NAGARJUNA

COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous College under VTU

DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)
Scheme and Syllabus

With effect from Academic Year 2024-25

VISION

To be a centre of excellence with quality education and research in Artificial Intelligence through nurturing collaborative culture, disseminating customer oriented innovations and positive contribution to the welfare ofthe society.

MISSION

- To impart quality technical education to the students to enhance their professional skills and make themglobally competitive.
- To carry out research in cutting out technologies in Artificial Intelligence and its allied fields to meet therequirements of industry and society.
- To create an innovation environment with the collaboration of industry in which students can providesolutions to global problems.
- To inculcate strong ethical and leadership qualities to the minds of students and make them as successfulentrepreneurs.
- To produce the Computer Science and Engineering professionals with a specialization in AIML withpersonal and professional responsibilities and commitment to lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

The graduates of Computer Science and Engineering are expected to fulfill the following PEOs after a fewyears of their graduation.

PEO1: Graduates in Computer Science and Engineering will apply the technical knowledge of analysis and design of software used for sustainable societal growth.

PEO2: Graduates of Computer Science and Engineering will demonstrate logical thinking and programming skills**.**

PEO3: Graduates in Computer Science and Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.

PEO4: Computer Science and Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.

PEO5: Computer Science and Engineering graduates will have the ability to be come entrepreneurs there by switching over from responsive engineer to creative engineer.

PROGRAM OUTCOMES (POs):

Graduates of the Computer Science and Engineering Programme will be able to achieve the following POs:

PO1:Engineering Knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and **Computer Science and Engineering** principles to the solution of complex problems in **Computer Science and Engineering.**

PO2: Problem Analysis:

Identify, formulate, research literature, and analyze complex **Computer Science and Engineering** problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3:Design/Development of Solutions:

Design solutions for complex **Computer Science and Engineering** problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to **Computer Science and Engineering** problems.

PO5: Modern Tool Usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex **Computer Science and Engineering** activities with an understanding ofthe limitations.

PO6: The Engineer and Society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional **Computer Science and Engineering**practice.

PO7: Environment and Sustainability:
Understand the impact of the professional **Computer Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics:
Apply ethical principles and commit to professional ethics and responsibilities and norms of the **Computer Science and Engineering** practice

PO9: Individual and Teamwork:
Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:
Communicate effectively on complex **Computer Science and Engineering** activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance:
Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage **Computer Science and Engineering** projects and in multidisciplinary environments.

PO12: Life Long Learning:
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):
Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering programshould be able to do at the time of graduation.

PSO1: Professional Skills:
The ability to understand, analyze and develop computer programs in the areas related to system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems ofvarying complexity

PSO2: Problem-Solving Skills:
The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Foundation of mathematical concepts:
Ability to apply mathematical concepts to solve real world problems using appropriate data structure andsuitable algorithms.

Nagarjuna College of Engineering and Technology

B.E. in CSE (AI&ML)

Scheme of Teaching and Examinations 2022

Outcome Based Education (OBE) and Choice Based Credit System(CBCS)

(Effective from the academic year 2024-25)

V SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	22CIT531	Fundamentals of Human Computer Interaction	CSE (AI&ML)	3	0	0	0	3	50	50	100	**3**
		22CIT532	Fundamentals of Computer vision							50	50	100	
		22CIT533	Cryptography							50	50	100	
2	IPCC	22CII51	Machine Learning		3	0	2	0	5	50	50	100	**4**
3	IPCC	22CII52	Game Design and Development using Unity 3D		3	0	2	0	5	50	50	100	**4**
4	PCCL	22CIL54	Artificial Intelligence Lab		0	0	2	0	2	50	50	100	**1**
5	HSMC	22CIT55	Entrepreneurship & Management		3	0	0	0	3	50	50	100	**3**
6	Seminar	22CIS56	Technical Seminar		0	0	2	0	2	50	50	100	**1**
7	AEC	22RMP57	Research Methodology & IPR	Any Department	3	0	0	0	3	50	50	100	**3**
		22ENV58	Environmental Studies		1	0	0	0	2	50	50	100	**1**
8	Mini Project	22CIP59	Mini project on Machine Learning	CSE (AI&ML)	0	0	2	0	2	50	50	100	**2**
9	MC	23NS60	National Service Scheme (NSS)	NSS coordinator	0	0	2	0	02	100	0	100	0
		23PE60	Physical Education(PE) (Sports and Athletics)	Physical Education Director									
		23YO60	Yoga	Yoga Teacher									
							Total			**550**	**450**	**1000**	**22**

