is one of the most rapidly growing areas of law, and issues like privacy, cybercrime, bitcoin banking, international legal issues and internet governance are some of the important areas that will be covered in this course.</p>	



**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
C01	Demonstrate cyber security cybercrime and forensics.	L3
C02	Demonstrate tools and methods used in cybercrime and security.	L3
C03	Illustrate evidence collection and legal challenges	L2

**Program Outcome of this course**

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>C01</b>	x		x									
<b>C02</b>			x							x		
<b>C03</b>		x			x							

SAMPLE TEMPLATE for PCC/PEC/OEC

<b>OBJECT ORIENTED DESIGN</b>			
Course Code	<b>22SAD335</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>To Introduce various designing techniques and methods for object oriented.</li> <li>Performance analysis with real time system.</li> <li>Demonstrate a familiarity with object oriented data and system.</li> <li>To give clear idea on implementing design with UML diagram like state diagram , activity diagram , use case diagram etc.</li> </ul>			
<b>Module-1</b>			
The Motivation for Object-Oriented Programming, Classes and Objects: The Building Blocks of the Object-Oriented Paradigm Topologies of Action-Oriented Versus Object-Oriented Applications			
<b>Teaching-Learning Process</b>	Chalk and board /PPT / Web content		
<b>Module-2</b>			
The Relationships Between Classes and ObjectsThe Inheritance Relationship			
<b>Teaching-Learning Process</b>	Chalk and board /PPT / Web content		
<b>Module-3</b>			
Multiple Inheritance, The Association Relationship,			
<b>Teaching-Learning Process</b>	Chalk and board /PPT / Web content / Case Study		
<b>Module-4</b>			
Class-Specific Data and Behaviour, Physical Object-Oriented Design,			
<b>Teaching-Learning Process</b>	Chalk and board /PPT / Web content		
<b>Module-5</b>			
The Relationship Between Heuristics and Patterns, The Use of Heuristics in Object-Oriented Design			
<b>Teaching-Learning Process</b>	Chalk and board /PPT / Web content / Case Study		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

1. Three Unit Tests each of **20 Marks**
2. Two assignments each of **20 Marks** or **one Skill Development Activity of 40 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Text Books:**

1. *Object Oriented Design Heuristic.* Arthur J Riel. Addison-Wesley. 1996.

**Refence Books:**

1. *Elements of Reusable ObjectOriented Software.* Ralph Johnson, Erich Gamma, Richard Helm, John Vlissides. Pearson.
1. *Object - Oriented Modeling and Design With UM.* Paperback, Michael R. Blaha. Pearson. 2007

**Web links and Video Lectures (e-Resources):**

- [https://www.youtube.com/watch?v=WpJ\\_yiwGyk&list=PLJ5C\\_6qdAvBHsllkD7JB7kBgvg1SeXy3P](https://www.youtube.com/watch?v=WpJ_yiwGyk&list=PLJ5C_6qdAvBHsllkD7JB7kBgvg1SeXy3P)
- <https://www.geeksforgeeks.org/oops-object-oriented-design/>

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Identify the heuristics of the object-oriented programming	L1
CO2	Explain the fundamentals of OOP	L1
CO3	Examine fine object-oriented relations	L2
CO4	Explain the role of Physical Object-Oriented Design,	L2
CO5	Make use of Heuristics in The Use of Heuristics in Object-Oriented Design	L2

SAMPLE TEMPLATE for PCC/PEC/OEC

Mapping of COS and POs												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	x	x					x				x	
C02		x		x								
C03	x		x		x							
C04			x	x	x							
C05		x		x								

SAD 2022 SYLLABUS

<b>PROJECT WORK PHASE - 1</b>			
Course Code	22SAD34	CIE Marks	100
Number of contact Hours/Week	6	SEE Marks	--
Credits	03	Exam Hours	--
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• Support independent learning.</li> <li>• Guide to select and utilize adequate information from varied resources maintaining ethics.</li> <li>• Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.</li> <li>• Develop interactive, communication, organisation, time management, and presentation skills.</li> <li>• Impart flexibility and adaptability.</li> <li>• Inspire independent and team working.</li> <li>• Expand intellectual capacity, credibility, judgement, intuition.</li> <li>• Adhere to punctuality, setting and meeting deadlines.</li> <li>• Instil responsibilities to oneself and others.</li> <li>• Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.</li> </ul>			
<p><b>Project Phase-1</b> Students in consultation with the guide/s shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work.</p> <p><b>Seminar:</b> Each student, under the guidance of a Faculty, is required to</p> <ul style="list-style-type: none"> <li>• Present the seminar on the selected project orally and/or through power point slides.</li> <li>• Answer the queries and involve in debate/discussion.</li> <li>• Submit two copies of the typed report with a list of references.</li> </ul> <p>The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.</p>			
<p><b>Course outcomes:</b></p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Demonstrate a sound technical knowledge of their selected project topic.</li> <li>• Undertake problem identification, formulation, and solution.</li> <li>• Design engineering solutions to complex problems utilising a systems approach.</li> <li>• Communicate with engineers and the community at large in written and oral forms.</li> <li>• Demonstrate the knowledge, skills and attitudes of a professional engineer.</li> </ul>			
<p><b>Continuous Internal Evaluation</b></p> <p>CIE marks for the project report (50 marks), seminar (30 marks) and question and answer (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p>			

