B.Sc. Computer Science (Gaming Design)

(Duration: 3 Years)

CURRICULUM and SYLLABUS

(Applicable for Students admitted from Academic Year 2022-23)

DEPARTMENT OF COMPUTER APPLICATIONS

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

Motto:

To Make Every Man a Success and No Man a Failure

Vision:

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission:

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instill highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

Value Statement:

Integrity, Innovation, Internationalization.

DEPARTMENT OF COMPUTER APPLICATIONS

Vision:

The department of Computer Applications aims to transform aspiring students into software professionals with a high degree of technical skills and to inculcate a research mind set.

Mission:

- *To provide strong theoretical foundations complemented with extensive practical training.*
- *To design and deliver curricula to meet the changing needs of industry.*
- *To establish strong collaborations with industry, R&D and academic institutes for training and research.*
- *To promote all-round development of the students through interaction with alumni and industry*

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The Program Educational Objectives (PEOs) of the Computer Applications are listed below:

PEO1. To prepare graduates to be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms

PEO2. To prepare graduates to achieve peer-recognition, as an individual and as a team player, through demonstration of good analytical, design, implementation and interpersonal skills.

PEO3. To prepare graduates to contribute to society as broadly educated, expressive ethical and responsible citizens with proven expertise

PEO4. To prepare graduates to pursue life-long learning to fulfil their goals.

PROGRAMME OUTCOMES (PO'S):

(To be achieved by the student after every semester/year/and at the time of graduation)
At the end of this program, graduates will be able to

1. ***Computer knowledge:*** *Apply the knowledge of mathematics, computer Fundamentals to IT applications.*

2. ***Design/Development of solutions:*** *Design solutions for IT applications using latest technologies and develop and implement the solutions using various latest languages.*

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

4. ***Environment and sustainability:*** *Understand the impact of the IT analyst solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.*

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

6. ***Individual and teamwork:*** *Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*

PROGRAMME SPECIFIC OUTCOMES (PSO'S):

PSO-1: *Apply mathematical, conceptual knowledge of computing and analytical skills to demonstrate the graphical representation of real-world data.*

PSO-2: *Formulate and use appropriate graphics tools to enhance their knowledge in the field of Animation and other animation related fields.*

PSO-3: *Equipped with creative and technical skills in various domains of Animation, Gaming, VFX and multimedia*

B.SC. COMPUTER SCIENCE (GAMING DESIGN)

			SEMESTER- I						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	CF	ELA0101	English	2	0	0	2	1	2
2	CF	MAA0101	Calculus and Linear Algebra	3	0	2	4	0	5
3	PC	CAB0102	Data Structures	3	0	2	4	0	5
4	PC	CAB0103	Python Programming	3	0	0	3	1	3
5	PC	CAB0104	Computer Science Essentials	2	0	2	3	0	4
			PRACTICAL						
6	PC	CAB0131	Python Programming Lab	0	0	2	1	0	2
7	PC	CAB0133	Internet Programming Lab	0	0	2	1	0	2
			Total	13	0	10	18	2	23
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

			SEMESTER- II						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	CF	MAA0117	Statistics and Probability	3	1	0	4	1	4
2	PC	CAB0116	Design and Analysis of Algorithms	3	0	2	4	0	5
3	PC	CAB0120	2D Game Design	2	0	2	3	1	3
4	PC	CAB0121	Introduction to Game Theory and Development	3	0	0	3	1	3
5	PC	CAB0123	Elements of Design	3	0	0	3	1	3
			PRACTICAL						
6	PC	CAB0143	Game Designing Lab	0	0	2	1	0	2
7	PC	CAB0144	Digital Art Lab	0	0	2	1	0	2
			Total	14	1	8	19	4	22
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER- III									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CAB0206	Operating Systems	2	0	2	3	1	4
2	PC	CAB0207	Database Management Systems	2	0	2	3	0	4
3	PC	CAB0208	HTML 5 Gaming Framework	3	1	0	4	1	4
4	DE	CAC02**	Elective – 1	2	1	2	4	0	5
5	PC	CAB0209	Interactive Graphics and Games	3	0	0	3	1	3
PRACTICAL									
6	PC	CAB0233	Web Designing Lab	0	0	2	1	0	2
7	PC	CAB0234	Animation and Interactivity Lab	0	0	2	1	0	2
			Total	12	2	10	19	3	24
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER- IV									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CAB0220	3D Animation	2	0	2	3	1	4
2	PC	CAB0221	Game Interface Design	3	1	0	4	0	4
3	PC	CAB0222	Digital Marketing	3	0	0	3	0	3
4	PC	CAB0223	Virtual Reality	3	0	0	3	0	3
5	DE	CAC02**	Elective – II	2	1	2	4	0	5
PRACTICAL									
6	PC	CAB0243	Video Game Development Lab	0	0	2	1	0	2
7	PC	CAB0244	3D Animation Lab	0	0	2	1	0	2
			Total	13	2	8	19	1	23
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

			SEMESTER- V						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CAB0304	Mobile Application Development	2	1	2	4	1	4
2	PC	CAB0305	AR Game Development	2	1	2	4	0	5
3	DE	CAC03**	Elective – III	2	1	2	4	0	5
4	DE	CAC03**	Elective – IV	2	1	2	4	0	5
PRACTICAL									
5	PC	CAB0333	AR Game Lab	0	0	2	1	0	2
6	PC	CAB0334	Mini Project	0	0	2	1	0	2
			Total	8	3	16	18	1	23
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

			SEMESTER- VI						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CAB0317	Game Environment	3	0	2	4	0	5
2	PE	CAC03**	Elective – V	2	1	2	4	1	5
PRACTICAL									
3	PC	CAB0341	Internship	0	0	2	1	0	2
4	PC	CAB0342	Project Work	0	0	16	8	0	16
			Total	5	1	22	17	1	28
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

TOTAL CREDITS: 110

LIST OF DEPARTMENTAL ELECTIVES WITH GROUPING - SEMESTER WISE

SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
Elective I									
3	DE	CAC0251	Principles of Game Theory	2	1	2	4	1	5
3	DE	CAC0252	Color Theory	2	1	2	4	1	5
Elective II									
4	DE	CAC0268	Introduction to Multimedia Design	2	1	2	4	1	5
4	DE	CAC0269	2D Gaming Production	2	1	2	4	1	5
Elective III									
5	DE	CAC0355	Hardware in Game Programming	2	1	2	4	1	5
5	DE	CAC0356	Business and Legal issues for Video Game Developers	2	1	2	4	1	5
Elective IV									
5	DE	CAC0357	3D Character Development	2	1	2	4	0	5
5	DE	CAC0358	Principles of Sound Design	2	1	2	4	0	5
Elective V									
6	DE	CAC0370	Visual Scripting	2	1	2	4	0	5
6	DE	CAC0371	Advanced Modelling and Texturing	2	1	2	4	0	5
6	DE	CAC0372	Stop Motion Animation	2	1	2	4	0	5

COURSE TITLE	ENGLISH			CREDITS	2
COURSE CODE	ELA0101	COURSE CATEGORY	CF	L-T-P-S	2-0-0-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-4

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course has been designed to develop students' language skills and communication needs. It attempts to develop their proficiency through oral communication skills with an application knowledge of grammar and vocabulary. This course teaches students how to communicate accurately, appropriately and fluently in professional and social situations.
Course Objectives	1. To acquire self-confidence by which the learner can improve upon their informative listening skills by an enhanced acquisition of the English language 2. To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate 3. To equip the students to read intensively and extensively, short meaningful extracts from literary and non-literary texts. 4. To enhance the oral communication skills of the students via functions in clusters and respond to daily conversations naturally 5. To equip the learners in develop critical thinking skills and participate in Group activities, task-based activities and respond to hypothetical situations
Course Outcome	Upon completion of this course, the students will be able to 1. Upgrade from grammatical competence to communicative competence through problem solving tasks 2. Functioning in English by listening to speeches, lectures, telephone conversations, recorded versions of all the above, and responding non-verbally as well as verbally 3. Developing a conscious awareness about the processes of metacognitive skills by understanding societal and environmental contexts 4. Apply and analyze the contextual knowledge through reading the passages and participate in group activities and task-based activities 5. Identifying his/her choicest field or specialized area through wide reading such as science fiction, crime thriller and so on by applying ethical principles and contributing to society

Psrerequisites: Plus Two English-Intermediate Level

CO, PO AND PSO MAPPING

	PO -1	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	1	2	2	1	2	1	1	1	2	
CO-2	-	1	1	2	1	2	1	2	1	
CO-3	1	1	1	-	2	1	2	1	2	
CO-4	1	2	1	2	1	2	-	2	1	
CO-5	2	1	1	1	1	1	1	1	1	

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – EXTENSIVE READING	**(6)**

Reading short meaningful extracts from literary and non - literary texts and identifying various types of connections among statements such as reason - result, statement - illustration, cause - effect, result - reason, addition, contradiction/opposite, introduction, furthering, adding, summing up, conclusion - tracing the texture of texts - referencing - anaphoric and cataphoric references - identifying relationships between topic sentences and subordinate sentences **Suggested Activities:** Reading to making notes, Random note making, Systematizing conventions **Suggested Reading:** 1. Professional Speaking Skills by ArunaKoneru, Oxford Press, 2015 2. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani,	**CO-1** **BTL-2**

MODULE 2 – INTENSIVE READING	**(6)**

Matching discourse functions with corresponding linguistic structures - one function carried out through several structures - one structure fulfilling several functions - Cohesion and cohesive markers - Coherence and grammatical linkers - Reading newspapers at breakfast table - Reading publicity materials - Skimming - Reading quickly for grasping the main idea or point - Scanning - Reading carefully, looking for specific information - Railway timetable - medical prescription - textbooks - cover letters accompanying important documents - Reading and Note making - Purposes of note making - Various formats of making notes - Short forms and abbreviations - commonly used and personal conventions **Suggested activities:** Non-literary texts for comparison and contrast **-** Identifying words, phrases, idioms, phatic communion phrases, formulaic expressions etc. (which suits day to day communication) from reading materials and using them appropriately in one's own use **Suggested sources:** 1. (Listening and Speaking Modules) – Language Lab 2. Professional Speaking Skills by ArunaKoneru, Oxford Press 3. English for Life and the Workplace Through LSRW&T skills, by Dolly John, Pearson Publications, 2014 edition 4. Cambridge Academic English, An integrated skills course for EAP by Martin Hewings and 5. Craig Thaine, by Cambridge University Press, 2014	**CO-2** **BTL-3**

MODULE 3 – CRITICAL THINKING	**(6)**

Identifying differences and similarities between pairs of pictures, illustrations, diagrams etc. and talking about them by working in pairs and small groups - Defining 'argument' - Components of an argument: reason and conclusion - illustrating arguments - Identifying arguments from a set of statements and identifying their components **Suggested Activities:** Developing critical thinking skills through visuals (print and electronic), Choose the best responses from the statements, Group activities, task based activities, responses to hypothetical situations **Suggested sources:** 1. Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.	**CO-3** **BTL-3**

MODULE – 4 : ORAL COMMUNICATION SKILLS	(6)
Functions in clusters - Inviting, responding with thanks, accepting invitation/declining - invitation with a valid reason, promising to meet on a later occasion, taking leave & bidding farewell - Apologizing, explaining reason, promising not to repeat the mistake, reassuring, taking leave - Correcting someone, defending the right point or stance, convincing the other etc - Greeting, Appreciating something good, illustrating the point further, Complimenting - 5.Complaining, defending logically, demanding things to be set right, and producing proof or evidence - Examples in the form of short recorded extracts of direct interactions as well as telephone conversations from various walks of life such as office work, business, advertisement, law court, police, various service providers such as gas agency, door delivery agency and so on **Suggested activities:** Listening to small meaningful chunks of day-to-day communication and responding to them naturally - Greetings, formulaic expressions etc. Identifying and listing natural ways of functioning in contexts, based on short extracts taken from plays, or dialogues from fiction. **Suggested sources:** 1. Embark, English for Under Graduates by Steve Hart, Arvind Nair, Veena Bhambhani, Cambridge University Press 2016.	**CO-4** **BTL-4**

MODULE 5 – FUNCTIONAL GRAMMAR	(6)
Sentence - Parts of Speech - Comparative Adjectives - Pronouns - prepositions - conjunctions - Articles - Non-finite Verbs - tenses - conditionals - question tags - modal verbs - common errors - concord - Reported speech - Active & Passive voice **Suggested Activities:** Exercises related to grammatical aspects and its function in functional English (day to day conversations) **Suggested Sources:** 1. Essential English Grammar by Raymond Murphy, Cambridge University Press, 2016 edition	**CO-** **BTL-1**

TEXT BOOKS	
1.	Dr.Bikram, K. Das "An Introduction to Professional English and Soft Skills", Cambridge University Press, 2009.
2.	Dolly John, "English for Life and the Workplace through LSRW&T skills", Pearson Publications, 2014 .

REFERENCE BOOKS	
1.	Sabina Pillai and Agna Fernandez , "Soft Skills and Employability Skills", Cambridge University Press, 2018.
2.	Steve Hart " Embark, English for Undergraduates", Cambridge University Press, 2016.
3.	Collins, "Skills for the TOEFL IBT Test", Pustak Mahal, 2012.
4.	Jeff Butterfield , "Soft Skills for Everyone", Cengage Learning, 201 .
5.	ArunaKoneru , "Professional Speaking Skills" Oxford Publications, 2015.

E BOOKS	
1.	https://www.britishcouncil.in/english/courses-business
2.	http://www.bbc.co.uk/learningenglish/english/features/pronunciation

MOOC	
1.	https://www.mooc-list.com/tags/english
2.	https://www.mooc-list.com/course/adventures-writing-stanford-online
3.	http://www.cambridgeenglish.org/learning-english/free-resources/mooc/

COURSE TITLE	CALCULUS AND LINEAR ALGEBRA			CREDITS	4
COURSE CODE	MAA0101	COURSE CATEGORY	CF	L-T-P-S	3-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	First Periodical Assessment	Second Periodical Assessment
15%	15%	10%	5%	15%	15%

Course Description	Learn about the two core Calculus concepts: derivatives and integrals, From scalars and vectors to Eigen decomposition and Singular Value Decomposition
Course Objectives	1. To explain the concept for finding out the eigen value and eigen vector of a matrix 2. To comprise the solution of simultaneous linear algebraic equation. 3. To infer the concept of differential calculus 4. To apply the maximum and minimum values of two independent values. 5. To understand the concepts of integrals
Course Outcome	Upon completion of this course, the students will be able to 1. Solve problems using Eigen vectors. 2. Carry out algebraic linear simultaneous equation by using numerical methods. 3. Examine the nth order differential equation by using leibnitzs theorem and partial differential equation. 4. Demonstrate necessary and sufficient condition for maxima and minima of function of two variable. 5. Calculate the area and volume by using integral calculus.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO - 1	PO - 2	PO - 3	PO - 4	PO - 5	PO - 6	PSO - 1	PSO - 2	PSO – 3
CO – 1	3	2	1	2	1	2	3	1	2
CO – 2	2	1	2	-	2	1	2	2	1
CO – 3	3	2	1	2	1	2	3	1	2
CO – 4	2	1	2	1	2	1	2	2	1
CO - 5	-	1	1	2	1	2	3	1	1
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: MATRIX	(12)
Matrix: Introduction- Terms related to Matrix-Basic operations on Matrix - Representing in Matrix form. Solving the problem - Row Echelon form - Inverse of a Matrix - Finding Inverse - The power of Matrices - solving the equations in one go - Use of Inverse in Data Science. Eigenvalues and Eigenvectors - Finding Eigenvectors - Use of Eigenvectors in Data Science: PCA algorithm - Singular Value Decomposition of a Matrix.	CO-1 BTL-2

MODULE 2: SOLUTION OF SIMULTANUOUS LINEAR ALGEBRAI EQUATION	(12)
Direct and Indirect method – Gauss elimination & Gauss Jordan methods – Gauss Jacobi & Gauss-Seidel Methods – Find the inverse of the matrix by Gauss Jordan method – Eigen value & eigen vector by Power method.	CO-2 BTL-3

MODULE 3: DIFFERENTIAL CALCULUS	(12)
Introduction – Differentiation- Geometrical meaning of derivative at a point-Successive Differentiation- Calculation of nth order Differential coefficients-LeibnitzTheorem. partial Differentiation: Introduction- Partial Derivatives of First order – Higher orders – Homogeneous Function – Euler's Theorem on Homogeneous Functions – Jacobian – Important properties of Jacobians.	CO-3 BTL-3

MODULE 4: MAXIMA AND MINIMA	(12)
Introduction- Maxima & Minima of functions of two independent variables- Necessary conditions for the Existence of Maxima or Minima of f(x,y) at the point (a,b) – Sufficient Conditions for maxima and Minima (Lagrange's condition for two independent variables) – Lagrange's Method of Multipliers	CO-4 BTL-3

MODULE 5: INTEGRAL CALCULUS	(12)
Introduction – Indefinite Integral – some Standard results on integration – Definite Integral – Applications of Integral calculus	CO-5 BTL-3

TEXT BOOKS	
1.	Dr.B.S. Grewal , "Higher Engineering Mathematics", Khanna Publishers, 2015.
2.	C.B. Gupta, S.R. Singh and Mukesh Kumar, "Engineering Mathematics" , Mc-Graw Hill, 2007.
3.	Kandasamy S. Chand," Numerical Methods" , S. Chand publisher, 2008.