FUNDAMENTALS OF COMPUTER VISION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22CIT532	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PCC

Pre-Requisites:

- Basic knowledge of coordinate geometry, linear algebra and probability.
- Basic knowledge of Image Processing ·
- A decent coding skill in a modern language. C++, Matlab and Python ...

Objectives :

1. To introduce various components of image processing techniques for computer vision.
2. To understand filters and computing Image Gradient.
3. To understand segmentation, model fitting and tracking
4. To impart knowledge about object registration and object matching
5. To implement various techniques available for object recognition.

Teaching-Learning Process

These are sample Strategies, used in FCV to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Pre-video links of the concept are sent to students well in advance so that students will be able to grasp the topics that is taken in class.
3. After the class quiz is been asked in the class with respect to the topics to know their understanding level and which also promotes critical thinking.
4. After the completion of module hands on is been conducted in the class /lab with respect to the topics to know practically.
   their understanding level and which also promotes critical thinking
5. Problem Based Learning (PBL) id adopted, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Every concept can be applied to the real world - and when that's possible, is taught in the class which helps improve the students' understanding.

Module I

Introduction: Image Processing: Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal

Overview of computer vision and its applications: Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation

08 Hours

Module II

Feature detection: edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations

Segmentation: Active contours, split & merge, watershed, region splitting, region merging, graph-basedsegmentation, **08 Hours**

Module III

Camera calibration: camera models; intrinsic and extrinsic parameters; radial lens distortion; direct parameter calibration; camera parameters from projection matrices; orthographic, weak perspective, affine, and perspective camera models.

08 Hours

Module IV

Motion representation: The motion field of rigid objects; motion parallax; optical flow, the image brightness constancy equation, affine flow; differential techniques; feature-based techniques; regularization and robust estimation

Motion tracking: statistical filtering; iterated estimation; observability and linear systems; the Kalman filter.

08 Hours

Module V

Object recognition and shape representation: Alignment, appearance-based methods, invariants, Image Eigen spaces

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Course Outcomes

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

1. Understand various image formation models.
2. Extract shape, texture and edge based features.
3. Detect region of interest using image segmentation and object localization techniques.
4. Identify and recognize objects using image registration and classification.

Explore various case studies on vision based applications

Text Books:

1. Computer Vision: Algorithms and Applications. R. Szeliski, Springer, 1st Edition, springer, 2011,

Reference Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
   5.1 – 5.8, 6.6 – 6.7, 8.3.

E - Resources:

1. https://www.cs.princeton.edu/
2. https://www.opendatastructures.org/ods-cpp
3. https://www.lib.mdp.ac.in/ebook/DSa
4. https://ww.cs-fundamentals.com/data-structures/introduction-to-datastructures.php
5. https://www.cprogramming.com/algorithms-and-data-structures.html
6. https://online-learning.harvard.edu/course/data-structures-and-algorithms

CO-PO-PSO Mapping

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PS O 1	PS O 2	PSO 3
CO 1	3											2			2
CO 2		3										2			2
CO 3			2									2			1
CO 4						1				1		1			
Avg	**3**	**3**	**2**			1				1		**1.75**			**1.67**

MACHINE LEARNING					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
21CII51	3:0:2:0	4	IAT:50 SEE:50	3 Hours	IPCC

Pre-Requisites: Basic knowledge of statistics, probability, calculus, linear algebra, and programming knowledge.

This course will enable students to:

1. Replicating human learning processes to improve accuracy for specific tasks.
2. Classifying data based on developed models (e.g., detecting spam emails).
3. Making predictions for future outcomes (e.g., predicting house prices).
4. Building algorithms that learn from data to find patterns and make accurate predictions.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method, but different type of teachingmethods may be adopted to develop the outcomes.
2. Show Video/animation films to explain evolution of communication technologies.
3. Encourage collaborative (Group) Learning in the class
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to come up with theirown creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module I

Introduction to machine learning: Types of Machine learning, supervised learning, unsupervised learning, semi supervised learning, reinforcement learning, Handling – Bad, insufficient and poor quality data and Irrelevant features, Over fitting and Under fitting the data

Well Posed Learning System: Designing a learning system, Perspectives, and issues in machine learning, Find-S Algorithm, Candidate elimination Algorithm.