<b>Societal Project</b>			
Course Code	22SAD35	CIE Marks	100
Number of contact Hours/Week	6	SEE Marks	—
Credits	3	Exam Hours	03
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• Build creative solutions for development problems of current scenario in the Society.</li> <li>• Utilize the skills developed in the curriculum to solve real life problems.</li> <li>• Improve understanding and develop methodology for solving complex issues.</li> </ul>			
<b>Some of the domains to choose for societal projects:</b>			
<ul style="list-style-type: none"> <li>• Infrastructure</li> <li>• Health Care</li> <li>• Social security</li> <li>• Security for women</li> <li>• Transportation</li> <li>• Business Continuity</li> <li>• Remote working and Education</li> <li>• Digital Finance</li> <li>• Food Security</li> <li>• Rural employment</li> <li>• Water and land management</li> <li>• Pollution</li> <li>• Financial Independence</li> <li>• Agricultural Finance</li> <li>• Primary Health care</li> <li>• Nutrition</li> <li>• Child Care</li> <li>• E-learning</li> <li>• Distance parenting</li> <li>• Mentorship Etc</li> </ul>			
<b>Course outcomes:</b>			
At the end of the course the student will be able to:			
<ul style="list-style-type: none"> <li>• Building solution for real life societal problems.</li> <li>• Improvement of their technical/curriculum skills</li> </ul>			
<b>Continuous Internal Evaluation:</b>			
<b>Identifying the real life problems and producing literature report : 20 marks</b>			
<b>Data sampling and Cleaning :10 Marks</b>			
<b>Establishing the right Objective: 10 Marks</b>			
<b>Developing the solution : 20 Marks</b>			
Propagating the solution to the stake holders 1)Lectures 2)Social Meetings 3)Social media 4)Street plays 5)Advertisement Either of the 3(evidence of the work through Geo tag photo) certified by stake holders and authorized by concerned government authorities.			
<b>Project Report:</b> 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.			
<b>Project Presentation:</b> 10 marks.			
The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.			
<b>Evaluation:</b> 10 marks.			
The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.			

<b>INTERNSHIP</b>			
Course Code	22SADI36	CIE Marks	50
Number of contact Hours/Week	3	SEE Marks	50
Credits	06	Exam Hours	03
<p><b>Course objectives:</b></p> <p>Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,</p> <p>To put theory into practice.</p> <p>To expand thinking and broaden the knowledge and skills acquired through course work in the field. To relate to, interact with, and learn from current professionals in the field.</p> <p>To gain a greater understanding of the duties and responsibilities of a professional. To understand and adhere to professional standards in the field.</p> <p>To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.</p> <p>To identify personal strengths and weaknesses.</p> <p>To develop the initiative and motivation to be a self-starter and work independently.</p>			
<p><b>Internship/Professional practice:</b> Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.</p> <p><b>Seminar:</b> Each student, is required to</p> <ul style="list-style-type: none"> <li>• Present the seminar on the internship orally and/or through power point slides.</li> <li>• Answer the queries and involve in debate/discussion.</li> <li>• Submit the report duly certified by the external guide.</li> <li>• The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.</li> </ul>			
<p><b>Course outcomes:</b></p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Gain practical experience within industry in which the internship is done.</li> <li>• Acquire knowledge of the industry in which the internship is done.</li> <li>• Apply knowledge and skills learned to classroom work.</li> <li>• Develop a greater understanding about career options while more clearly defining personal career goals.</li> <li>• Experience the activities and functions of professionals.</li> <li>• Develop and refine oral and written communication skills.</li> <li>• Identify areas for future knowledge and skill development.</li> <li>• Expand intellectual capacity, credibility, judgment, intuition.</li> <li>• Acquire the knowledge of administration, marketing, finance and economics.</li> </ul>			
<p><b>Continuous Internal Evaluation</b></p> <p>CIE marks for the Internship/Professional practice report (30 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p>			
<p><b>Semester End Examination</b></p> <p>SEE marks for the internship report (20 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.</p>			



<b>PROJECT WORK PHASE -2</b>			
Course Code	22SAD41	CIE Marks	100
Practical /Field work/Week	8	SEE Marks	100
Credits	18	Exam Hours	03
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• To support independent learning.</li> <li>• To guide to select and utilize adequate information from varied resources maintaining ethics.</li> <li>• To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.</li> <li>• To develop interactive, communication, organization, time management, and presentation skills.</li> <li>• To impart flexibility and adaptability.</li> <li>• To inspire independent and team working.</li> <li>• To expand intellectual capacity, credibility, judgement, intuition.</li> <li>• To adhere to punctuality, setting and meeting deadlines.</li> <li>• To instill responsibilities to oneself and others.</li> <li>• To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.</li> </ul>			
<p><b>Project Work Phase - II:</b> Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.</p> <ul style="list-style-type: none"> <li>• Follow the Software Development life cycle</li> <li>• Data Collection ,Planning</li> <li>• Design the Test cases</li> <li>• Validation and verification of attained results</li> <li>• Significance of parameters w.r.t scientific quantified data.</li> <li>• Publish the project work in reputed Journal.</li> </ul>			
<p><b>Course outcomes:</b></p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Present the project and be able to defend it.</li> <li>• Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.</li> <li>• Habituated to critical thinking and use problem solving skills</li> <li>• Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.</li> <li>• Work in a team to achieve common goal.</li> <li>• Learn on their own, reflect on their learning and take appropriate actions to improve it.</li> </ul>			
<p><b>Continuous Internal Evaluation:</b></p> <p><b>Project Report:</b> 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.</p> <p><b>Project Presentation:</b> 20 marks.</p> <p>The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p> <p><b>Project Execution:</b> 50 Marks</p> <p>The Project Execution marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.</p> <p><b>Question and Answer:</b> 10 marks.</p> <p>The student shall be evaluated based on the ability in the Question and Answer session</p>			

for 10 marks.

**Semester End Examination**

SEE marks for the project report (60 marks), seminar (30 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.

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