COURSE TITLE	DATA STRUCTURES			CREDITS	4
COURSE CODE	CAB0102	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-4
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment		Practical Assessment		ESE
15%	15%		20%		50%
Course Description	This course describes basic data structures such as stack, lists and linked lists, etc. Also, this course gives insight in nonlinear data structures like graphs, trees and their applications in solving real world problems.				

Course Objectives	Upon completion of the course the students will be able to, 1. To gain knowledge in designing algorithms to solve problems. 2. To understand the concept of linear and nonlinear data structures. 3. To know the concept of various sorting and searching techniques. 4. To acquire knowledge in graph traversal and searching. 5. To apprehend the greedy approach to solve problems.
Course Objectives	Upon completion of the course the students will be able to, 1. Compute and Analyze algorithms for efficiency using asymptotic notations. 2. Develop knowledge about basic data structures like arrays, linked list, trees. 3. Solve problems by applying suitable data structure. 4. Define graph and illustrate graph traversal. 5. Design and develop projects requiring implementation of the data structure.

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	2	1	3	1	2
CO-2	2	3	2	3	3	2	-	2	1
CO-3	3	2	3	3	2	1	3	1	2
CO-4	2	-	3	2	-	2	3	1	1
CO-5	3	3	3	3	2	1	2	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION   (6L+6P=12)

Introduction to Data structures - Algorithms - Algorithm Specifications - Performance analysis - Space Complexity - Time Complexity - Asymptotic Notations - Elementary of Data structures - Stack and Queue - Linked lists - Singly Linked List - Doubly linked list - Linked list-based implementation of Stacks.

Practical component:

1. Write a C program using functions to perform the following:

   a) Create a singly linked list of integers.

   b) Delete the given integer from the above linked list.

   c) Display the contents of the linked list before and after deletion.

2. Write a C program using functions to perform the following:

   a) Create a doubly linked list of strings.

   b) Delete the given string from the above linked list.

   c) Display the contents of the linked list before and after deletion.

CO-1
BTL-4

Suggested Readings:

Introduction of Data structures

MODULE 2: TREES AND GRAPHS	(6L+6P=12)
Trees - Dictionaries - Binary search trees- Priority Queues - Heaps - Heap Sort – Sets and Disjoint Set union - Union and Find operations - Graphs - introduction - definitions – Graph representations. **Practical component:** 1. Search for the given element in a matrix. 2. Binary search using recursion. 3. Infix to postfix conversion and evaluation of postfix. **Suggested Readings:** Advances in Binary search trees	**CO-2** **BTL-2**

MODULE 3: SORTING AND SEARCHING	(6L+6P=12)
Sorting Algorithms: Basic concepts - Binary search - Finding the maximum and minimum - Merge sort - Quick sort - Performance measure - Randomized sorting algorithms - Selection sort - Strassen's matrix multiplication. **Practical component:** 1. Sort the list of integers using the following sorting methods: a) Merger Sort b) Selection Sort c) Quick Sort d) Heap sort	**CO-3** **BTL-3**

MODULE 4: TRAVERSAL AND SEARCH TECHNIQUES	(6L+6P=12)
Techniques for Binary trees – Techniques for graphs – Breadth First Search and Traversal – Depth First search Traversal- Connected components and Disconnected components. Practical component: 1. Construct an expression tree and print the postfix and prefix using suitable traversal. 2. Create a binary search tree of integers and display the integers in ascending order using a traversal algorithm. Suggested Readings: Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-4** **BTL-2**

MODULE 5: KNAPSACK PROBLEM AND GREEDY METHOD	(6L+6P=12)
The general method – Knapsack problem – Tree vertex splitting – Job sequencing with deadlines – Minimum cost spanning trees – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm- An optimal randomized algorithm – Optimal storage on tapes. **Practical component:** 1. Construct a Minimum spanning Tree using Prim's and Kruskal's algorithm. 2. Construct the shortest path in a graph using Dijkstra's algorithm. **Suggested Readings:** Ellis Horowitz, Sahni, Freed, S. (2015). Fundamentals of Data Structures in C, 2nd edition	**CO-5** **BTL-2**

TEXT BOOKS	
1.	Ellis Horowitz, Sahni, Freed, S. (2015). *Fundamentals of Data Structures in C*, 2nd edition.

REFERENCE BOOKS	
1.	R. G. Dromey(2013) "How to Solve it by Computer" (Chaps 1-2), Prentice-Hall of India

E BOOKS	
1.	https://pdfs.semanticscholar.org/54eb/d5fbd450c745ffb1a5a126d975aa0a53c2e1.pdf (Succinct Data Structures)
2	https://courses.csail.mit.edu/6.851/spring12/scribe/lec12.pdf (Fusion Data Structures)

MOOC	
1.	https://www.mooc-list.com/tags/data-structures
2.	https://nptel.ac.in/courses/106102064/
3	https://www.udemy.com/algorithm/

COURSE TITLE	PYTHON PROGRAMMING			CREDITS	3
COURSE CODE	CAB0103	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL – 3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Description	The course elaborates the basic of python programming with concepts such as Class, functions, variables, If Else statements, For loops, While loops, iterative and recursive programs. This course will be of great interest to all learners who would like to gain thorough knowledge and understanding of the basic components of computer programming using the Python language.				
Course Objective	1. To understand the basic python programming 2. To comprise the data collections and language components of the Python 3. To learn object-oriented concepts in Python. 4. To comprehend the concepts of functions and modules. 5. To implement I/O and Error Handling in Python				
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the basics of python programming to implement python codes. 2. Demonstrate various data types and language components of python code. 3. Developing python applications using object-oriented concepts of python programming. 4. Implementing functions and modules of python programming. 5. Illustrate I/O and Error Handling concepts in the Python.				
Prerequisites: NA					

CO, PO AND PSO MAPPING									
PO -1	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	2	3	2	1	2	1	2	1	1
CO-2	3	3	3	2	1	1	2	2	1
CO-3	2	2	3	1	-	2	3	1	2
CO-4	3	3	3	1	2	1	2	1	1
CO-5	3	3	2	2	1	-	3	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO PYTHON PROGRAMMING LANGUAGE	(9)
Strengths and Weaknesses - IDLE - Dynamic Types - Naming Conventions - String Values - String Operations - String Slices - String Operators - Numeric Data Types - Conversions - Built in Functions **Practical component:** Implementation of various data types in Python **Suggested Readings:** Data types and structures	**CO-1** **BTL-2**

MODULE 2: DATA COLLECTION AND LANGUAGUE COMPONENT	(9)
Introduction - Control Flow and Syntax - Indenting - The if Statement - Relational Operators - Logical - Operators - True or False - Bit Wise Operators - The while Loop - break and continue - The for Loop, Lists - Tuples – Sets – Dictionaries - Sorting Dictionaries - Copying Collections. **Practical component:** Demonstration of Python code with python 3 editor. **Suggested Readings:** Advances in data types	**CO-2** **BTL-2**

MODULE 3: OBJECT AND CLASSES	(9)
Classes in Python - Principles of Object Orientation - Creating Classes - Instance Methods - File Organization - Special Methods - Class Variables - Inheritance - Polymorphism - Type Identification - Custom Exception Classes **Practical component:** Handling objects and classes in Python. **Suggested Readings:** Best practices for classes and classes	**CO-3** **BTL-3**

MODULE 4: FUNCTIONS AND MODULES	(9)
Introduction - Defining Your Own Functions - Parameters - Function Documentation - Keyword and Optional Parameters - Passing Collections to a Function - Variable Number of Arguments, Scope, Functions - First Class Citizens - Passing Functions to a Function - Mapping Functions in a Dictionary - Lambda -Modules - Standard Modules - sys - Standard Modules -math - Standard Modules -time - The dir Function **Practical component:** Implementing functions and modules in Python. **Suggested Readings:** Functions and modules	**CO-4** **BTL-2**

MODULE 5: I/O AND ERROR HANDLING IN PYTHON	(9)
Introduction - Data Streams - Creating Your Own Data Streams - Access Modes - Writing Data to a File - Reading Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling IO Exceptions - Working with Directories - Metadata - Errors - Run Time Errors - The Exception Model - Exception Hierarchy - Handling Multiple Exceptions **Practical component:** I/O and error handling test in Python. **Suggested Readings:** introduction to next level of Python programming language	**CO-5** **BTL-2**

TEXT BOOKS		
1.	Mark Pilgrim, "Dive into Python", Apress Publication, 2009.
2	Mark Lutz, "Learning Python", 4th Edition,Oreilly Publication,2009.

REFERENCE BOOKS		
1.	Mark Lutz, "Programming Python", 4th Edition, Oreilly Publication, 2009.
2.	David Beazley, "Python Essential Reference" 4th Edition, Person Education, 2009.

E-BOOKS		
1.	https://docs.python.org/3/tutorial/

MOOC		
1.	https://www.mooc-list.com/course/learn-python-fundamentals-python-programming-language-skillshare
2.	https://www.mooc-list.com/course/python-basics-absolute-beginners-skillshare

COURSE TITLE	COMPUTER SCIENCE ESSENTIALS			CREDITS	3
COURSE CODE	CAB0104	COURSE CATEGORY	PC	L-T-P-S	2-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE
15%	15%	20%		50%

Course Description	This program introduces the learners to the Introduction to Computers, the Computer System Hardware, Computer Memory, Data representation, Computer Hardware, Programming Languages Generation, Operating System, Data Communication and Network, Internet Services, Database and Computer Security.
Course Objective	1. To learn fundamentals of computer system and hardware 2. To explain computer memory, data representation and computer number systems. 3. To describe user interface and the fundamental concepts of programming. 4. To comprehend the concepts of operating system and networking. 5. To enumerate the basics of database and computer security.

Course Outcome	Upon completion of this course, the students will be able to 1. Discuss the fundamentals of computer system and hardware. 2. Outline the concept of memory management, data representation and solve number conversions. 3. Summarize the concepts of system software and Operating Systems and to Illustrate flowcharts. 4. Associate the basics of networks with the different network topologies and protocols. 5. Apply various memory management techniques.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	1	2	1	3	1	2
CO-2	2	3	-	2	1	2	2	2	1
CO-3	3	2	3	1	2	1	3	1	2
CO-4	3	3	3	-	1	1	2	1	1
CO-5	2	3	2	1	1	2	3	2	1
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: INTRODUCTION TO COMPUTERS (9)	
Introduction to Computers – Analog and Digital Computers – Generations of Computer – Classification of Computer – Basic Organization of Computer – Microprocessor-Inside a Computer Cabinet. **Practical component:** Assemble the parts of the computer. **Suggested Readings:** Computer Classification and organization	**CO-1** **BTL-2**
MODULE 2: I/O ,MEMORY AND DATA REPRESENTATION (9)	
Memory Representation – Memory Hierarchy – CPU Registers-Cache Memory – Primary Memory-Secondary Memory – Magnetic Tapes-Human Data Entry Devices-Output Devices-Number System-Logic Gates **Practical component:** Conversion of Binary, Octal, Decimal, and Hexadecimal Numbers. **Suggested Readings:** Recent standards in memory representation	**CO-2** **BTL-2**
MODULE 3: USER COMPUTER INTERFACE & PROGRAMMING DAMENTALS (9)	
Software - System Software - Application Software - Software Acquisition - Objectives of Operating System - Type of OS - Function of OS - Process Management - File Management - Memory Management - Device Management - Program Development Life Cycle - Algorithms - Flowchart - Pseudo Code - Programming Paradigms - Generation of Programming Languages. **Practical component:** Illustrate of flowcharts for different problems **Suggested Readings:** Recent Industry used Software Development Life Cycle models	**CO-3** **BTL-2**

Networks - Importance of Networking - Data Transmission and Media - Data Transmission Across Media - Switching - Network Types - Topologies - Protocols - Network Devices - History of Internet - Internetworking Protocol - Internet Architecture - WWW - Email - Telnet

Practical component:

Draw Client Server Architecture based on the topology.

Suggested Readings:

Network Protocols and its importance

		CO-4 **BTL-2**

MODULE 5: APPLICATIONS AND SECURITY		(9)

Information System - Need for Efficient Information System - Categories of Information System - Database - Database System - Database Management System - Database System Architecture - Elements of Multimedia - Multimedia Applications - Computer Security - Security Threat and Security Attack - Hacking - Cryptography - Digital Signature - Firewall - Security Awareness

Practical component:

Identify the types of threats/attack.

Suggested Readings:

Cyber Security and Awareness.

		CO-5 **BTL-3**

TEXT BOOKS	
1.	Anita Goel, "Computer Fundamentals", 2nd Edition, Pearson Education, 2012.

REFERENCE BOOKS	
1.	Norton Peter, "Introduction to Computers", 4th Edition, TMH, 2001.
2.	P. K. Sinha and PritiSinha , "Computer Fundamentals",6th Edition, BPB Publications ,2004.

E BOOKS	
1.	https://books.google.co.in/books?id=zyOYs2EqZDgC&lpg=PP1&pg= PA1#v=onepage&q&f=false

MOOC	
1.	https://www.coursera.org/specializations/introduction-computer-science- programming
2.	https://www.udemy.com/course/computer-fundamentals-k/

COURSE TITLE	PYTHON PROGRAMMING LAB			CREDITS	1
COURSE CODE	CAB0131	COURSE CATEGORY	PC	L-T-P-S	0-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
Continuous Internal Assessment				ESE	
80 %				20 %	

Course Description	The course will enable the students to write high level python programming and use them for various real time applications.
Course Objective	1. To implement simple Python programs. 2. To solve conditionals and loops concepts of python programming. 3. Use functions for structuring Python programs. 4. Represent compound data using Python lists, tuples, and dictionaries. 5. Read and write data from/to files in Python.
Course Outcome	Upon completion of this course, the students will be able to 1. Write, test, and debug simple Python programs. 2. Implement Python programs with conditionals and loops. 3. Develop Python programs step-wise by defining functions and calling them. 4. Apply the concepts of Python lists, tuples, dictionaries for representing compound data. 5. Write data from/to files in Python.

Prerequisites: NIL

CO, PO AND PSO MAPPING

PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	2	2	3	1	2	1	-	1	2
CO-2	3	3	2	1	1	1	3	2	1
CO-3	2	3	3	2	1	2	2	1	2
CO-4	3	-	2	1	2	1	3	2	1
CO-5	3	2	3	2	1	2	2	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS

1. a. Create a list and perform the following methods (insert, remove, append, len, pop, clear)

   b. Create a tuple and perform the following methods (Add items, len, check for item, Access items)
2. a. Write a python program to add two numbers.
   b. Write a python program to print a number is positive/negative using if-else.
   c. Write a python program to find largest number among three numbers.
   d. Write a python Program to read a number and display corresponding day using if_elif_else.
3. a. Write a python program to check whether the given string is palindrome or not.
   b. Write a python program to find factorial of a given number using functions
   c. Write a Python function that takes two lists and returns True if they are equal otherwise false

4. a. Write a python program to check whether the given string is palindrome or not.
    b. Write a python program to find factorial of a given number using functions
    c. Write a Python function that takes two lists and returns True if they are equal otherwise false
5. a. Write a program to double a given number and add two numbers using lambda().
    b. Write a program for filter() to filter only even numbers from a given list.
    c. Write a program for map() function to double all the items in the list.
6. a. Write a python program to open and write "hello world" into a file.
    b. Write a python program to write the content "hi python programming" for the existing file
7. a. Write a python program to display a particular month of a year using calendar module.
    b. Write a python program to print all the months of given year
8. a Write a python program to print date, time for today and now.
    b. Write a python program to add some days to your present date and print the date added.
    c. Write a python program to print date, time using date and time functions.
9. Write a python program which accepts the radius of a circle from user and computes the area (use math module).
10. Copy the contents of file 1 to file 2 and display the contents of the both in the screen 2.