08 Hours

Module II

Linear Classifiers: Linear Regression, Multiple Linear Regression, Logistic Regression, K Nearest Neighbours, Decision Trees: ID3, Classification and Regression Trees, Support Vector Machines: Linear and Non-Linear, Kernel Functions. **08 Hours**

Module III

Probabilistic Learning: Bayes Theorem and Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Bayesian Learning, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm.

08Hours

Module IV

Ensemble Learning: Combining multiple learners: Model combination schemes,Voting Classifiers, Bagging and Pasting, Random Patches and Random Subspaces, Random Forests, Boosting, Stacking,
Unsupervised learning: Introduction to Clustering, K-means clustering, Dimensionality reduction-Principal Component Analysis.

08 Hours

Module V

Reinforcement Learning: Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning.

. **08 Hours**

Course objectives:

This laboratory course enables students to get practical experience in design, develop, implement analyze and evaluation/testing of

- Explain the concept learning algorithms
- Illustrate the supervised and unsupervised learning techniques
- Explain clustering and classification algorithms for predictions and evaluating hypotheses.

PROGRAMS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training example.
3. Write a program to implement the working of the decision tree based ID3 algorithm.
4. Write a program to demonstrate the working of C4.5 algorithm and validate it.
5. Write a program to implement the Bayesian belief network for a weather dataset.
6. Write a program to demonstrate the working of Naive bayes classifier for a network attack dataset.
7. Write a program to solve a non-label dataset using k-means clustering
8. Write a program to demonstrate the working of random forest algorithm in dataset
9. Consider an undirected graph with 8 points from 0 to 7, 0 -> 1, 1-> 5, 1->2, 5->4, 5->6 , 2- >3 and 2->7. Your bot is in the position 0 and needs to reach the position 7. Design a q-learning based model to help the bot to reach the position 7.
10. Design a q-learning based model to help the humanoid bot to reach the village near the river. If it finds the desert, it is in the wrong direction. The map is represented in an undirected graph as 0->1, 1-> 5, 5->6, 5->4 1->2, 2->3 and 2->7. The bot current position is 0, the river is located in position 2 and the village is in 7. The position 4, 5 and 6 has the desert.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	Total 25 Marks : Reduced to 15 Marks	
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

Course Outcomes

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

1. Apply different learning algorithms for complex problems
2. Evaluate the developed learning model for given dataset
3. Develop the machine learning model to solve a problem.
4. Conduct experiments to solve real-world problems using appropriate machine learning techniques.

Text Books

1. Machine Learning Tom M Mitchell, 1st Edition,McGraw Hill Education, 2013.

2. Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow Aurelien Geron,2nd Edition,O'Reilly,2020.

Textbook 1: Chapters 6.1,6,8,12.

Textbook 2: Chapters 1, 2, 3, 4, 5, 6, 7, 8

Reference Text Book

1. Introduction to Machine Learning Ethem Alpaydın, 4th Edition MIT press,2020
2. Thoughtful Machine learning, Agarwal,1st Edition, Shroff Publishers,2019.
3. Machine Learning Step by step guide to implement machine learning algorithms with python Rudolph Russell,1st Edition, Create space Independent, publishing Platform,2018.

E - Resources:

1. http://www2.ift.ulaval.ca/~chaib/IFT-4102-7025/public_html/Fichiers/Machine_Learning_in_Action.pdf
2. https://nptel.ac.in/courses/106106139

CO-PO-PSO Mapping

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

JUSTIFICATION

- The students will be able to identify, formulate and analyse computing problems through the knowledge of all abstract data types and their implementations to arrive at feasible solutions. Hence, on an average, the COs are mapped with PO1 with a strength of 3 and PO2 with a strength of 2.
- The students will be able to design the solution for complex engineering problems by applying concepts like arrays, structures, lists and trees. Hence, on an average, the COs are mapped with PO3 with a strength of 2.
- Recognizing the need and the importance of the course, data structures with C in articulating solutions for engineering and soIATtal problems, the COs are mapped with PO12 with a strength of 2.
- On an average, the COs are mapped to PSO1 and PSO3 with a strength of 2, because fundamental knowledge of data structures and implementation is required to solve any real world problems.

GAME DESIGN AND DEVELOPMENT USING UNITY 3D					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22CII52	3:0:2:0	4	CIE:50 SEE:50	3 Hours	IPCC

Pre-Requisites:

- Basics of Programming
- Digital gaming concepts

Objectives :

1. Introducing the concepts of Game Design & Development.
2. Understand Unity Interface and Tools.
3. Understand Game Mechanics and Systems Design.
4. Applying knowledge to Game Publishing & Marketing.

Teaching-Learning Process

These are sample Strategies, used in Game design using Unity to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Google site web links of the concept are sent to students well in advance so that students will be able to grasp the topics that is taken in class.
3. After the class quiz is been asked in the class with respect to the topics to know their understanding level and which also promotes critical thinking.
4. Experience Based Learning (EBL) id adopted, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Every concept can be applied to the real world - and when that's possible, is taught in the class which helps improve the students' understanding.

Module I

Introduction to Game Design - Overview, Basics of Computer Graphics -Transformation, Projection, Rendering, Introduction to Unity - Installing unity, Setting up Unity environment and project structure.

Components and Prefabs - Components examples, Adding a Component to an Object, C# functions, Writing our 'Player Controller' Component, Making and Spawning Prefabs, Collision Detection, Turning an Object into a Prefab.

08 Hours

Module II

2D Game Development - Basics of 2D game, 2D vs 3D game, 2D Sandbox, Creating 2D game prototypes in Unity - Sprites, sprite sheets, Tilemaps,2D assets selection from store, 2D physics and movement, 2D animation, Cinemation camera, The Power of Parallax.

3D game modeling - Working with 3D models, Implementing 3D character controllers and animations - Introduction to lighting and visual effects.

08 Hours

Module III

Advanced game mechanics - Subsystems, Making our health system, Principles of animations, Making a basic animation, The animation view.

Designing and implementing AI behaviors - New Component - AI Brain, Unity events and AI actions, Hunting down the player, Setting up the AI Component, Navmesh & agents.

08 Hours

Module IV

Designing user interfaces (UI) for games - Game Flow vs Gameplay Flow, Game flow breakdown, The Unity UI system, Title Menu - Adding the UI elements, adding scripts, button actions, adding scenes to build settings.

Game Audio - The audio components, Importing Music and SoundFX, Importing Audio clips, Basics of 3D sound.

08 Hours

Module V

Platform and Publishing - Your Platform of Choice, PC/Mac/Linux, Mobile games, Console development, WebGL, AR/VR, Publishing your game, Preproduction - Design docs, Paper prototypes, Concept Art, Project Management.

08 Hours

LIST OF LABORATORY PROGRAMS

Introduction to the basic unity hub installation and set up.

1. Importing of Image target inbuilt type and custom type from Vuforia.
2. Implement Game object manipulation and script writing for basic cube builders.
3. Create a rolling ball game through Unity.
4. Create a Flappy Bird game through Unity.
5. Create a Pong game through Unity.
6. Create a Brick Breaker game through Unity.
7. Create a Endless Runner game through Unity.
8. Create a snake game using Unity.
9. Create a Target Shooting game through Unity.
10. Matlab implementation of Computer Graphics (Image processing and classification)

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	Total 25 Marks : Reduced to 15 Marks	
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

Course Outcomes

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

Define and explain the concepts of Data Structures

1. Comprehend the basics of Unity & Game Design.
2. Comprehend the 2D & 3D Game Development.
3. Comprehend the Unity's UI system.
4. Learn Advanced game mechanics and System Design.
5. Learn Game publishing and Marketing.