TEXT BOOKS	
1.	Y. Daniel Liang, "Introduction to programming using Python", 1st Edition, Pearson Publication, 2012.
2.	Mark Lutz, "Learning Python", 4th Edition, Oreilly Publication, 2009.
REFERENCE BOOKS	
1.	David Beazley, "Python Essential Reference" 4th Edition, Person Education, 2009.
E BOOK	
1.	https://docs.python.org/3/tutorial/
MOOC	
1.	https://www.mooc-list.com/course/learn-python-fundamentals-python-programming-language-skillshare

COURSE TITLE	**INTERNET PROGRAMMING LAB**			**CREDITS**	**1**
COURSE CODE	**CAB0133**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**0-0-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**
ASSESSMENT SCHEME					
Continuous Internal Assessment					**ESE**
80%					**20%**
Course Description	This course will enable the student to develop skill in web programming including mark-up and scripting languages. This course introduces structures, object-oriented programming design, XHTML and concepts in JavaScript programming.				
Course Objective	1. To learn HTML tags and JavaScript Language programming concepts and techniques. 2. To develop the ability to logically plan and develop web pages. 3. To learn to write, test, and debug web pages using HTML and JavaScript. 4. To build tools that assist in automating data transfer over the Internet. 5. To compare the advantages and disadvantages of the core Internet protocols.				

	Upon completion of this course, the students will be able to
Course Outcome	1. Develop a dynamic webpage by the use of javascript and DHTML. 2. Experiment using a well-formed / valid XML document. 3. Develop a Java program that connects to a DBMS and performs insert, update and delete operations on the DBMS table. 4. Develop a server-side java application called Servlet to catch form data sent from client, process it and store it on database. 5. Apply a server-side java application called JSP to catch form data sent from the client and store it on the database.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	3	1	3	2	3
CO-2	2	1	1	-	2	3	2	3	2
CO-3	3	-	2	2	1	2	3	2	3
CO-4	2	3	1	1	2	2	-	3	2
CO-5	3	1	1	3	2	2	2	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF PROGRAMS

1. Web page creation using HTML 2. Web page creation with all types of Cascading style sheets 3. Client side scripts for validating web form controls using DHTML 4. Java programs to create applets 5. Programs in java using servlets 6. Programs in java to create three-tier applications using JSP and Databases 7. Programs using XML-schema-XSLT/XSL 8. Programs using AJAX 9. Implementation of web services and databases	**CO - 1,2,3,4,5** **BTL-3**

TEXT BOOKS

1. Thomas A Powell, " The Complete Reference- HTML and CSS", 5th Edition, McGraw Hill, 2010.

REFERENCE BOOKS

1. Steven M. Schafer, " HTML, XHTML, and CSS Bible", 5th Edition, Wiley, 2011.

E BOOKS

1. https://wtf.tw/ref/duckett.pdf

REFERENCE BOOKS

1. https://www.coursera.org/learn/html

SEMESTER-II

COURSE TITLE	STATISTICS AND PROBABILITY		CREDITS	4
COURSE CODE	MAA0117	COURSE CATEGORY	CF	L-T-P-S	3-1-0-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-4

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	In course , students learn the basics of statistical methods. This course introduces the concepts of correlation, regression and types of testing hypothesis.
Course Objective	1. To understand the fundamentals of Statistics Methods 2. To comprehend the concepts of Probability and distribution 3. To interpret simple correlation and Regression analysis 4. To describe sampling inference and testing of hypothesis 5. To gain knowledge on time series and forecasting problems in statistical data
Course Outcome	Upon completion of this course, the students will be able to 1. Deploy concepts of Statistics method to compute averages for statistics data 2. Identify probability value of real-life situation problem by using Probability and distribution concepts 3. Analyze casual relation between two variables by using correlation and regression methods 4. Illustrate significance difference between Null and Alternative Hypothesis for statistical data 5. Recognize the trends between two statistical data by using time series method and solution of forecasting problems.

CO, PO AND PSO MAPPING

CO	PO - 1	PO - 2	PO - 3	PO - 4	PO - 5	PO - 6	PSO - 1	PSO - 2	PSO – 3
CO – 1	2	2	1	1	1	1	3	1	1
CO – 2	2	1	1	1	1	-	3	1	1
CO – 3	3	2	1	1	1	1	3	1	1
CO – 4	2	1	-	1	1	1	3	-	1
CO - 5	3	2	1	1	1	1	3	1	1
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: STATISTICAL METHODS	
Introduction to statistics and Data collection – Summarizing and presenting statistical Data – Measures of central tendency – Measures of variation – Measures of skewness and kurtosis	**CO-1** **BTL-2**
MODULE 2: PROBABILITY AND DISTRIBUTION	
Introduction – Definition of Probability – Basic concepts – Addition law of probability or Theorem of total probability – conditional probability – Bayes' theorem. Random variable – MGF – Distributions - Binomial - Poisson – Uniform – Normal	**CO-1** **BTL-3**
MODULE 3: STATISTICAL METHODS	
Introduction – correlation analysis – simple correlation analysis – Rank correlation – Regression analysis	**CO-1** **BTL-4**
MODULE 4: STATISTICAL METHODS	
Introduction – Parameters & Statistics – Statistical Inference – Testing of Hypothesis – Null & alternative Hypothesis – LOS- Test of significance of large and small samples – student's t-distribution – Chi – square test – F- distribution.	**CO-1** **BTL-2**
MODULE 5: TIME SERIES AND FORECASTING	
Introduction – Parameters & Statistics – Statistical Inference – Testing of Hypothesis – Null & alternative Hypothesis – LOS- Test of significance of large and small samples – student's t-distribution – Chi – square test – F- distribution.	**CO-1** **BTL-3**
TEXT BOOKS	
1.	Richard I. Levin, David S. Rubin, " Statistics for Management ", Seventh Edition, Prentice – Hall of India, 2017.
2.	T. Veerarajan," Statistics", Third Edition, McGraw hill, 2008.
3.	Dr. B.S.Grewal, "Higher engineering Mathematics", Sixth Edition, Khanna publishers, 2017.

COURSE TITLE	DESIGN AND ANALYSIS OF ALGORITHMS		CREDITS	4
COURSE CODE	CAB0116	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-4

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	The course will enable the students to analyze various algorithms based on running time and to use them for various real time applications.
Course Objective	1. To gain knowledge on the running times of algorithms and its limitations. 2. To outline the limitations of all the algorithms. 3. To describe the algorithms for real time applications. 4. To summarize real word examples using graphs 5. To comprise various approximation algorithms
Course Outcome	Upon completion of this course, the students will be able to 1. Analyze the worst-case and average-case running times of algorithms. 2. Identify the limitations of algorithms in problem solving and use it to identify the completeness of algorithms. 3. Use the various algorithmic techniques and its real time applications. 4. Solve the real word problems using graphs. 5. Implement Approximation Algorithms.

Prerequisites: Data Structures

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	3	1	3	1	3	3	3	1	2
CO-2	2	2	1	2	3	2	-	2	1
CO-3	3	3	-	1	2	1	2	1	2
CO-4	-	2	1	3	1	2	3	2	1
CO-5	3	1	2	1	2	1	2	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	(6L+6P=12)

Fundamentals of Algorithmic Problem Solving - Sorting - Searching - Graphs - Analysis Framework- Asymptotic Notations and Basic Efficiency Classes- Analysis of Recursive and Non-recursive algorithms. **Practical component:** 1. Calculate the complexity of algorithms.	CO-1 BTL-4

MODULE 2: BRUTE FORCE & DIVIDE-AND-CONQUER	(6L+6P=12)

Brute Force - Travelling Salesman Problem, Knapsack Problem, Assignment Problem. Divide and Conquer Approach - Binary Tree Traversals, Multiplication of large Integers, Strassen's Matrix Multiplication. **Practical component:** 1. Solve problems using brute force approach and analyze its complexity 2. Solve problems using divide and conquer approach and analyze its complexity	**CO-2** **BTL-3**

MODULE 3: DYNAMIC PROGRAMMING	(6L+6P=12)

Dynamic Programming - Warshall's and Floyd's algorithm - Optimal Binary Search Trees-Memory Functions. **Practical component:** 1. Solve problem using dynamic programming approach and analyze its complexity	**CO-3** **BTL-3**

MODULE 4: GREEDY TECHNIQUE AND GRAPH ALGORITHMS	(6L+6P=12)

Representing Graphs - Breadth First Search (BFS) - Depth First Search (DFS) - Single source shortest path - Dijkstra's algorithm - Prim's algorithm - Kruskal's algorithm **Practical component:** 1. Solve problem using Greedy approach and analyze its complexity 2. Implement Single source shortest path algorithm and Analyze its complexity	**CO-4** **BTL-3**

MODULE 5: BACKTRACKING AND APPROXIMATION ALGORITHMS	(6L+6P=12)

Backtracking - n Queen's problem - Hamiltonian Circuit Problem - Subset-Sum Problem - Branch and Bound - Approximation Algorithms -Travelling Salesman Problem, Knapsack Problem. **Practical component:** 1. Implement Approximation algorithms for Traveling salesman problem and analyze its complexity 2. Implement Approximation algorithms for Knapsack problem and analyze its complexity	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2017.

REFERENCE BOOKS	
1.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, " Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, " Data Structures and Algorithms", Pearson Education, First Edition, 2006.

E BOOKS	
1.	https://edutechlearners.com/download/Introduction_to_algorithms-3rd%20Edition.pdf

MOOC	
1.	https://www.coursera.org/learn/analysis-of-algorithms
2.	https://www.coursera.org/lecture/algorithms-part1/analysis-of-algorithms- introduction-xaxyP

COURSE TITLE	2D GAME DESIGN			CREDITS	3
COURSE CODE	CAB0120	COURSE CATEGORY	PC	L-T-P-C	2-0-2-1
VERSION	1.0	Approval Details	XX ACM, XX.XX.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Component		ESE
15%	15%	20%		50%

Course Description	This course aims to focus on the design and development of 2D games, working with 2D, 2D game design pipeline, 2D environment and 2D background, and different UI patterns. It introduces all the components of game development and Navigation. The course is intended to bridge the rich talent pool in engineering academia, with the vast gaming industry
Course Objective	1. To understand the different types of games and navigations 2. To become creative and competent to work with 2D Character and vector graphics 3. To Create Storyboards, paper prototype of your game and game design document 4. To be able to work in a challenging work environment and solve complex problems related to the field of the study. 5. To understand the different UI patterns
Course Outcome	Upon completion of this course, the students will be able to 1. Develop any Gaming Project with the different gaming components. 2. Demonstrate on the workflow of 2D game design. 3. Illustrate game publishing and game testing. 4. Apply 2D environment and 2D background for Designing 2D Characters. 5. Prepare different case studies on UI patterns

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	2	3
CO-2	-	1	1	1	1	1	2	-	2
CO-3	3	3	2	2	3	3	3	2	3
CO-4	2	3	1	1	2	-	2	3	2
CO-5	3	1	1	3	2	1	2	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO 2D GAME DESIGN	(6L+3P=9)
Game development - Different types of game and use cases - FPS, RPG, Racing, Fighting, Casual, Money, Spinner, Casino, Massively Multiplayer Online (MMO). Simulations. Adventure - Real Time Strategy (RTS) - Puzzle, Action - Stealth Shooter, Combat. Revert Settings - Launching Your First Project - Importing a Project - Switching Between Projects - Customizing the UI – Navigation - Manipulating Objects - Position Game Objects - Place Light Probes. **Practical component:** 1. Create a design for puzzle game **Suggested Readings:** History of Gaming	CO-1 BTL-3
MODULE 2: WORKING 2D	(6L+3P=9)
2D characters - Characters from Different Countries and Styles - Asian characters vs. Western characters - Making sprites - Working with vector graphics. **Practical component:** 1. Story broad creating for a racing game **Suggested Readings:** Unity production basic	CO-2 BTL-3
MODULE 3: 2D GAME DESIGN PIPELINE	(6L+3P=9)
The market - The audience - The platforms where to publish the game - The competitor - Define the story - Create timelines - Storyboards - Level Design - Game play mechanics - Costs of the game - Making and maintenance- Create a game design document. **Practical component:** 1. Create a prototype of a tic tac game. **Suggested Readings:** Vector Math in game development	CO-2 BTL-3
MODULE 4: 2D ENVIRONMENT AND 2D BACKGROUND	(6L+3P=9)
2D environment - Form and Shape, Anatomy and Proportions, Perspective, Breaking Down Color, Lighting and Shading.2D background - Form and Shape - Anatomy and Proportions- Perspective - Breaking Down Color - Lighting and Shading - 2D Character Design – Primitives – Textures - creating face – expressions – anatomy - body parts - cartoon making. **Practical component:** 1. Create a 2D toy character with suitable animation effects **Suggested Readings:** Level Design for Games **Suggested Readings:** Frameworks of HTML Game Development	CO-4 BTL-4

MODULE 5 UI – DIFFERENT UI PATTERNS	(6L+3P=9)
Introduction - UI and UX - What Does a Good UI Do? - Case study – Games - With Poor UIs-bad and good cases - Success rates and compilation - Oblivion- case study - Far Cry 3 - case study - Mortal Kombat X- Case Study - Fight of the legends - case study. 2D Platformer – Build with assets. **Practical component:** 1. Create a test plan for testing a board game **Suggested Readings:** Game physics	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Adams, " Fundamentals of Game Design", Third edition , New Riders Publication, 2015.

REFERENCE BOOKS	
1.	Chris Solarski, " Drawing Basics and Video Game Art: Classic to Cutting-Edge Art Techniques for Winning Video Game Design", First Edition, Watson – Guptill Publication, 2012.
2.	Alan Thorn, "Introduction to Game Programming with C++",BPB Publications, First Edition, 2007.

E BOOKS	
1.	https://www.gamedesigning.org/learn/game-physics/

MOOC	
1.	https://www.udemy.com/unitycourse
2.	https://www.coursera.org/learn/game-design

COURSE TITLE	INTRODUCTION TO GAME THEORY AND DEVELOPMENT			CREDITS	3
COURSE CODE	CAB0121	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course covers an introduction to the game theory and development. The students are able to learn the fundamental theory of games and strategic thinking, Ideas such as dominance, backward induction, Nash equilibrium, commitment, credibility, asymmetric information, and reputation.
Course Objective	1. To understand the fundamentals of game theory. 2. To learn the different theories of strategic thinking in the game theory. 3. To gain the knowledge on the methods right from algorithmic game theory to the modelling and analysis of real-world problems. 4. To apprehend the structure of the game development. 5. To use different game development essentials for developing stories and characters.
Course Outcome	Upon completion of this course, the students will be able to 1. Summarize the fundamentals of game theory and concepts. 2. Explain the different models of games and strategic thinking.

3. Illustrate various application areas of computer science where game theoretical models are relevant.
4. Apply real-world problems in game theory and development
5. Recognize the structure of the game development industry wherein understanding various game development techniques.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	1	1	1	-	1	3	2	3
CO-3	3	3	2	2	3	3	3	3	2
CO-4	2	-	1	1	2	3	2	2	3
CO-5	3	1	1	3	2	1	2	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO GAME THEORY	(9)

Introduction: What is game theory - An outline of the history of game theory - John von Neumann - The theory of rational choice. **Suggested Readings:** Fundamental of game theory	CO-1 BTL-2

MODULE 2: GAMES WITH PERFECT INFORMATION	(9)

Games with Perfect Information - Nash Equilibrium – Theory - Strategic games - Example: the Prisoner's Dilemma - Bach or Stravinsky - Matching Pennies - The Stag Hunt - Nash equilibrium - John F. NashBB- Studying Nash equilibrium experimentally - Examples of Nash equilibrium - Equilibrium in a single population - Symmetric games and symmetric equilibria - Nash Equilibrium: Illustration - Cournot's model of oligopoly - Bertrand's model of oligopoly. **Suggested Readings:** Strategic games and symmetric games	CO-2 BTL-2

MODULE 3: MIXED STRATEGY EQUILIBRIUM	(9)

Introduction: Some evidence on expected payoff functions - Strategic games in which players may randomize - Mixed strategy Nash equilibrium - Dominated actions - Pure equilibria when randomization is allowed – Illustration: expert diagnosis - Equilibrium in a single population - Illustration: reporting a crime - The formation of players' beliefs. **Suggested Readings:** Practices on strategic equilibrium and illustrations	CO- 3 BTL-3

MODULE 4: EXTENSIVE GAMES WITH PERFECT INFORMATION	(9)

Introduction - Strategies and outcomes - Nash equilibrium - Subgame perfect equilibrium - Finding subgame perfect equilibria of finite horizon games - Backward induction - Extensive Games with Perfect Information - The ultimatum game and the holdup game - Experiments on the ultimatum game - Stackelberg's model of duopoly - Buying votes - A race - Extensive Games with Perfect Information - Extensions and Discussion.	CO-4 BTL-3

Suggested Readings:	
Games with perfect information like theory and illustration	

MODULE 5: THE GAME DEVELOPMENT	(9)
About game development essentials: An introduction - Historical elements - Platforms and player modes - Goals and Genres - Player elements - Story and character development - Creating the narrative. **Suggested Readings:** Story and character development	CO-5 BTL-3

TEXT BOOKS	
1.	Martin J. Osborne, "An Introduction to Game Theory",First Edition, New York: Oxford University Press, 2004.
2.	Jeannie Novak, "Game Development Essentials: An Introduction", Third edition, Cengage Learning, 2012.