Text Books:

1. "Mastering Game design with Unity 2021" by Scott Tykoski (BPB Publications, 2021)

Textbook : Chapter 1: 1.1 - 1.5; Chapter 2: 2.1 - 2.4; Chapter 3: 3.1 - 3.2; Chapter 4: 4.1 - 4.6; Chapter 7: 7.1 - 7.2; Chapter 8: 8.1 – 8.4; Chapter 10: 10.1 – 10.4; Chapter 15: 15.1 – 15.11; Chapter 17: 17.1 – 17.7, Chapter 18: 18.1 – 18.4.

Reference Books:

1. "Unity in Action: Multiplatform Game Development in C#" by Joe Hocking (Manning Publications, 2018)
2. "Mastering Unity 2D Game Development" by Simon Jackson (Packt Publishing, 2014)
3. "Unity 2D Game Development Cookbook" by Claudio Scolastici (Packt Publishing, 2015)
4. "Unity 3D Game Development by Example" by Ryan Henson Creighton (Packt Publishing, 2018)

E - Resources:

1. **https://learn.unity.com/**
2. https://community.unity.com/

CO-PO-PSO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	-	2	-	3	-	-	-	2	-	-	-	3	2	-
CO 2	-	-	3	2	3	-	-	-	-	-	-	2	3	3	-
CO 3	-	-	3		3	-	-	-	-	3	-	-	2	3	-
CO 4	-	3	3	3	3	2	-	-	-	-	2	-	-	3	-
CO5	-	-	-	2	-	-	2	3	-	3	3	-	-		3
Avg	0.6	0.6	2.2	1.4	2.4	0.4	0.4	0.6	0.4	1.2	1.0	0.4	1.6	2.2	0.6

JUSTIFICATION

1. The students will be able to remember, identify, formulate and analyse game design concepts through the knowledge of basic computer graphics and C# programming and their implementations to arrive at feasible solutions. Hence, on an average, the CO1 is mapped with POs with a strength of 3 and 2.

2. The students will be able to design and develop the 2D & 3D Games by applying the game designing techniques. Hence, on an average, the CO2 is mapped with POs with a strength of 3 and 2.

3. Recognizing the need and the importance of the Game user interface design and the audio components , the CO3 is mapped with POs with a strength of 3.

4. The need and the importance of the Game mechanics and the project management for the game publishing and marketing is considered. Hence, on an average, the CO4, CO5 is mapped with POs with a strength of 3 and 2.

5. On an average, the COs are mapped to PSOs with a strength of 3, because fundamental knowledge of game design and Computer graphics knowledge is required to solve any real time implementation of games.

ARTIFICIAL INTELLIGENCE LABORATORY

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
22CIL54	0 : 0 : 2 : 0	1	IAT:50 SEE:50	3 Hours	PCCL

Course objectives:

This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of

- AI Search strategies
- Formulating and solving AI problems
- Expert Systems

	PROGRAMS
1	Implementation and analysis of a) Breadth First Search b)Depth First Search for an application
2	Given a graph where each node represents a state and each edge has an associated cost, implement the best first search algorithm to find the path from the starting node to the goal node.
3	Implement A* algorithm to find the shortest path between two nodes in a graph.
4	Implement 4-Queens problem using hill-climbing algorithm, where the goal is to place 4 queens on a 4*4 chessboard so that no queens threaten each other.
5	You are given two jugs, a 4-litre one and a 3-litre one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 liters of water in to a 4-litre jug? Implement.
6	Implement Travelling Salesman Problem to determine the shortest possible route that allows the salesperson to visit each city once and return to the same city.
7	There is a monkey at the door into a room. In the middle of the room, a banana is hanging from the ceiling. The monkey is hungry and wants to get the banana, but he cannot stretch high enough from the floor. At the window of the room, there is a box the monkey may use. Implement the monkey banana problem.
8	Implement 8-Puzzle problem using search algorithms to find the solution to the puzzle.
9	Implement Recursive / Iterative solutions for the Tower of Hanoi Problem
10	Implement Tic-Tac-Toe game using search algorithms and heuristics to make optimal moves.

Laboratory Outcomes:

The student should be able to:

1. Analyze and implement uninformed search strategies.
2. Analyze and implement different types of informed or heuristic search strategies.
3. Formulate different real world problems.
4. Design and implement expert systems.

Assessment Details(both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

Conduct of Practical Examination:

Experiment distribution :

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Need to change in accordance with university regulations)
  a) For laboratories having only one part → Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  b) For laboratories having PART A and PART B
     i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
     ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

CO-PO-PSO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3														
CO 2		3													
CO 3			3												
CO 4				2	2										
Average	3	3	3	2	2										

Management and Entrepreneurship					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22CIT55	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PCC

Pre-Requisites:

- Basic knowledge of understanding how businesses operate and how to make them profitable.
- Networking is an essential part of entrepreneurship.

Objectives:

1. Management improves the efficiency of processes and resource utilization to achieve better results
2. Employee Development: Management fosters the development of employees and ensures their job satisfaction and well-being
3. Achieving project goals within constraints, optimizing resources, enhancing team collaboration, managing risks, ensuring customer satisfaction.

Teaching-Learning Process

These are sample Strategies, used in FCV to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Pre-video links of the concept are sent to students well in advance so that students will be able to grasp the topics that is taken in class.
3. After the class quiz is been asked in the class with respect to the topics to know their understanding level and which also promotes critical thinking.
4. After the completion of module hands on is been conducted in the class /lab with respect to the topics to know practically.
   their understanding level and which also promotes critical thinking
5. Problem Based Learning (PBL) id adopted, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Every concept can be applied to the real world - and when that's possible, is taught in the class which helps improve the students' understanding.

Module I

Management Introduction:

Meaning - nature and characteristics of Management, Scope and Functional areas of management Management as art or science, art or profession - Management & Administration - Roles of Management, Levels of Management, Development of Management Thought - early management approaches - Modem management approaches.

Planning: Nature, importance and purpose of planning process objectives - Types of plans (meaning only) - Decision making, Importance of planning - steps in planning & planning premises - Hierarchy of plans. **08Hours**

Module II
Organizing: Nature and purpose of organization, Principles of organization – Types of organization-Departmentation Committees-Centralization Vs Decentralization of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of **staffing**--: Process of Selection & Recruitment (in brief). **08Hours**
Module III
Staffing: Definition of staffing, the system approach to human resource management: An overview of staffing function, Situational factors affecting staffing, the system approach to selection: An overview. Leadership: Defining Leadership, Ingredients of Leadership, Trait approaches to leadership, Leadership behaviour and style.
Module IV
Entrepreneurship: Importance of entrepreneurship, concepts of entrepreneurship, characteristics of a successful entrepreneur, classification of entrepreneurs, myths of entrepreneurship, entrepreneurial development models, problems faced by entrepreneurs and capacity building for entrepreneurship. **Women Entrepreneurs**: Women entrepreneurship defined, women entrepreneurship environment, challenges in the path of women entrepreneurship, strategies for development of women entrepreneurs. **08 Hours**
Module V
Small Scale Industry: Definition, characteristics of SSIs, Objectives, Scope no SSIs, Role of Small-Scale Industries, Advantages of SSIs, steps to start SSI, Government policy towards SSI, and development of the Small-Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Impact of Globalization on SSI, Impact of WTO/GATT on SSIs, Ancillary Industry and Tiny Industry (Definition only).

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Course Outcomes

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

1. Describe the understanding of motivation and different control systems in management.
2. Understanding of Entrepreneurships and Entrepreneurship development process.
3. Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.

Text Books:

1. Management and Entrepreneurship: **N V R Naidu and T Krishnarao** International Publishing House **2008.**

Reference Books:

1. Management fundamentals - Concepts, Application, Skill Development: Author RobersLusier, Thomson Thomson south-wester.
2. Entrepreneurship Development S. S. Khanka, S. Chand & Co 4th Edition Stephen Robbins 2011.

E - Resources:

https://www.udemy.com/course/management-101/?couponCode=IND21PM
https://www.udemy.com/course/management-101/?couponCode=IND21PM
https://books.google.co.in/books?id=_sXZYWcx_VAC&printsec=copyright&redir_esc=y#v=onepage&q&f=false

CO-PO-PSO Mapping

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PS O 1	PS O 2	PSO 3
CO 1	3											2			2
CO 2		3										2			2
CO 3			2									2			1

RESEARCH METHODOLOGY AND IPR					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22RMP57	3:0:0:0	03	CIE:50 SEE:50	3 Hours	PCC

Pre-Requisites:

It helps researchers frame research problems and use words, concepts, and practices to present a unique research.