REFERENCE BOOKS	
1.	Steven Tadelis, "Game Theory: An Introduction", Princeton University Press, 2013.
2.	John Von Neumann, "Theory of Games and Economic Behavior", 60th Anniversary Commemorative Edition, Princeton University Press ,2007.

E BOOKS	
1.	http://ommolketab.ir/aaf-lib/yc12x5u5f3haaeea3h8iepvwd7142n.pdf

MOOC	
1.	https://www.coursera.org/learn/game-theory-1
2.	https://online.stanford.edu/courses/soe-ycs0002-game-theory

COURSE TITLE	ELEMENTS OF DESIGN			CREDITS	3
COURSE CODE	CAB0123	COURSE CATEGORY	PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-4

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course introduces the concept of design fundamentals, including exercises in figure-ground relationships, color interaction, line, texture, shape, scale, balance, rhythm, emphasis, and organization of elements in the 2D plane, this course develops perceptual skills, sensitivity, creative awareness, and the technical ability necessary to handle a variety of design media.
Course Objective	1. To learn about color interaction, line, texture, shape, scale, balance and rhythm 2. To understand organization of elements in the 2-D Plane 3. To comprehend the basic 2D games 4. To apprehend 3D game world and interactions 5. To perform game testing and reporting
Course Outcome	Upon completion of this course, the students will be able to 1. Distinguish different game models with respect to perceptual skills, sensitivity, Creative, Awareness and Technical Ability

2. Outline the player theories with the different types of player models
3. Analyze standard Game Testing techniques and develop reports.
4. Carry out Game Testing on different game platforms
5. Create 3D Games world and Interactions

Prerequisites: Experience in writing Computer Code

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	1	1	2	3	2	3
CO-2	2	3	3	2	3	-	2	3	2
CO-3	3	1	2	1	1	2	3	2	3
CO-4	2	-	3	2	2	1	2	-	2
CO-5	3	3	1	1	1	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: ELEMENTS	(9)

Design Process - Games as Machines - Game Design Is User-Centered- Motivating Example: Poker - Model Description - Designer's Role - Designer's Process -Player's Experience - Elements of Games Outside This Model - The Practice of Game Design - Game Design, Systems Design, Content Design - Discipline Interactions	**CO-1 BTL-2**

MODULE 2: PLAYER EXPERIENCE	(9)

Experience Is Relative -What Do You Enjoy? - Building a Naive Taxonomy - Player Theories - Designer Theories -The Bartle Model -The Koster Model - User Personas - Empirical Models - The Big Five Personality Model -Yee's Gamer Motivation Profiles -Player Motivations and the Big Five - Experience Design -Questions to Guide Experience Design - Experience Archetypes and Genres	**CO-2 BTL-3**

MODULE 3: PROTOTYPING AND PLAYTESTING	(9)

Motivating Example: Project Highrise - Production Stages - Game Concept - Understanding the Game Idea - Understanding the Market - Forming a Game Pitch - From Concept to Prototyping: Kelly Guidelines - Prototyping - Playable Prototypes - Iterative Process - Playtesting - Documenting Design - Finishing Iteration -Production and Beyond -Ideas for Student Prototyping -Shorter Production Cycle - Scaling Prototyping Scope - Supporting Portfolio Development	**CO-3 BTL-4**

MODULE 4: DEVELOPMENT PROCESS	(9)

Development teams - Game designer – Game artist – Game Concepts -Design -Prototype – Testing **Suggested Readings:** Frameworks of HTML Game Development	**CO-4 BTL-2**

MODULE 5: ISSUES	(9)
Different Game Issues – Board Games – Card Games -Dice Games -Casion Games -Role Playing games – Sports – Video Games – War Games - Game Testing- Combinatorial Testing - Clean Room Testing - Functionality Testing - Compatibility Testing - Regression Testing - Ad hoc Testing – Playtesting. **Suggested Readings:** Game mechanics and Game Testing.	CO-5 BTL-2

TEXT BOOKS	
1.	Robert Zubek. "Elements of game design". First Edition, MIT Press, 2020.

REFERENCE BOOKS	
1.	Schultz, C. P. and Bryant, R. D, " Game testing: All in one". Second Edition, Stylus Publishing, LLC, 2016.

E BOOKS	
1.	https://www.w3schools.com/html/
2.	http://html5gamedevelopment.com/

MOOC	
1.	https://www.coursera.org/learn/game-theory-1
2.	https://www.edx.org/course/html5-apps-and-games

COURSE TITLE	GAME DESIGNING LAB			CREDITS	1
COURSE CODE	CAB0143	COURSE CATEGORY	PC	L-T-P-S	0-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

Continuous Internal Assessment		ESE
80%		20%

Course Description	Creating video games is an endeavor that lies at the merger of two main disciplines, viz., computer programming and creating artwork. This course aims to focus on the former aspect via design and development of 2D games. The course will introduce all these components of game development in a hands-on manner wherein the students will write a 2D game as part of lab exercises.
Course Objective	1.To gain knowledge on the workflow for creating 2D video games. 2. To understand different types/genres of video games and the components thereof. 3. Description of game engines, e.g., Unity. 4.To comprehend the usage of subcomponents of game engines such as graphics, physics and audio engines. 5. To have knowledge on writing scripts for controlling the behavior of different game components.

	Upon completion of this course, the students will be able to
Course Outcome	1. Apply the workflows for creating 2D video games.
	2. Distinguish different types/genres of video games and the components thereof.
	3. Hands-on experience with game engines, e.g., Unity.
	4. Know the usage of subcomponents of game engines such as graphics, physics and audio engines.
	5. Write scripts which control the behavior of different game components.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	1	1	1	1	-	3	2	3
CO-3	3	-	2	2	3	3	3	3	2
CO-4	2	3	1	1	2	3	-	2	3
CO-5	3	1	1	3	2	1	2	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF PROGRAMS

1. Installation of a game engine, e.g., Unity, familiarization of the GUI 2. Conceptualize the theme for a 2D game. 3. 2D Game development with character design, sprites and movements. 4. Level design: design of the world in form of tiles along with interactive and collectible objects. 5. Design of interaction between the player and the world, optionally using the physics engine.	**CO-1** **BTL-3**

TEXT BOOKS

1.   Nystrom Robert, " Game Programming Patterns", Third edition- Genever Benning, 2014.

REFERENCE BOOKS

1.	Paris Buttfield, "Unity Game Development Cookbook: Essentials for Every Game" First Edition, O'Reilly Media, 2019

COURSE TITLE		**DIGITAL ART LAB**		**CREDITS**	**1**
COURSE CODE	CAB0144	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**0-0-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**

ASSESSMENT SCHEME

Continuous Internal Assessment	**ESE**
80%	**20%**

Course Description	Students will develop skills in both analog and digital processes to work across disciplines and develop a portfolio of work that represents their personal voice and demonstrate the technical, critical, and analytical skills required in the career field.

	Upon completion of this course, the students will be able to:
Course Objective	1. To work with animation, models, character design. 2. To create environment art, texture art, concept art, storyboard art, lighting art and roto art. 3. To develop animation with motion graphics art. 4. To implement in level designer, gameplay designer. 5. To use interactivity, cut animations and apply creativity.
Course Outcome	1. Identify and apply strategies to improve and succeed their initial skills. 2. Solve problems and learn from creative risks by using people skills, design principles, and processes. 3. Deploy inspiration in fields outside of digital media. 4. Develop a professional commitment to their field, their work, and themselves. 5. Demonstrate an attitude of openness so that they seek new and unusual opportunities to learn and create.

Prerequisites: None

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	-	1	1	1	1	-	2	1
CO-3	3	3	2	2	3	3	3	3	3
CO-4	2	3	1	-	2	3	2	2	2
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

Lab Component: Adobe Photoshop, Flash

1. Motion Tweening 2. Shape Tweening 3. Working on Layers 4. Masking Effect 5. Bouncing 6. Fade-in, Fade-out and Zoom-in, Zoom-out 7. Blur 8. Ripple Effect 9. Sparkling Glass Effect & Photo Slide-Show	**CO-1,2,3,4 BTL-1,2,3**

TEXT BOOKS

1.	Faulkner Andrew, Chavez Conrad, "Adobe Photoshop CC Classroom ", Pearson Education, First Edition,2017.

REFERENCE BOOKS / E Link

1.	https://www.photoshopessentials.com/

MOOC

1.	https://www.mooc-list.com/tags/photoshop

COURSE TITLE	OPERATING SYSTEMS			CREDITS	3
COURSE CODE	CAB0206	COURSE CATEGORY	PC	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE	
15%	15%	20%		50%	

Course Description	An operating system is a system software that manages computer hardware, software resources and provides common services for computer programs. This course covers the basic and advanced concepts of operating system such as operating system components, CPU scheduling algorithms, Deadlocks and file organization techniques.
` Course Objective	1. To describe and explain the fundamental components of a computer operating system. 2. To define, restate, discuss, and explain the policies for CPU scheduling 3. Describe reasons for using interrupts, dispatching, and context switching to support concurrency in an operating system 4. To identify the relationship between the physical hardware and the virtual devices maintained by the operating system 5. To compare and contrast different approaches to file organization, recognizing the strengths and weaknesses of each.
Course Outcome	Upon completion of this course, the students will be able to 1. Illustrate the basic functionalities of operating systems. 2. Demonstrate the concepts of process management and deadlocks. 3. Implement different memory allocation techniques. 4. Implement File systems and disk I/O techniques 5. Apply the techniques for accessing remote files.

Prerequisites: Computer organization

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	3	2	2	1	1	1	2	1	1
CO-2	3	2	2	-	1	1	2	1	1
CO-3	-	2	2	1	1	1	-	1	1
CO-4	3	2	2	1	1	1	2	1	1
CO-5	3	2	2	1	1	1	2	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE: INTRODUCTION	(6L+3P=9)
Introduction - Computer System Organization - Computer System Architecture Computer System Structure - Operating System Operations - Process Management - Memory Management - Storage Management - Distributed Systems - Operating System Services - User Operating System Interface - System Calls - Types of System calls - System Programs - Process Concept - Process Scheduling -Operations on Processes - Inter-process Communication. **Practical component:** 1. CPU scheduling algorithms to find turnaround time and waiting time. 2. Simulate Bankers algorithm for the purpose of deadlock avoidance. **Suggested Readings:** CPU Scheduling algorithms , Deadlock Prevention and Detection	**CO-1** **BTL-3**

MODULE 2: PROCESS MANAGEMENT AND COORDINATION	(6L+3P=9)
Process Concept - Operations on Processes - Interprocess Communication Threads - Multithreading Models - Process Scheduling - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multiple-Processor Scheduling - Synchronization - The Critical-Section Problem - Peterson's Solution - Semaphores - Deadlocks - System Model - Deadlock Characterization - Methods for handling Deadlocks - Deadlock Prevention - Deadlock avoidance- Deadlock detection - Recovery from Deadlock. **Practical component:** 1.Implement the Producer – Consumer problem using semaphores. **Suggested Readings:** CPU Scheduling algorithms , Deadlock Prevention and Detection	**CO-1** **BTL-3**

MODULE 3: MEMORY MANAGEMENT	(6L+3P=9)
Memory - Management Strategies – Swapping - Contiguous Memory allocation - Paging Segmentation - Virtual Memory Management - Demand Paging - Copy on Write - Page Replacement - Allocation of frames - Thrashing - Memory Mapped Files - Allocating Kernel Memory **Practical component:** 1. Contiguous memory allocation techniques – a) Worst-fit b) Best-fit c) First-fit **Suggested Readings:** Virtual Memory Management	**CO-3** **BTL-3**

MODULE 4: STORAGE MANAGEMENT	(6L+3P=9)
File Concept - Access Methods - Directory and Disk Structure - File System Structure - File System Implementation - Directory Implementation - Allocation Methods - Free-Space Management - Recovery - Disk Structure - Disk Attachment - Disk Scheduling - Disk Management - Swap Space Management - RAID Structure - Stable Storage Implementation - Tertiary Storage Structure **Practical component:** 1. Simulate the file allocation strategies 2. Implementation of file organization techniques **Suggested Readings:** File Management system, Directory and Disk Structure	**CO-4** **BTL-3**

MODULE 5: DISTRIBUTED SYSTEMS	(6L+3P=9)
Advantages of Distributed Systems -Types of Network based Operating Systems - Network Structure - Network Topology - Communication Structure - Communication Protocols - Robustness - Design Issues - Naming and Transparency - Remote File Access - Stateful versus Stateless Service - File Replication **Practical component:** 1. Implementation of Remote file Access **Suggested Readings:** Distributed Operating Systems, Distributed File Systems	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", Tenth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2018.

REFERENCE BOOKS	
1.	Stallings, William. "Operating Systems", Fifth Edition. Pearson Education India, 2006..

E BOOKS	
1.	http://www.freebookcentre.net/CompuScience/Free-Operating-Systems-Books- Download.html

MOOC	
1.	https://www.coursera.org/courses?query=operating%20system

COURSE TITLE	DATABASE MANAGEMENT SYSTEMS			CREDITS	3
COURSE CODE	CAB0207	**COURSE CATEGORY**	PC	**L-T-P-S**	**2-0-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**

ASSESSMENT SCHEME			
First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course gives a detail understanding about the basics of database management system, to develop queries and implement it, to know about form generation and report generation, transaction management, concurrency control during the data base transaction, client server and distributed architectures.
Course Objective	1. To understand the basics of data base system 2. To learn Query Basics and SQL commands 3. To comprehend the concepts of storage structures, form design, usage of report 4. To apprehend the concepts of transaction management and recoverability 5. To gain knowledge on database architecture, directory system and network types.

		Upon completion of this course, the students will be able to
Course Outcome		1. Create a normalized data base for an organization.
		2. Implement and test data base queries for any real time data bases.
		3. Formulate and design forms and reports for database applications.
		4. Apply transactional management and concurrency control for a database transaction.
		5. Recognize the features of client server architecture, distributed architecture, directory system and network types

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PSO -1	PSO -2	PSO -3
CO-1	2	2	1	1	1	1	3	1	1
CO-2	2	2	1	1	-	1	3	1	1
CO-3	2	-	1	1	1	1	3	1	1
CO-4	2	2	1	1	1	1	3	-	1
CO-5	2	2	1	1	1	1	3	1	1

1: Weakly related, 2: Moderately related and 3: Strongly Related

MODULE 1: INTRODUCTION TO DATA BASE MANAGEMENT SYSTEM	**(6L+3P=9)**
Advantages and Components of a Database Management Systems - Feasibility Study – Class Diagrams - Data Types - Events - Normal Forms - Integrity - Converting Class Diagrams to Normalized Tables - Data Dictionary. **Practical Component** Table creation for student details with primary key constrain **Suggested Readings:** Database Management System, Normalization, Data Integrity	**CO-1 BTL-3**
MODULE 2: QUERIES AND SUBQUERIES	**(6L+3P=9)**
Query Basics - Computation Using Queries - Subtotals and GROUP BY Command - Queries with Multiple Tables - Subqueries - Joins - DDL & DML - Testing Queries. **Practical component:** Execute DML queries using sqlserver. **Suggested Readings:** SQL, Applications of SQL, Table constraints	**CO-2 BTL-3**
MODULE 3: FILE STORAGE, FORMS AND REPORTS	**(6L+3P=9)**
Storage and File Structure - RAID - File Organisation - Indexing and Hashing - B Tree - B Tree Index files - Static and Dynamic Hashing - Effective Design of Forms and Reports - Form Layout - Creating Forms - Graphical Objects - Reports - Procedural Languages - Data on Forms- Programs to Retrieve and Save Data. **Practical Component** Create a binary tree for the values 45, 15, 79, 90, 10, 55, 12, 20, 50 **Suggested Readings:** Raid methods, Indexing, forms, reports	**CO-3 BTL-3**

MODULE 4: TRANSACTION & CONCURRENCY CONTROL	(6L+3P=9)
Transaction Management – Implementation of Atomicity and Durability – Serializability – Recoverability – Concurrency Control – Dead Lock Handling – Recovery System – Buffer Management. **Practical Component** Checking the serializability of a set of transactions **Suggested Readings:** Deadlock handing, transaction, concurrency control	**CO-4** **BTL-3**

MODULE 5: DATABASE ARCHITECTURE & DISTRIBUTED DATABASE	(6L+3P=9)
Database – System Architecture – Client Server – Architectures – Parallel System – Network Types – Distributed Database – Homogeneous and Heterogeneous Database – Directory System – Case Study – Oracle – MSSQL Server. **Practical Component** Draw the architecture diagram of various client server architectures **Suggested Readings:** Client server architecture, DBMS security, Distributed DBMS resources	**CO-5** **BTL-3**

TEXT BOOKS

1.	A. Silberschatz, H.F. Korth and S. Sudharshan, "Database System Concepts" , Fifth Edition, Tata McGraw Hill, New Delhi, 2006.
2.	G. V. Post, "Database Management Systems Designing and Building Business Application" , McGraw Hill International edition, 1999.