Exposure to linguistics may be useful, but it is not mandatory.

Objectives :

1. To provide an overview of technical research and its methodology with the basics of intellectual property and its rights research.
2. To describe the techniques for defining a research problem.
3. To describe the roles of the literature review in the research process.
4. To outline the process of conducting a literature search, reviewing findings, developing theoretical and conceptual frameworks, and writing reviews and research reports.
5. To give exposure to various software/ resources supporting the literature survey, statistical tools and plagiarism check.

Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's, Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps to improve the students' understanding.

Module I

Introduction: Meaning of Research, Objectives, and Motivation in Engineering Research, Criteria for Good Research, Types of Engineering Research, Research Process, Research Problem, Selection and Components of the Research Problem, Techniques Involved in Defining a Problem.

Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

08 Hours

Module II

Reviewing the literature: Importance of the Literature Review, new and existing knowledge, Steps Involved in the Literature Review, Bibliography databases and Search Engines for Research Papers: Web of Science and Google search. Developing a Theoretical and Conceptual Framework, Sample Outline of a Literature Review.

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions.

08 Hours

Module III

Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports.

Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper, The Choice, Writing Strategies, Journal Paper: Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited.

08 Hours

Module IV

Patent application preparation - Preparing patent applications, Obtaining invention disclosures from Inventors, identifying patentable inventions, Understanding the invention (core inventive concept), Inventorship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, and Application format.

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements.

Trademarks: Eligibility Criteria. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration and validity of a Trademark. Process for Trademarks Registration. Prior Art Search. Types of Trademark Registered in India.

Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

08 Hours

Module V

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Non-Protectable Industrial Designs India. Procedure for Registration of Industrial Designs. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Classification of Industrial Designs. International Treaties.

Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India and their Identification. Classes of GI.

08 Hours

Assessment Details (Both CIE and SEE)						
Theory Courses: 3						
Evaluation Type		**Component**	**Max Marks**	**Marks Reduced to**	**Min. Marks**	**Evaluation Details**
Theory Component	Internal Assessment Tests(IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25 marks
		IAT-2	25			
	Comprehensive Continuous Evaluations(CCE)	CCE-1	25	25		Any two Assessment methods as scaled down to 25 marks
		CCE-2	25			
	Total CIE -Theory			**50**	**20**	Scale down marks of IAT and CCE to 25
SEE			100	**50**	**18**	Conducted for 100 marks and scaled down to 50.
CIE + SEE				**100**	**40**	

Textbooks:

Sl. No.	Title of Book	Authors details	Publisher details	Edition and Year
1	Research Methodology: Methods and Techniques	C. R. Kothari, Gaurav Garg	New Age International	4th Edition, 2019
2	Engineering Research Methodology:A Practical Insight for Researchers	Dipankar Deb, Rajeeb Dey, Valentina E. Balas	Intelligent Systems Reference Library, Springer	1st Edition 2019
3	WIPO, Patent Drafting Manual, 2nd edition. Geneva: WIPO.	DOI: 10.34667/tind.44657 ISBN: 978-92-805-3264-7	World Intellectual Property Organization	2nd Edition, 2022

Course Outcomes

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

- **CO1** **Apply** the concepts of research process, methods, and techniques to address research problems.
- **CO2** **Analyze** the data, and effectively use the library and its resources in gathering information related to the research project.
- **CO3** **Design** effective research studies by selecting suitable sampling methods and data collection techniques and writing report.
- **CO4** **Conduct** comprehensive literature reviews to support the development of theoretical and conceptual frameworks
- **CO5** **Investigate** research problems using structured approaches, patents, and copyrights

4	Research Methodology a step-by-step guide for beginners	Ranjit Kumar	SAGE Publications India Pvt Ltd	3rd Edition, 2011
Reference Books:				
1	"Research Methods for Engineers"	David V. Thiel	Cambridge University Press	2020

CO-PO-PSO Mapping

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C307.1	3	--	--	--	--	--	--	--	--	--	1	1	--	--	--
C307.2	-	2	--	--	--	--	--	--	--	--	1	1	--	--	--
C307.3	-	1	3	--	--	--	--	--	--	--	--	1	--	--	--
C307.4	-	-	-	3	--	--	--	3	--	--	--	1	--	--	--
C307.5	-	-	-	3	--	2	2	--	3	1	--	1	--	--	--

ENVIRONMENTAL STUDIES AND E-WASTE MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22ENV58	1:0:0:0	1	CIE:50 SEE:50	1 Hour	PCC

Pre-Requisites:

- Basic knowledge of Natural Resources, Atmosphere
- Basic knowledge of Waste management, E waste management, sources of pollution

Objectives :

1. To recognize fundamental concepts in environmental science and demonstrate a comprehensive understanding of the environment.
2. To understand the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting.
3. To expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.
4. Analyze the impact of issues w. r. t. waste and e-waste management to protect the environment

Teaching-Learning Process

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes Critical thinking.
- Adopt Case study Based Learning (CBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module I

Ecosystem and Sustainability:

Ecosystem: Structure of ecosystem and their types, including forest, desert, wetland, riverine, and oceanic ecosystems.

Sustainability:17 Sustainable Development Goals (SDGs) and possible actions, Carbon foot print(CFP),Concept of calculation of CFP and CFP reduction

Self-Study Component (SSC): Components of the environment. Textbook 1: CH- 3

03 Hours

Module II

Natural Resources Management and Energy:

Natural Resources: Water resources – Availability & Quality aspects, water induced diseases, Fluoride contamination in drinking water.

Energy: Different types of energy, Conventional sources & Non -Conventional sources of Energy, Solar energy, Wind Energy, Hydrogen as an alternative energy source.

Self-Study Component (SSC): Alternative Energy sources Textbook 1: CH- 2

04 Hours

Module III
Environmental Pollution: Water Pollution, Noise pollution, Air pollution including (Sources, Impacts, Preventive measures and Public Health Aspects). **Environmental Law and policy – Evaluation of environmental acts and policy, Environmental Ethics, Sustainability concept, and Environmental impact assessment** Self-Study Component (SSC): Case studies of air pollution episodes Textbook 1: CH- 5 **04 Hours**
Module IV
Waste management: Waste management: Solid Waste Management , types and sources, functional elements of SWM, Biomedical Waste Management - Sources, Characteristics Environmental Legislation: Solid Waste Management Rules, 2016, Biomedical Waste Management Rules, 2016. Self-Study Component (SSC): Case studies on waste management options Textbook 1: CH- 6 **03Hours**
Module V
E - Waste Management E-waste: Composition and generation. Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E- waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E waste management. E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2022 - Salient Features and its implications. Self-Study Component (SSC): E-Waste (Management) Amendment Rules, 2023, 2024 Textbook 1: e-resource:2 **04 Hours**

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Course Outcomes

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

1. Understand the principles of ecology and the environmental issues related to air, land, and water on a global scale
2. Develop observation skills to address environmental problems effectively.
3. Apply the basic principles of e-waste management, including collection, recycling, and safe disposal method
4. Able to identify the hazardous effect of e waste and focus on current role.

   To follow the guidelines of environment and e-waste and conduct survey to acquire the knowledge about biomedical waste disposal.

Text Books:

1. S M Prakash , "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018.
2. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.

Reference Books:

1. Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited.
2. R. Rajagopalan, "Environmental Studies- From Crisis to Cure", 2nd Edition, Oxford university press, New Delhi, 2013.
3. G. Tyler Miller Jr.,Scott Spoolman "Introduction to Environmental Science –, Cengage Learning

E - Resources:

1. https://sdgs.un.org/goals
2. https://kspcb.karnataka.gov.in/waste-management/biomedical-waste

E Waste (Management) Rules, 2022: https://kspcb.karnataka.gov.in/sites/default/files/inline-files/E%20Waste%20%28Management%29%20Rules%2C%202022.pdf

CO-PO-PSO Mapping

POS / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C308.1	2	-	-	-	-	1	3	-	-	-	-	2
C308.2	-	1	2	-	-	-	2	-	3	-	-	2
C308.3	-	-	-	-	-	1	2	2	2	1	-	2
C308.4	-	-	-	-	-	1	1	-	-	-	-	2
C308.5	-	-	-	-	-	1	3	-	-	1	-	2