REFERENCE BOOKS

1.	J. D. Ullman, "Principles of Database Systems", Galgotia Publishers, Second Edition, New Delhi, 1988
2.	C.J. Date, An Introduction to Database Systems, Third Edition, Narosa, New Delhi, 1985

E BOOKS

1.	https://www.amazon.com/Database-Management-Systems-Raghu- Ramakrishnan /dp/0072465638

MOOC

1.	https://www.coursera.org/learn/core-database
2.	https://swayam.gov.in/courses/4598-database-and-content-organisation

COURSE TITLE	HTML 5 GAMING FRAMEWORK			CREDITS	4
COURSE CODE	CAB0208	**COURSE CATEGORY**	PC	**L-T-P-S**	3-1-0-1
Version	1.0	**Approval Details**	XX ACM, XX.XX.2022	**LEARNING LEVEL**	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project**	**Surprise Test / Quiz**	**Attendance**	**ESE**
15%	15%	10%	5%	5%	50%

Course Description	This course aims to focus on game development using HTML, CSS and JavaScript. This course will help to create interactive 2D and 3D games. This course also helps to learn various game testing methodology.
Course Objective	1. To gain Knowledge on developing animations using HTML and CSS 2. To familiarize with OOP Concepts in JavaScript 3. To design basic 2D game using HTML, CSS and JavaScript 4. To develop 3D interactive games with HTML, CSS and JavaScript. 5. To use standard Game Testing techniques and develop reports.
Course Outcome	Upon completion of this course, the students will be able to 1. Implement scripts using HTML & CSS for game animations. 2. Demonstrate game environment using OOP in JavaScript. 3. Develop basic 2D games with HTML, CSS and JavaScript. 4. Create 3D game world and interactions. 5. Hands on experiment with game testing and reporting.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	-	2	3
CO-2	2	-	1	1	1	1	3	3	3
CO-3	3	3	2	2	3	3	3	3	3
CO-4	2	3	1	1	2	-	2	1	2
CO-5	3	1	1	3	2	1	2	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO HTML CSS	(6L+6P=12)

The Evolution of HTML, Need for DOM, HTML 5 Tags - Semantic Tags, useful tags - Template pages – Images- Hyperlink s- Multimedia-Tables – Accessibility - Validating the webpage - Hosting a page, Working on Cpanel. Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – CSS Animations - Working with Sound, Video, and Animation - Understanding Codecs and Containers, Understanding Plug-Ins. **Practical component:** Design animations using HTML 5 and CSS.	CO-1 BTL-2

MODULE 2: INTRODUCTION TO JAVA SCRIPT	(6L+6P=12)

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements - Functions - Objects - Array, Date and Math related Objects, Event Handling - Controlling Windows & Frames and Documents - Form handling and validations - Introduction-Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - jQuery and AJAX. **Practical component:** Create interactive designs with HTML, CSS and JavaScript	CO-2 BTL-2,3

MODULE 3: INTRODUCTION TO GAME PROGRAMMING	(6L+6P=12)
Game Introduction – Canvas – Components – Controllers – Obstacles – Game Scores – Multimedia – Images, Sound – Game Gravity, Bouncing – Rotation & Movement. **Practical Component:** Create a simple 2D Car game with a controller - UP, Down, Left and Right.	**CO-3** **BTL-3**
MODULE 4: GAME WORLD AND INTERACTION	(6L+6P=12)
Introduction to HTML Game Frameworks – Understanding 2D & 3D platforms, Creating a Basic Game World - Physics Engine Basics - Integrating the Physics Engine - Creating a Mobile Game - Creating the RTS Game World - Intelligent Unit Movement- Adding Game Elements. **Practical Component:** Create a simple 3D game with Interactive environment	**CO-4** **BTL-3**
MODULE 5: GAME DEVELOPMENT AND TESTING	(6L+6P=12)
Game mechanics, rules and challenges - Playtesting, balancing and level design - Prototyping and Pitching – UI Designing - Materials and Shaders - Optimizing Runtime Performance - Collision Detection. Game Testing - Combinatorial Testing - Clean Room Testing - Functionality Testing - Compatibility Testing - Regression Testing - Ad hoc Testing – Playtesting. **Practical component:** Perform various testing on the developed game and submit a test report.	**CO-4** **BTL-3**

TEXT BOOKS	
1.	Russell. S and Norvig. P, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall 2009.
2.	Bratko. I, "Prolog: Programming for Artificial Intelligence", Fourth Edition, Addison- Wesley Educational Publishers Inc., 2011.

REFERENCE BOOKS	
1.	Tim Jones. M, "Artificial Intelligence: A Systems Approach (Computer Science) ",First Edition, Jones and Bartlett Publishers Inc, 2008.
2.	William F. Clocksin and Christopher S Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
3.	Gerhard Welss, "Multi Agents Systems", Second Edition, 2013.

E BOOKS	
1.	https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern approach. 9780131038059.25368.pdf

MOOC	
1.	https://www.coursera.org/learn/html
2.	https://www.edx.org/course/cs50s-introduction-to-game-development

COURSE TITLE	INTERACTIVE GRAPHICS AND GAMES				CREDITS	3
COURSE CODE	CAB0209	COURSE CATEGORY		PC	L-T-P-S	3-0-0-1
Version	1.0	Approval Details		XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course will examine real-time rendering of high-quality interactive graphics. Applications such as video games, simulators, and virtual reality have recently become capable of near cinematic-quality visuals at real-time rates. We will study the advances in graphics hardware and algorithms that are making this possible.
Course Objective	1. To introduces the basic concepts of computer graphics 2. To provides the necessary theoretical background and demonstrates the application of computer science to graphics 3. To develop programming skills in computer graphics through programming 4. To Classical and Computer Viewing 5. To Learn multimedia authoring tools
Course Outcome	Upon completion of this course, the students will be able to 1. Illustrate the fundamental graphic system and models. 2. Demonstrate Programming with Two-Dimensional Applications and concepts. 3. Implement the Scalars, Points, and Vectors and three-Dimensional Primitives. 4. Apply Parallel Projections, Perspective Projections techniques. 5. Develop features of Lighting Model.

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	2
CO-2	2	1	-	1	1	1	3	2	3
CO-3	3	3	2	2	3	3	3	3	2
CO-4	-	3	1	1	2	-	2	3	3
CO-5	3	1	1	3	2	1	2	2	2
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: GRAPHICS SYSTEMS AND MODELS	(9)
Applications of Computer Graphics - A Graphics System-Images: Physical and Synthetic-Imaging Systems -The Synthetic-Camera Model - The Programmer's Interface-Graphics Architectures-Programmable Pipelines-Performance Characteristics.	**CO-1** **BTL-3**

MODULE 2: GRAPHICS PROGRAMMING	(9)
The Sierpinski Gasket - Programming Two Dimensional Applications - The OpenGL Application Programming Interface - Primitives and Attributes – Color Viewing Control Functions - The Gasket Program - Polygons and Recursion - The Three-Dimensional Gasket - Adding Interaction – Menus	**CO-2** **BTL-3**

MODULE 3: GEOMETRIC OBJECTS AND TRANSFORMATIONS	(9)
Scalars, Points, and Vectors - Three-Dimensional Primitives - Coordinate Systems and Frames - Frames in OpenGL - Matrix and Vector Classes - Modeling a Colored Cube - Affine Transformations - Translation, Rotation, and Scaling - Transformations in Homogeneous Coordinates - Concatenation of Transformations - Transformation Matrices in OpenGL - Spinning of the Cube - Interfaces to Three - Dimensional Applications	**CO-3** **BTL-3**

MODULE 4: VIEWING	(9)
Classical and Computer Viewing - Viewing with a Computer - Positioning of the Camera - Parallel Projections - Perspective Projections - Perspective Projections with OpenGL-Perspective - Projection Matrices - Hidden-Surface Removal - Displaying Meshes	**CO-4** **BTL-3**

MODULE 5: LIGHTING AND SHADING	(9)
Light Sources - The Phong Reflection Model - Computation of Vectors - Polygonal Shading - Specifying Lighting Parameters - Implementing a Lighting Model – Per Fragment Lighting	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Edward Angel, "Interactive Computer Graphics- A Top-Down Approach with Shader-Based OpenGL",Sixth Edition, Pearson Publication, 2012.

REFERENCE BOOKS	
1.	Shreiner Angel, "Interactive Computer Graphics", Sixth Edition, 2016.
2.	Kelvin Sung, Peter Shirley , "Essentials of Interactive Computer Graphics Concepts and Implementation", First Edition, Steven Baer publication, 2008.

E BOOKS	
1.	https://www.gettextbooks.com/isbn/9780133574845/InteractiveComputer Graphics.pdf

MOOC	
1.	https://www.edx.org/course/computer-graphics-2
2.	https://www.coursera.org/learn/interactive-computer-graphics

COURSE TITLE		WEB DESIGNING LAB		CREDITS	1
COURSE CODE	CAB0233	COURSE CATEGORY	PC	L-T-P-S	0-0-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

Continuous Internal Assessment	ESE
80 %	20 %

Course Description	Unity is a cross-platform game engine initially released by Unity Technologies. The focus of Unity lies in the development of both 2D and 3D games and interactive content.
Course Objective	In this lab, we will be able : 1. To learn the fundamentals concepts of Unity 2. To understand the working of the game engine 3. To understand the basic concepts of game design 4. To create and build actual sample games 5. To deploy projects in the market
Course Outcome	Upon completion of the course, students will be able to 1. Illustrate various fundamentals of Unity 2. Demonstrate working in the engine 3. Experiment with basic concepts of game design 4. Build actual sample games 5. Demonstrate deployment of projects in the market

Prerequisites: Basics of Unity

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	3	2	1	1	3	3	3	3
CO-2	3	2	3	1	-	2	2	3	2
CO-3	2	-	2	2	3	3	3	2	3
CO-4	3	2	3	1	2	2	2	-	2
CO-5	2	3	2	2	2	3	2	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related									

LIST OF PROGRAMS	

1. Installation and Setting up Unity 3D & Creating your First Project
2. With Unity: Creating – Sprites, Modifying Sprites, Transform and Object Parenting
3. Unity: Saving and Loading Scenes & Basic Movements Scripting
4. Unity: Understanding & Implementation of Collisions, Rigid bodies & Custom collisions boundaries.
5. Unity – Understanding of Prefabs & Instantiation and Game Object Destructions.
6. Introduction to Audio using Unity – Audio components & Playing a Sound
7. Starting with Unity UI- User Interfaces
   a. Screen Space Overlay
   b. Screen Space – Camera
   c. World Space
8. Unity Insertion of elements in UI
   a. The Button
   b. Text Element
   c. The Slider
9. Unity – Materials and Shaders
   a. Material
   b. Shader
10. Usage of Asset Store in Unity
	CO-1,2,3,4
	BTL-1,2,3,4

TEXT BOOKS	
1.	Jaffal Y, "A Practical Introduction to 3D Game Development", First Edition, 2012.

REFERENCE BOOKS	
1.	William Vaughan, "Digital Modeling", First Edition, New Riders, 2012.

E BOOKS	
1.	https://www.gettextbooks.com/isbn/9780133574845/Interactive Computer Graphics.pdf
2.	https://vocadmy.com/wp-content/uploads/2019/09/A-Practical-Introduction-to-3D-Game-Development.pdf

MOOC	
1.	https://www.edx.org/course/computer-graphics-2
2.	https://www.coursera.org/learn/interactive-computer-graphics

COURSE TITLE	ANIMATION AND INTERACTIVITY LAB			CREDITS	1
COURSE CODE	CAB0234	COURSE CATEGORY	PC	L-T-P-S	0-0-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

Continuous Internal Assessment	ESE
80%	20%

Course Description	The students will learn to use adobe flash toll for animation and interactivity, and apply their creativity to develop web animations, cut animations, movie clips and graphics.
Course Objective	1.To work with flash tools. 2. To create movie clips and graphics. 3. To develop animation with the objects. 4. To implement animated web banners. 5. To use interactivity, cut animations and apply creativity.
Course Outcome	Upon completion of this course, the students will be able to 1. Demonstrate experiments with different flash tools. 2. Create movie clips and graphics. 3. Develop animation with object animations 4. Implement animated web banners. 5. Create cut animations and apply creativity

Prerequisites: Basic Knowledge about Animation

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	1	1	2	2	1	2
CO-2	3	2	2	1	-	2	2	2	2
CO-3	3	2	2	1	1	1	2	2	2
CO-4	-	2	2	1	1	2	-	1	2
CO-5	3	2	2	1	1	2	2	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF PROGRAMS

1. Create simple drawing with flash. 2. Create scenery using drawing tools in adobe flash line tool, shape tool, pencil, brushes, fills, stokes, gradient. 3. Apply Symbols with movie clips and graphics for your own application . 4. Trace the pencil drawings and reference drawing for your creative drawing. 5. Implement simple object animations using flash. 6. Animate text, apply filters and effects using Flash.	CO - 1,2,3,4,5 BTL-3,4

7. Create interactive animated web banners.
8. Implement the Frame-by-frame animations (Butter fly, Bird fly, biped walks, quadruped walks) using flash.
9. Implement Cut out animations (Character animations, lip-sync animation, walks, body movements with dialogues) using Flash.
10. Create a short animation of lip sync, body movement and character interaction using animation software.

TEXT BOOKS

| 1. | Tay Vaughan, "Multimedia: Making It Work, " Seventh Edition, Tata Mc-Graw Hill, 2008 |

REFERENCE BOOKS

| 1. | Ranjan Parekh, "Principles of Multimedia",Second Edition, TMH, 2006 |

E BOOKS

| 1. | https://users.dimi.uniud.it/~antonio.dangelo/MMS/materials/Fundamentals_of_Multimedia. Pdf |

MOOC

| 1. | https://www.coursera.org/learn/copyright-for-multimedia |

COURSE TITLE	3D ANIMATION			CREDITS	3
COURSE CODE	CAB0220	COURSE CATEGORY	PC	L-T-P-S	2-0-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	In this course the students will learn the fundamental skills to animate effectively with simple objects and characters necessary for working in 3D Animation. Students can apply the skills learned in this course in areas like game art, motion graphics and 2 D Animation.
Course Objective	1. To describe 3D animation and its importance 2. To apprise digital video and image capturing 3. To extend solutions with pre visualization 4. To use standard techniques and create visual effects. 5. To recognize features, setup render farms and find data storage solutions.
Course Outcome	Upon completion of this course, the students will be able to 1. Develop digital imaging and video. 2. Design solutions with pre visualization 3. Create rigging and texturing effects 4. Implement standard techniques and create visual effects. 5. Integrate features, setup render farms and find data storage solutions.

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	1	2	1	3	3	2
CO-2	2	1	2	2	1	2	-	3	3
CO-3	3	-	3	1	2	1	3	2	2
CO-4	3	2	2	2	1	1	2	3	3
CO-5	3	3	3	1	1	2	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION TO 3D ANIMATION (6L+6P=12)

Defining 3D Animation - Exploring 3D animation Industry - Understanding the production pipeline components - Working on 3D animation production: Layout-Research and Development - Modeling - Texturing – Rigging / Setup - Animation - 3D Visual Effects - Lighting / Rendering - Postproduction

Practical component:

1. Apply rigging and texturing effect to a sample image

Suggested Readings:

History of 3D Animation

**CO-1
BTL-3**

MODULE 2:DIGITAL IMAGING AND VIDEO (6L+6P=12)

Understanding digital Imaging: Pixels, Raster Graphics Vs Vector Graphics - Antialiasing-Basic Graphic file formats - Channels - Color Depth or Bit Depth - Color Calibration-Understanding Digital Video: Resolution - Device Aspect ratio - Pixel Aspect Ratio - Safe areas - Interlaced and Progressive scanning - Compression - Frame rate and Time code - Digital image capture

Practical component:

1. Perform color calibration on difference layers of an image

Suggested Readings:

Digital Image Capture

**CO-2
BTL-3**

MODULE 3: PRE-VISUALIZATION AND TEXTURING (6L+6P=12)

Using principles of fine art and traditional animation - Building a good story - Pre visualization techniques: Basic Short Framing - Camera Movements - Editing - Modeling: Polygons - NURBS -Texturing

Practical component:

1. Create a Visual story board with 10 frames

Suggested Readings:

Camera Movements and animation

**CO-3
BTL-3**

MODULE 4: PRE-VISUALIZATION AND TEXTURING (6L+6P=12)

Rigging: Parenting - Pivot Positions - Skeleton systems - Forward and Inverse Kinematics - Deformers – Constraints – Scripting – Animation - Creating Visual effects: Particles - Hair and Fur - Rigid Bodies - Soft Bodies - Lighting: Types – attributes – techniques - Rendering: Methods, Illumination

Practical component:

1. Adding edge loop in a polygon cylinder
2. Apply different types of lighting to a given image

Suggested Readings:

**CO-4
BTL-3**

Dope sheet and uses	
MODULE 5: HARDWARE AND SOFTWARE TOOLS	**(6L+6P=12)**
Choosing a computer - Using Monitors/ Displays - Graphic Tablets - 3D Scanners - Setting up render farms - Finding data storage solutions **Practical component:** 1. List out the different hardware and software required to create 3D animation 2. List out the latest hardware and software available to create 3D animation **Suggested Readings:** Industry trends	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Andy Beane, " 3D Animation Essentials", 1st Edition, John Wiley & Sons, 2012.

REFERENCE BOOKS	
1.	Isaac Kerlow, "The Art of 3D Computer Animation and Effects", 4th Edition, Wiley, 2009.
2.	William Vaughan, "Digital Modeling" , 1st Edition, New Riders, 2012.

E BOOKS	
1.	https://dl.softgozar.com/Files/Ebook/3D_Animation_Essentials_Softgozar.com.pdf

MOOC	
1.	https://www.coursera.org/specializations/virtual-reality
2.	https://www.edx.org/course/basic-3d-animation-using-blender

COURSE TITLE	**GAME INTERFACE DESIGN**			**CREDITS**	**4**
COURSE CODE	**CAB0221**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**3-1-0-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**

ASSESSMENT SCHEME

First Periodical Assessment	**Second Periodical Assessment**	**Seminar/ Assignments/ Project**	**Surprise Test / Quiz**	**Attendance**	**ESE**
15%	**15%**	**10%**	**5%**	**5%**	**50%**
Course Description	Students will explore the fundamentals of graphical user interfaces, User Experience, and User Interface design.				

Course Objective	1. To explore the fundamentals of graphical user interfaces 2. To identify user experience and user interface design 3. To compare the different platforms and genres for game interface design. 4. To empower the player with controls. 5. To design online tutorials and automated documents.
Course Outcome	Upon completion of this course, the students will be able to 1. Analyze the basic concepts of Game Interface Design 2. Program with various platforms and genres for Game interface design 3. Demonstrate control functionality and the objectives of redefine approach. 4. Develop independent games and explain speech recognition and synthesis. 5. Create online tutorials and visualize the information.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	-	3	2	3
CO-2	2	-	1	1	1	1	3	3	3
CO-3	3	3	2	2	-	3	2	2	2
CO-4	2	3	1	1	2	3	2	3	3
CO-5	3	1	1	3	2	1	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: HISTORY AND CONCEPTS	(12)

Arcade - Console - First Generation to Seventh Generation - Computer: Keyboard-Text & Graphics - Joystick - Mouse & GUI - Hardware Flexibility - Laptop Controls - Mobile - Continuous Evolution of Interfaces - Functions - Audio - Functionality - Usability-Accessibility - Immersion - Player view - Interface Element Classification - Understanding Interfaces.	**CO-1** **BTL-3**

MODULE 2: PLATFORMS AND GENRES	(12)

Consoles: Controllers - Platform Specific Controls - Interface Guidelines - Computers -Mobile - Classifying Games - Actions - Adventure - Role Playing - Dialogue - Displaying Details- Journal - Crafting - Simulation - Strategy - Real Time Strategy - Turn-based Strategy - Multi player.	**CO-2** **BTL-3**

MODULE 3: CONTROL AND ANALYSIS	(12)

Control Functionality: Buttons - Text Inputs - Scroll Bars - Prompts, Control Usability - Saving Player Progress: Persistent Games - Intermittent Games - Create Interactivity with Controls - Analysis: Game Overview - Design Pillars - Initial Interface Design - Basic Controls – Heads - Up Display - Conversation Window - Objectives of Redesign Approach.	**CO-3** **BTL-3**

MODULE 4: ANALYSIS & FUTURE OF GAME INTERFACE DESIGN	(12)

Redesign Approach - Technology Changes - Revisiting Modes - Cutting Features - Interface Modifications - Login Mode - Exploration Mode - Web of details. Process Industry & Mindset - Independent Game Development - Game Interface Design as a Science - Game Design Vs Game Interface Design - Technological Innovations - Touch screens - Projected Controls - Speech Recognition - Speech Synthesis - Gesture Controls – Electroencephalography - Unconscious Control.	**CO-4** **BTL-3**

MODULE 5: DESIGN ISSUES	(12)
Quality of Service: Models of response time impacts - Expectations and Attitudes - User Productivity - Variability in Response time - Balancing Function & Fashion: Nonanthropomorphic Design - Display Design - Web page Design - Window Design - Color-Online Vs Paper Documentation - Shaping the content of Documentation - Online Tutorials and Animated Demonstrations - Information Search - Information Visualisation.	CO-5 BTL-3

TEXT BOOKS	
1.	Kevin.D. Saunders and Jeanine Novak, "Game Development Essentials: Game Interface Design", Second Edition, Cengage Learning , 2013.
2.	Ben Shneiderman and Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Fifth Edition, Pearson Education, 2009.

REFERENCE BOOKS	
1.	Michael Sellers. "Advanced Game Design: A Systems Approach", First Edition, Addison-Wesley 2017.

E BOOKS	
1.	https://books.google.co.in/books/about/Game_Interface_Design.html?id=-KVQAAAAMAAJ &redir_esc=y

MOOC	
1.	https://www.coursera.org/specializations/user-interface-design
2.	https://www.udemy.com/course/user-experience-design-fundamentals/

COURSE TITLE	DIGITAL MARKETING			CREDITS	3
COURSE CODE	CAB0222	COURSE CATEGORY	PC	L-T-P-C	3-0-0-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course provides the fundamental knowledge about Digital Marketing and pinpoints the factors that are influencing the online marketing and also focus on social media content management to understand and estimate the mindset of users to make successful marketing.
Course Objective	1. To understand the essentials of Digital Marketing. 2. To learn about current market trends and Strategies. 3. To gain knowledge on the social media tools and online advertisement promotions for digital marketing. 4. To identify search engine users and pinpointing the elements for getting high rankings. 5. To optimize the digital marketing tactics and performance in order to create a Valuable brand story.

	Upon completion of this course, the students will be able to
Course Outcome	1. Explain fundamental concept of Digital Marketing with essentials. 2. Demonstrate digital marketing strategies and principles. 3. Apply social media marketing tools and achieve marketing objectives. 4. Implement the search engine optimization techniques with the real world. 5. Formulate and evaluate the digital marketing strategies to achieve marketing goals.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	1	1	1	1	1	3	2	2
CO-3	3	3	-	2	3	3	3	3	3
CO-4	2	3	1	1	2	-	2	3	2
CO-5	3	1	1	3	2	1	2	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: DIGITAL MARKETING ESSENTIALS	(9)

Introduction - Evolution of Digital Marketing - Traditional Marketing Vs Modern Marketing - Digital Marketing Types - Applications and Benefits - Opportunities and Challenges to Internet Marketing - Essentials of Digital Marketing. **Suggested Readings:** The evolution of consumer behavior.	CO-1 BTL-3

MODULE 2: MARKET RESEARCH & STRATEGIES	(9)

Marketing Trends and Strategies - Digital Marketing - Automation, Targeting, Personalization, Planning, Budgeting - Competitor and web analytics. **Suggested Readings:** User and entity behavior analytics.	CO-2 BTL-3

MODULE 3: ONLINE ADVERTISING & SOCIAL MEDIA	(9)

Social Media Marketing and Online Advertisements - Content creation and promotion - Facebook Insights - Linkedin - Twitter - Instagram - Snapchat - Tumblr - Youtube - Blogging - Google Ads - Freelancing - Mobile Marketing - Online Reputation Management. **Suggested Readings:** Social Media Marketing Ethics	CO-3 BTL-3

MODULE 4: SEARCH ENGINE OPTIMIZATION	(9)

Identifying search engine users - Search Behaviour - On Page Optimization - Off Page Optimization - Online Keyword research - Pay per click - Meta Search - Location based search - Avoiding Spam - Understanding Personalized search's impact on ranking. **Suggested Readings:** Knowing what drives search results	CO-4 BTL-3

MODULE 5: CONVERSION,RETENTION AND MEASUREMENT	(9)

	Effective design - User Experience - Design Thinking - Managing Loyalty – CRM - Contact Strategy - Predictive analytics - Technology Platforms - Smooth online Service and customer experience - Measuring Success through data analytics and reporting.	CO-5 BTL-3
	Suggested Readings: Tailoring your final digital marketing strategy.	

TEXT BOOKS	
1.	Puneet Bhatia, "Fundamentals of Digital Marketing", Second Edition, June 2019, Pearson
2.	Kim Ann King "Complete Guide to B2B Marketing, The: New Tactics, Tools, and Techniques to Compete in the Digital Economy", Pearson Publication, 2015.
3.	Simon Kingsnorth "Digital Marketing Strategy: An Integrated Approach to Online Marketing ",Kogan Page; 2nd edition, 2019.

REFERENCE BOOKS	
1.	Gary Vaynerchuk, "Jab, Jab, Jab, Right Hook: How to Tell Your Story in a Noisy Social World",Harper Business, 2013.
2.	Seema Gupta, "Digital Marketing", 2nd Edition, Tata McGraw Hill, 2020.
3.	Bruce Clay, "Search Engine Optimization All-in-One For Dummies", 3rd Edition, 2015.

E BOOKS	
1.	https://www.uou.ac.in/sites/default/files/slm/DVDMM-101.pdf

MOOC	
1.	https://www.edx.org/course/digital-marketing-strategy
2.	https://www.coursera.org/specializations/digital-marketing-strategy-planning

COURSE TITLE	VIRTUAL REALITY			CREDITS	3
COURSE CODE	CAB0223	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE	
15%	15%	20%		50%	
Course Description	Virtual Reality, or VR, is the use of computer technology to create a simulated environment which can be explored in 360 degrees. Unlike traditional interfaces, VR places the user inside the virtual environment to give an immersive experience. In virtual reality (VR), the users' perception of reality is completely based on virtual information.				
Course Objective	1. To Understand the Virtual reality systems 2. To familiarize the techniques of creation and presentation of virtual environments in virtual Reality 3. To evaluate VR systems in terms of 2D and 3D orientation. 4. To Create content for augmented reality application. 5. To apply augmented reality to a problem and evaluate.				

	Upon completion of this course, the students will be able to
Course Outcome	1. Analyze Virtual reality concepts illustrating with examples.
	2. Familiarize with the evolution of VR systems in correspondence with the fundamental basics of human vision and optics.
	3. Distinguish 2D and 3D orientations of VR systems, rendering and perception.
	4. Formulate contents for ant augmented reality application.
	5. Recognize a given problem and apply augmented reality to the real-world problem and also evaluate.

Prerequisites: Computer Graphics

CO, PO AND PSO MAPPING

CO	PO -1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PSO- 1	PSO-2	PSO- 3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	-	1	1	1	1	3	-	2
CO-3	3	3	2	2	3	3	3	3	3
CO-4	2	3	1	-	2	3	2	2	2
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: VIRTUAL REALITY	(9)

Introduction to Virtual Reality - What is virtual reality – Modern VR experiences - Virtual reality systems - Hardware and Software - Geometry of virtual Worlds - Geometric models - Changing position and Orientation - Axis - Angle Representations -Transformations. **Practical Component:** 1. Setting up a project for virtual reality platform. 2. Use button interface functions for a VR project **Suggested Reading:** https://nptel.ac.in/courses/106106138/2	**CO-1** **BTL-3**

MODULE 2: VIRUAL REALITY EVOLUTION	(9)

Light and Optics - behavior of light - Optical Aberrations - cameras and displays - The physiology of human vision - Implications of VR - Visual Perception - Perception of Depth - Motion and Color. **Practical Component** Develop a VR application for any real-life application **Suggested readings**: https://nptel.ac.in/courses/106106138/8	**CO-2** **BTL-3**

MODULE 3: EVALUATING VR SYATEMS	(9)

Tracking 2D and 3D orientation - Interaction- Locomotion - Interaction Mechanisms - Auditory Perception and Rendering. **Practical component** Develop a gaze-based control for a VR application **Suggested Readings:** https://www.ronaldazuma.com/papers/cga99.pdf	**CO-3** **BTL-3**

MODULE 4: AUGMENTED REALITY	(9)

What Is Augmented Reality - The Relationship between Augmented Reality and Other Technologies - How Does Augmented Reality Work - Ingredients of an Augmented Reality Experience. **Practical Component** 1. Experience existing VR and AR applications **Suggested reading**: https://nptel.ac.in/courses/106105195/13	**CO-4** **BTL -3**

MODULE 5: COMPONENTS OF AUGMENTED REALITY	(9)

Augmented Reality Hardware and Software – Interaction - Mobile Augmented Reality - Reality Applications - Trends in Augmented Reality.
Practical Component:
  1. Installation and familiarizing game engine environment
  2. Installation and setting up of AR Toolkit
  3. Create a simple diorama with game objects
  4. Build Hello World in AR Toolkit
Suggested reading: https://electricalfundablog.com/augmented-assisted reality - technology-components-types-applications/
	CO-5
	BTL-3

TEXT BOOKS	
1.	Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", First Edition, Morgan Kaufmann, Elsevier, 2009.
2.	Alan B Craig, "Understanding Augmented Reality - Concepts and Applications", Morgan Kaufmann, Elsevier, First Edition, 2013.
REFERENCE BOOKS	
1.	Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", First Edition, ACM Publications, 2015.
2.	Dieter Schmalstieg, Tobias Höllerer, "Augmented Reality: Principles and Practice", First Edition, Addison-Wesley, 2016.
E BOOKS	
1.	http://vr.cs.uiuc.edu/vrbookbig.pdf
2.	https://arbook.icg.tugraz.at/Schmalstieg-2016-AW
MOOC	
1.	https://nptel.ac.in/courses/106/106/106106138/
2.	https://www.coursera.org/learn/ar

COURSE TITLE	VIDEO GAME DEVELOPMENT LAB	CREDITS	1

COURSE CODE	CAB0243	COURSE CATEGORY	PC	L-T-P-S	0-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

Continuous Internal Assessment		ESE
80%		20%

Course Description	Creating video games is an endeavor that lies at the merger of two main disciplines, viz., computer programming and creating artwork. This course aims to focus on the former aspect via design and development of 2D games.
Course Objective	1. To familiarize with the workflow for creating 2D video games and understand different types/genres of video games and the components thereof. 2. To understand all the steps of creating a 2D game and get hands-on experience with game engines, e.g., Unity. 3. To gain knowledge on the usage of subcomponents of game engines such as graphics, physics and audio engines. 4. To write scripts which control the behavior of different game components 5. Comprise creating game assets such as sprites, tiles, textures and audio and be able to create realistic scenes and environments.
Course Outcome	Upon completion of this course, the students will be able to 1. Create workflow for creating 2D video games and understand different types/genres of video games and the components thereof. 2. Identify all the steps of creating a 2D game and get hands-on experience with game engines, e.g., Unity. 3. Apply usage of subcomponents of game engines such as graphics, physics and audio engines. 4. Write scripts which control the behavior of different game components Design 5. write and deploy 2D video games.

CO,PO ANDPSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	1	1	3	2	3
CO-1	3	-	2	2	3	3	3	3	2
CO-3	2	3	1	1	-	3	2	2	3
CO-4	3	1	1	3	2	1	2	3	2
CO-5	3	1	1	3	2	1	2	-	2

1:Weakly related,2:Moderately related and 3:Strongly related

LABPROGRAMS

1. Installation of a game engine, e.g., Unity, familiarization of the GUI. 2. Character design, sprites, movement and character control. 3. Level design: design of the world in form of tiles with interactive objects. 4. Design of interaction between the player and the world, optionally using the physics engine. 5. Design of menus and user interaction in mobile platform. Lab12: Insert audio.	CO-1 BTL-1,2,3

TEXTBOOKS

1.	Nystrom Robert, "Game Programming Patterns", Third edition, Genever Benning, 2014
REFERENCE BOOKS	
1.	Paris Buttfield , Addison, "Unity Game Development Cookbook: Essentials for Every Game", First Edition, O'Reilly Media, 2019

COURSE TITLE	3D ANIMATION LAB			CREDITS	1
COURSE CODE	**CAB0244**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**0-0-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**

ASSESSMENT SCHEME

Continuous Internal Assessment	ESE
80%	20%

Course Description	3D animation is the art of using motion to bring characters, vehicles, props, and more to life within TV shows, films, and games. This course will enable students to have understanding on 3D video games, movie and television special effects, mobile devices, etc.
Course Objective	1. To comprehend core 3D concepts including design, film, video, and games. 2. To understand 3D animation basics. 3. To interpret polygon modelling for various model designs. 4. To enable knowledge in 3D concepts such as design, film, video, and games. 5. To develop 3D animations for organic and inorganic objects.
Course Outcome	Upon completion of this course, the students will be able to 1. Distinguish the language of 3D and computer graphics (CG) 2. Implement 3D animation basics: pre-production, modeling, animation, rendering, and post-production 3. Demonstrate core 3D concepts including design, film, video, and games 4. Deploy artistic and technical skills needed to succeed in the industry 5. Illustrate real-world scenarios and informative interviews with key educators and studio and industry professionals

No Prerequisites

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	2	3
CO-2	2	1	1	1	1	1	2	3	2
CO-3	3	3	2	2	3	3	3	2	3
CO-4	2	3	1	1	2	3	2	3	2
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF PROGRAMS	(15)

1. Working with Polygon Modeling , Polygon - Selection, Creation, separating, Splitting and Editing.
2. Working with Nurbs Modeling ,Nurbs - Creating curves, Creating Surfaces, Editing
3. Subdivision Surface Modeling in Maya. Subdivision - surface conversion, Editing surface, Editing Uvs,Create Various Basic 3D geometrical shapes.
4. Create Basic Polygon inorganic objects (lamp, Mobile, computer, Bike, Car) , Create basic architectural polygon modeling , Create Interior with polygon and Subdivision.
5. Create male and female body with polygon modeling with details, Create Cartoon and semi cartoon characters with poly , Surface Character Modeling (Mouse Embryo) , Create male and female body with subdivision modeling with details.
6. Character setup overview, Building skeleton , Creating Basic Bone System , Full body IK and FK.
7. Setup joint chain,Pose with invers and forward kinematics ,Skinning ,Constraint ,Deformers ,Weight
8. Rigging Male body , Rigging female body , Rigging Animal body ,Rigging Cartoon Character body.
9. Basic Animation, Key frame Animation Path Animation.
10. Animation Nodes, Animating Basic 3D Objects , Animating Camera.

TEXT BOOKS	
1.	Andy Beane, "3D Animation Essentials", First Edition, John Wiley & Sons, 2013.

REFERENCE BOOKS	
1.	Richard Williams, "The Animator's Survival Kit Book", Expanded Edition, Faber and Faber Publication, 2012.
2.	Steve Roberts, "Character Animation in 3D: Use Traditional Drawing Techniques to Produce Stunning CGI Animation", First Edition, Focal Press, 2004.

E BOOKS	
1.	https://dl.softgozar.com/Files/Ebook/3D_Animation_Essentials_Softgozar.com.pdf

MOOC	
1.	https://www.coursera.org/learn/interactive-3d-characters-social-virtual-reality
2.	https://www.coursera.org/learn/introtoalice

SEMESTER – V

COURSE TITLE	MOBILE APPLICATION DEVELOPMENT			CREDITS	4
COURSE CODE	CAB0304	COURSE CATEGORY	PC	L-T-P-S	2-1-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course covers mobile application development, its architecture and lifecycle, as well as its inherent design considerations. Students will learn about mobile application environments and platforms.
Course Objective	1. To help students to gain a basic understanding of Android application development 2. To apprehend different layouts in Android development 3. To identify various user interfaces used for Android development 4. To connect Android application with the database 5. To test the android applications

	Upon completion of this course, the students will be able to
Course Outcome	1. Implement essential Android Programming concepts. 2. Develop various Android applications related to layouts & rich uses interactive interfaces 3. Illustrate Android applications related to mobile related server-less database like SQLITE 4. Deploy applications to the Android marketplace for distribution 5. Apply android application in the play stores

Prerequisites: Basics of Java Programming

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO -1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	3
CO-2	2	1	-	1	1	-	3	3	3
CO-3	-	3	2	2	3	3	3	3	3
CO-4	2	3	1	1	2	3	-	3	3
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCN	(12)

Android: An Open Platform for Mobile Development- Android SDK Features- Introducing the Development Framework - Android Versions - Architecture of Android - Android Application Life Cycle - Features of Android - Android Development Tools - Creating Android Virtual Devices (AVDs) - Types of Android Applications- Creating Your First Android Application - Application Manifest - Android Activities - Activity Life Cycle. **Practical Component** Creating Various Android Virtual Devices	CO- 1 BTL-

MODULE 2: APPLICATION DESIGN ESSENTIALS	(12)

Intent: Linking Activities Using Intents - Calling Built-In Applications Using Intents- Displaying Notifications - Layouts: Views and View Groups – Linear Layout – Absolute Layout – Table Layout – Relative Layout – Frame Layout – Scroll View - Drawable Resources: Shapes, Colors, and Gradients - Composite Drawables **Practical Component** Experimenting Various linear layouts in android application	CO-2 BTL-3

MODULE 3: USER INTERFACE DESIGN ESSENTIALS	(12)

Views: Basic Views - Picker Views- List Views - Image Views to Display Pictures - Android Menu System - Menus with Views. **Practical Component** Creation of menu bar for an android application	CO-2 BTL-2

MODULE 4: DATABASES AND CONTENT PROVIDERS	(12)

Shared preferences - Android Databases – SQLite - Working with SQLite Databases – SQLiteOpenHelper - Querying a Database - Opening and closing a database, Working with Inserts, updates, and deletes - Content Providers. **Practical Component** Creating a database connection	CO-3 BTL-3

MODULE 5: TESTING AND PUBLISHING ANDROID APPLICATIONS	(12)

	Test automation of mobile application - JUnit for Android, Robotium - Preparing for Publishing - Deploying APK Files. **Practical Component:** Distributing apps on mobile market	CO-4 BTL-3

TEXT BOOKS	
1.	WeiMeng Lee, "Beginning Android Application Development", First Edition, Wrox Publications, 2012.
2	Reto Meier, " Professional Android 2 Application Development", Second Edition, Wiley India Pvt Ltd, 2012.
REFERENCE BOOKS	
1.	Dawn Griffiths, David Griffiths,"Head First Android Development", First Edition, O'Reilly Publishers, 2015.
2.	James C. Sheusi, "Android Application Development for Java Programmers", First Edition, 2014.
3.	Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", First Edition, Wrox Press Ltd, 2014.
E BOOKS	
1.	https://www.packtpub.com/product/xamarin-mobile-application-development-for-android/9781783559169
MOOC	
1.	https://www.shawacademy.com/courses/technology/online-mobile-app-development-course/
2.	https://www.coursera.org/specializations/android-app-development

COURSE TITLE	**AR GAME DEVELOPMENT**			**CREDITS**	**4**
COURSE CODE	**CAB0305**	**COURSE CATEGORY**	**PC**	**L-T-P-S**	**2-1-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Practical Assessment**		**ESE**	
15%	**15%**	**20%**		**50%**	
Course Description	The course is about developing virtual reality games with the latest Unity 5 toolkit. It includes building a location-based AR game that addresses the core technical concepts: GIS fundamentals, mobile device GPS, mapping, map textures in Unity, mobile device camera, camera textures in Unity, accessing location-based services, and other useful Unity tips.				
Course Objective	1. To introduce the design fundamentals of adventure games. 2. To learn about Unity assets. 3. To familiarize with the AR concept in games. 4. To interact with the AR world. 5. To Design a complete game.				

Course Outcome	Upon completion of this course, the students will be able to 1. Implement GPS and GIS features in games with simple examples. 2. Create and spawn monsters. 3. Demonstrate different types of menu buttons. 4. Use JSON to develop game scenes. 5. Check for compile errors, debug and troubleshooting.

Prerequisites: Unity

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	2	2	2	1	2	2	2	2
CO-2	3	2	-	2	-	2	2	2	2
CO-3	2	2	2	1	2	1	3	3	3
CO-4	3	3	3	-	2	2	3	3	3
CO-5	2	2	2	2	2	2	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: INTRODUCTION TO ADVENTURE GAMES	(6L+6P=12)
Getting started with Unity - Creating the game project - Building and deploying the game - Building and deploying to Android - Building and deploying to iOS - Mapping the Player's Location - GIS fundamentals - GPS fundamentals. **Practical component:** Downloading and installing Unity, Building and deploying a game to Android **Suggested Readings:** Features of Unity Software	CO-1 BTL-3
MODULE 2: MAKING THE AVATAR	(6L+6P=12)
Adding a character - Importing standard Unity assets - Spawning the Catch - Creating a new monster service - Checking for monsters. **Practical component:** Adding monsters to the map, Tracking the monsters in the UI **Suggested Readings:** GPS accuracy	CO-2 BTL-3
MODULE 3: CATCHING THE PREY IN AR	(6L+6P=12)
Loading a scene - Updating touch input - Building the AR Catch scene- Adding the catching ball - Throwing the ball - Checking for collisions- Particle effects for feedback - Catching the monster - Storing the Catch - Inventory system - Monster CRUD operations - Adding the menu buttons. **Practical component:** Creating the Inventory scene, Bringing the game together **Suggested Readings:** Mobile development woes	CO-3 BTL-3
MODULE 4: Interacting with an AR World	(6L+6P=12)
Introducing the Google Places API - Using JSON - Creating the markers- The Places scene - Google Street View as a backdrop - Updating the database - Connecting the pieces. **Practical component:** Slideshow with the Google Places API photos **Suggested Readings:** Adding UI interaction for selling The game mechanics of selling	CO-4 BTL- 3
MODULE 5: FINISHING THE GAME AND TROUBLESHOOTING	(6L+6P=12)
Outstanding development tasks - Missing development skills - Cleaning up assets - Releasing the game - Problems with location-based games - Location-based multiplayer game- Console window - Compiler errors and warnings - Debugging. **Practical component:** Releasing a location-based game **Suggested Readings:** Unity Analytics	CO-5 BTL - 3

TEXT BOOKS	
1.	Micheal Lanham, Augmented Reality Game Development, Packt,Jan 2017
REFERENCE BOOKS	
1.	Jesse Schell," Game UX: The Art of Game Design: A Book of Lenses", 3rd Edition, CRC Press, 2016.
2.	Roger Froze, "Augmented Reality For Beginners: Principles & Practices for Augmented Reality & Virtual Computers", CRC Press , First Edition, 2016.
E BOOKS	
1.	Richard Williams - The Animator's Survival Kit
2.	https://jo2bigornia.tripod.com/download/TimingAnimation.pdf
MOOC	
1.	https://www.edx.org/course/basic-3d-animation-using-blender
2.	https://www.coursera.org/learn/interactive-3d-characters-social-virtual-reality

COURSE TITLE	AR GAME LAB			CREDITS	1
COURSE CODE	CAB0333	COURSE CATEGORY	PC	L-T-P-S	0-0-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

Continuous Internal Assessment	ESE
80%	20%

Course Description	This course gives insights into how to design games across genres and development platforms. It covers all the basic fundamentals of game design from conceptualising a game idea to finally publishing your game and offering it as a service.
Course Objective	1. To comprehend core concepts including design, film, video, and games. 2. To understand AR basics. 3. To interpret standard modelling for various model designs. 4. To enable knowledge in 3D concepts such as design, film, video, and games. 5. To develop animations for fill out objects.
Course Outcome	Upon Completion of this course, the students will be able to 1. Setup Unity environment 2. Design gameplay systems 3. Apply audio effects to the game 4. Develop game menus and other interface 5. Create light and shadow effects

No Prerequisites

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	2
CO-2	2	1	1	1	1	1	3	-	3

CO-3	3	3	2	-	3	3	3	3	2
CO-4	2	-	1	1	2	3	2	2	3
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF PROGRAMS	(15)
1.Set up Unity environment and navigate its tools 2. Determine the scope of a game project and define its structure 3. Create the game Idea into a game concepts 4. Design gameplay systems 5. Create and test engaging game mechanics 6. Create a 3D Game World with terrain, sky, mountains & trees and add characters 7. Using animation controllers, learn to animate your game characters 8. Apply audio and effects to your game 9. create game menus and other interface elements 10. Create sound and lighting effects & shadows for your game	**CO-1** **BTL-2,3**

TEXT BOOKS	
1.	Andy Beane , "3D Animation Essentials" , First Edition, Sybex 2013.

REFERENCE BOOKS	
1.	Richard Williams, "The Animator's Survival Kit", First Edition, Faber and Faber Publication, 2012

E BOOKS	
1.	https://ar-js-org.github.io/AR.js-Docs/

MOOC	
1.	https://www.coursera.org/learn/augmented-reality

COURSE TITLE	MINI PROJECT			CREDIT	1
COURSE CODE	CAB0334	**COURSE CATEGORY**	PC	**L-T-P-S**	0-0-2-0

ASSESSMENT SCHEME					
CIA	80%		**ESE**	20%	
LEARNING LEVEL	BTL4				

CO	Outcomes	PO
Upon completion of this course, the students will be able to		
1	Identify a real time work for engaging, educating, focusing and energizing people	**1,2,3,4,5,6**
2	Develop a solution for the problem	**1,2,3,4,5,6**
3	Develop a gaming application by using relevant computer gaming design Concepts	**1,2,3,4,5,6**

Mini Project

Design and develop practical solutions to real life problems related to animation, visual effects and gaming. The subject should be applied to develop effective solutions to various computing problems. Submit a complete report of the project work carried out.

COURSE TITLE	GAME ENVIRONMENT			CREDITS	4
COURSE CODE	CAB0317	COURSE CATEGORY	PC	L-T-P-S	3-0-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This is an advanced 3D modelling course that utilizes content from many other courses. This class focuses on the art and design theories that drive 3D environments;
Course Objective	1. To help students learn how to create unique textures, tileables and texture atlases 2. Creating terrain using UDKs editor and important height maps from War Machine and ZBrush 3. Build attractive portfolio page layouts 4. Understand the features of different types of cameras 5. Create 2D interfaces for game development
Course Outcome	Upon completion of this course, the students will be able to 1. Preproduce and plan for environmental art creation. 2. Master several complex computer graphic production software packages used for creating textures. 3. Create props and modular assets for games. 4. Implement texture creation using high poly models for baking AO and normal maps, image mapping, 3D and 2D painting. 5. Demonstrate texture budgets and memory allocation.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	2
CO-2	-	1	1	1	1	1	2	2	3
CO-3	3	3	2	2	-	3	-	3	2
CO-4	2	3	-	1	2	3	2	2	3
CO-5	3	1	1	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	(6L+3P=9)
Character study - Importing a character and assigning a controller, character controller, unlimited controller, character curve follow, keyboard controller, keyboard mapper, character go to, share character animation **Practical Component** Creating a targeted character movement	CO-1 BTL-2

MODULE 2: COLLISION THEORY	(6L+3P=9)
Collision theory- Floor object collision, creating characters and floors, basic collision, advanced collision using collision detection triggering events, declare floors, declare obstacles, floor slider, prevent collision, sphere slider, sphere intersection	CO-2 BTL-2

Practical Component	
Experimentation with Floor Slider	

MODULE 3: CAMERA TRACKING **(6L+3P=9)**	
Introduction to camera, adjusting camera target, Camera Tracking, ,different types of camera-dolly,camera colour filter, camera zoom extend, switching cameras, get current camera, set as active camera, look around **Practical Component** Format conversion of new digital images	**CO-3** **BTL-3**

MODULE 4: MATERIAL AND TEXTURING	**(6L+3P=9)**
Material and Texturing- creating simple shadows- creating planar shadows- creating projected shadows-Using grid in virtools-creating grid collision-Creating a background **Practical Component** Creating a background colour using a background image	**CO-4** **BTL-2**

MODULE 5: ANIMATING AND MANIPULATION	**(6L+3P=9)**
Animating and Manipulating material- basic texture animation-creating pseudo-3d characters using sprites, animating material movement,2d interface, creating a 2d sprite-creating a 2d frame **Practical Component** Animating material movement using sprites	**CO-5** **BTL-2**

TEXT BOOKS	
1.	Daniel Liu and Shaun Le Lacheur Sales , "Virtools Fundamentals", First edition, Axis 3D Technology Inc, 2007.

REFERENCE BOOKS	
1.	Gustavo Tommasi, "3D Game Engine Programming: The Game Development Quick Start Guide for Beginners", 1st edition, Packt Publishing;, 2019.

E BOOKS	
1.	http://indexof.co.uk/Various/3D%20Game%20Programming%20All%20In%20One.pdf

MOOC	
1.	https://www.udemy.com/topic/3d-game-development/
2.	http://game-theory-class.org/

COURSE TITLE	**INTERNSHIP**			**CREDITS**	**1**
COURSE CODE	**CAB0341**	**COURSE CATEGORY**	**LAB**	**L-T-P-S**	**0-0-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**
ASSESSMENT SCHEME					
Technical report/ Certificate			**Presentation and Vivo- voce**		**ESE**
30%			**70%**		**-**
Course Description	This course is mainly focused on improving the skills in addition to classroom learning with industrial experience. The student is expected to apply the concepts, principles and algorithms learnt in the field of computer science with specialization in gaming and to gain knowledge in obtaining knowledge in building products/tools/applications addressing the needs of real-world societal issues.				

Course Objective	1. To learn critical thinking and problem-solving knowledge in an applied gaming setting. 2. To apply design and develop products/tools/applications to solve the issues related to real world gaming problems. 3. To obtain professional behavior and knowledge in gaming.
Course Outcome	Upon completion of this course, the students will be able to 1. Develop and test program segments that constitute a software/hardware product. 2. Demonstrate the software cycle principles and improve the project management skills 3. Appraise the hardware/software product developed in the form of technical presentations, demonstrations and report generation through team work.

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	-	3	3	3	1	2	3	3	2
CO-2	3	3	3	3	1	2	2	-	3
CO-3	3	3	3	3	3	1	3	3	2
CO-4	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	-	-	-	-	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

NOTE	
• A student has to compulsorily attend Summer / Winter internship during 3rd year for a minimum period of one month. • In lieu of Summer / Winter internship, the student is permitted to register for undertaking case study / project work under a teaching faculty of the Institute and carry out the project for minimum period of one month. • In both the cases, the internship report in the prescribed format duly certified by the faculty in-charge shall be submitted to the HoD. • Assessment is based on creativity, applicability to the society, project development skills, team work. • Technical communication, presentation and report writing skills form an essential component in assessment.	CO1, CO2, CO3 /BTL3

COURSE TITLE	PROJECT WORK			CREDITS	8
COURSE CODE	CAB0342	COURSE CATEGORY	PC	L-T-P-S	0-0-16-0
CIA	60%			ESE	40%
LEARNING LEVEL	BTL-3				

CO	COURSE OUTCOMES	PO
Upon completion of this course, the students will be able to		
1	Develop practical solutions through analyzing the real time problem and apply the fundamental Knowledge learnt from the previous semesters.	1,2
2	Use research-based knowledge and research methods through modern tools	3,4,5
3	Work as an individual and as a team in solving complex problem.	6
Design and Development of Solution for the identified real time complex problems by applying the gained knowledge in animation, visual effects and gaming.		

REFERENCE BOOKS	
1.	Neil G. Siegel, Engineering Project Management, Wiley, 2019
2.	Steve Tockey, How to Engineer Software: A Model-Based Approach, Wiley, 2019

Weightage of Assessment:

Review / Examination Scheme	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End Semester Viva Voce	50%

A committee shall be constituted by the HoD for the Review

COURSE TITLE		PRINCIPLES OF GAME THEORY			CREDITS	4
COURSE CODE		CAC0251	COURSE CATEGORY	DE	L-T-P-S	2-1-2-1
Version		1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Component		ESE	
15%	15%	20%		50%	

Course Description	The aim of this course is to introduce students to the novel concepts of Game Theory with special emphasis on its applications in diverse fields and current research.
Course Objective	1. To comprehend Game Theory principles in workplace settings. 2. To formulate a game situation from a pure individual's decision problem 3. To explain concepts of players, strategies, payoffs, rationality, equilibrium 4. To gain understanding on two player games concept. 5. To summarize Bayesian game concepts and techniques.
Course Outcome	Upon completion of this course, the students will be able to 1. Determine the basic functionalities of a "game". 2. Translate the basic of a "game" into a wide range of conflicts. 3. Integrate increasing analytical skills into increasingly complex conflicts. 4. Formulate strategic alternatives for the design of games. 5. Appraise theoretical predictions obtained from Game Theory analyses against real world conflicts

Prerequisites: NIL

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	2	1	3	3	3	2
CO-2	2	1	1	-	1	1	3	2	3
CO-3	-	3	2	2	3	3	3	3	2
CO-4	2	3	1	1	2	3	-	2	3
CO-5	3	1	2	3	2	1	2	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	(6L+3P=9)
Players and Strategies- Game Matrices and Payoff Vectors- Two-Person Zero-Sum Games- Dominated Strategies- Equilibrium Points- Strategies for Zero-Sum Games and Equilibrium Points **Practical Component** Develop metrices to access a two player game	CO-1 BTL-2
MODULE 2: REPEATED TWO-PERSON ZERO-SUM GAMES	(6L+3P=9)
Introduction to Repeated Games -Mixed Strategies OF Graphical Solution-Using Sage to Graph Lines-Mixed Strategies: Expected Value Solution-Liar's Poker-Augmented Matrices	CO-2 BTL-2

MODULE 3: NON-ZERO-SUM GAMES	(6L+6P=12)
Introduction to Two-Player Non-Zero-Sum Games-Prisoner's Dilemma and Chicken-Class-Wide Experiment-Multiplayer Experiment-Volunteer's Dilemma-Repeated Prisoner's Dilemma. **Practical Component** Add suitable framework for Multiplayer game environment	**CO-3** **BTL-3**
MODULE 4: EXTENSIVE GAMES	(6L+3P=9)
Extensive Games with Perfect Information-Theory and illustrations-Coalitional Games- Bayesian Games **Practical Component** Apply Bayesian principle to an existing game	**CO-4** **BTL-2**
MODULE 5: COMPETITIVE GAMES	(6L+3P=9)
Strictly Competitive Games and Maxminimization-Rationalizability-Evolutionary Equilibrium-Monomorphic pure strategy equilibrium- Mixed strategies and polymorphic equilibrium-Asymmetric equilibria **Practical Component** Deploy various equilibrium on the given audio clip	**CO-5** **BTL-2**

TEXT BOOKS	
1.	Jennifer Firkins Nordstrom," Introduction to Game Theory:a Discovery Approach", First Edition, Ennifer Firkins Nordstrom publications, 2020
2.	Martin J. Osborne, "An Introduction to Game Theory", First Edition, Oxford University Press, 2000

REFERENCE BOOKS	
1.	Saul Stah:"A Gentle Introduction to Game Theory", American Mathematics Society,2000
2.	Erich Prisner "Game Theory Through Examples", Mathematical Association of America, Inc.2014

E BOOKS	
1.	http://faculty.econ.ucdavis.edu/faculty/bonanno/PDF/GT_book.pdf

MOOC	
1.	https://www.coursera.org/learn/game-theory-1
2.	http://game-theory-class.org/

COURSE TITLE	COLOR THEORY			CREDITS	4
COURSE CODE	CAC0252	COURSE CATEGORY	DE	L-T-P-S	2-1-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE	
15%	15%	20%		50%	

Course Description	This course provides an overview of the application of color theory in digital media and visualization.
Course Objective	1. To be familiar with different color models. 2. To be able to explain color gamut and color spaces. 3. To understand color wheels and its methodologies. 4. To enable the usage of online and mobile color tools. 5. To outline coloring techniques in real time.
Course Outcome	Upon completion of this course, the students will 1. Illustrate different color models. 2. Demonstrate color gamut and color spaces. 3. Design color wheels. 4. Deploy online and mobile color tools. 5. Apply coloring techniques for real time applications.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	2	2	1	2	1	1	2	1
CO-2	2	3	2	-	1	2	1	2	2
CO-3	3	2	2	1	2	1	1	1	1
CO-4	2	-	3	2	1	2	-	2	2
CO-5	2	2	2	1	1	1	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INTRODUCTION	(6L+6P=12)

Introduction to color – RGB, CMYK, RYB Color model, History of color theory, Application, Review of color vision principles – Visible light spectrum, Human vision fundamentals, Trichromatic color vision – opponent color theory – Trichromacy-Luminosity- Chromaticity – Color vision deficiencies. **Practical Component** Convert a color image into a grey scale image	CO-1 BTL-2

MODULE 2: COLOR GAMUT, COLOR SPACES	(6L+6P=12)
Color gamut, color spaces – commonly applied RGB color spaces – colorimetry – CIE XYX color space – CIE LUV and CIE LAB – MUNSELL color system – HSV – HSL – Web colors – Pantone color matching system. **Practical Component** Select and apply suitable colors scheme for the given image	CO-2 BTL-2
MODULE 3: COLOR HARMONY	(6L+6P=12)
Color wheels –constructing color wheel – Hues, tints, tones and shades – warm and cool colors – color harmony – gamut masking – historical evolution -interaction of color studies with APP. **Practical Component** Construct a color wheel with 12 colors	CO-3 BTL-3
MODULE 4: ONLINE AND MOBILE COLOR TOOLS	(6L+6P=12)
Overview – Adobe color CC – Adobe capture CC – Colorlovers community – color scheme designer – color companion – color brewer **Practical Component** Use color scheme designer and change the color effects of the given image	CO-4 BTL-3
MODULE 5: COLORIZING VISUALIZATIONS	(6L+6P=12)
Visualizing biological data –Household broadband availability – Tropical storm animation **Practical Component** Create tropical storm animation with adobe after effects	CO-5 BTL-3

TEXT BOOKS	
1.	Theresa and Marie Rhyne, "Applying Color Theory to Digital Media and Visualization", First Edition, CRC Press, 2017.

REFERENCE BOOKS	
1	Patti Mollica , "Color Theory: An essential guide to color-from basic principles to practical applications", First Edition, Walter Foster Publication, 2013.

E BOOKS	
1.	https://www.google.co.in/books/edition/ Applying_Color_Theory_to_Digital_Media_a/ JDANDgAAQBAJ?hl=en&gbpv=1&dq=Applying+Color+Theory+to+Digital+Media+and+ Visualization&printsec=frontcover

MOOC	
1.	https://www.coursera.org/lecture/graphic-elements-design/understanding-color-theory-1SYDS

COURSE TITLE	INTRODUCTION TO MULTIMEDIA DESIGN		CREDITS	4
COURSE CODE	CAC0268	COURSE CATEGORY	DE	L-T-P-S	2-1-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE
15%	15%	20%		50%

Course Description	This course aims to introduce the fundamental elements of multimedia. It provides an understanding of the fundamental elements in multimedia. The emphasis will be on learning the representations, perceptions, and applications of multimedia. Software skills and hands on work on digital media will also be emphasized
Course Objective	1. To understand the fundamentals of multimedia design. 2. To learn representations and applications of multimedia design. 3. To comprehend the various software for multimedia design. 4. To gain knowledge on the technology behind multimedia design applications. 5. To create and develop multimedia projects.
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the different components of multimedia design and concepts. 2. Differentiate the usage of different technologies behind multimedia applications 3. Acquire the skills for developing multimedia projects. 4. Create and develop multimedia design using appropriate tools. 5. Develop technical and creative skills required for multimedia design.

Prerequisites:

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	1	2	1	3	2	1
CO-2	3	2	3	-	1	2	2	-	2
CO-3	2	3	2	1	1	1	3	3	1
CO-4	3	-	3	1	2	2	-	2	2
CO-5	3	3	3	2	1	1	3	2	1
1: Weakly related, 2: Moderately related and 3: Strongly related									

MODULE 1: INTRODUCTION TO MULTIMEDIA	(6L+6P=12)
Introduction to Multimedia, What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media. **Practical component:** Analyze the components of multimedia. **Suggested Readings:** Conventional media and digital media	**CO-1** **BTL-2**

MODULE 2: COMPUTER FONTS AND HYPERTEXT	(6L+6P=12)
Usage of text in Multimedia, Families and faces of fonts, outline fonts, bitmap fonts International character sets and hypertext, Digital fonts techniques. **Practical component:** Implementation and practice on multimedia fonts and techniques. **Suggested Readings:** Basic knowledge of multimedia fonts.	**CO-2** **BTL-2**

MODULE 3: AUDIO FUNDAMENTALS AND REPRESENTATIONS	(6L+6P=12)
Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format,Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet,Adding sound to your multimedia project, Audio software and hardware. **Practical component:** Practice on multimedia data format and audio systems. **Suggested Readings:** Best practices for audio files handling	**CO-3** **BTL-3**

MODULE 4: IMAGE FUNDAMENTALS AND REPRESENTATIONS	(6L+6P=12)
Colour Science , Colour, ColourModels, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats :GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing [Can Use Photoshop], Use of image editing software, White balance Correction, Dynamic range correction, Gamma correction, Photo Retouching. **Practical component:** Image processing using tools. **Suggested Readings:** Understand the basic concept of image processing techniques.	**CO-4** **BTL-3**

MODULE 5: VIDEO, ANIMATION AND MULTIMEDIA AUTHORING	(6L+6P=12)

Video Basics, How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell Animation, Computer Animation, Morphing. Multimedia Authoring: Multimedia Authoring Basics, Some Authoring Tools, Macromedia Director & Flash.	CO-5 BTL-3
Practical component:	
Implementation of multimedia animation on tools.	
Suggested Readings:	
Learn and understand the multimedia tools	

TEXT BOOKS	
1.	Tay Vaughan, "Multimedia making it work", Ninth Edition, Tata McGraw-Hill, 2008.
2.	Rajneesh Aggarwal & B. B Tiwari, " Multimedia Systems", First Edition, Excel Publication, 2007.
3.	Li and Drew, " Fundamentals of Multimedia" , First Edition, Pearson Education, 2009.

REFERENCE BOOKS	
1.	Parekh Ranjan, "Principles of Multimedia", Second Edition, Tata McGraw-Hill, 2007.
2.	Anirban Mukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House, 2007.

E BOOKS	
1.	https://yslaiseblog.files.wordpress.com/2013/10/gfx-multimedia-making-it-work-8th-edition.pdf

MOOC	
1.	https://www.coursera.org/lecture/android-programming-2/multimedia-part-1-NW4wT
2.	https://mediaarts.humber.ca/programs/multimedia-design-and-development.html

COURSE TITLE	2D GAMING PRODUCTION			CREDITS	4
COURSE CODE	CAC0269	**COURSE CATEGORY**	DE	**L-T-P-S**	2-1-2-1
Version	1.0	**Approval Details**	XX ACM, XX.XX.2022	**LEARNING LEVEL**	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	Creating video games is an endeavor that lies at the merger of two main disciplines such as computer programming and creating artwork. This course aims to focus on the former aspect via design and development of 2D games.
Course Objective	1. To be familiar with the workflow of creating 2D video games. 2. To get hands on experience with gaming engines. 3. To have knowledge on the usage of subcomponents of game engines such as graphics, physics and audio engines.

	4. To emphasize on writing scripts for the different game components.
	5. To elaborate on realistic scenes and environments and design, write and deploy 2D video games
Course Outcome	Upon completion of this course, the students will
	1. Analyze the different workflow for creating 2D video games.
	2. Demonstrate various game engines, e.g., Unity.
	3. Deploy subcomponents of game engines such as graphics, physics and audio engines.
	4. Write scripts which control the behavior of different game components.
	5. Create realistic scenes and environments and design, write and deploy 2D video games.

Prerequisites: Basic programming, computer graphics

MODULE 1: INTRODUCTION	(6L+6P=12)
Motivation - Types of games - Different aspects of game design - Different components in a game - Game engines - Geometric primitives - 2D and 3D linear transforms - Homogeneous matrices - Examples of games. **Practical component:** 1. Installation of a game engine, e.g., Unity, familiarization of the GUI. 2. Conceptualize the theme for a 2D game.	CO-1 BTL-2

MODULE 2: SPRITES AND ANIMATION	(6L+6P=12)
Different image formats - Polygon file formats - Creating sprites – Rigging - Animations using sprite - sheets - Animations using keyframes - Animation controllers. **Practical component:** 1. Character design, sprites 2. Movement and character control.	CO-2 BTL-2

MODULE 3: LEVEL DESIGN	(6L+6P=12)
Scenes - Tiles - Visual continuity in tiles - Adding objects to scene – Prefabs – Lighting - RGB space - Transparency - Texture mapping - Collectibles - Navigation and Pathfinding. **Practical component:** 1. Design of the world in form of tiles along with interactive and collectible objects.	CO-3 BTL-3

MODULE 4: WORLD INTERACTION	(6L+6P=12)
Physics engines - Gravity simulation - Rigid body interaction - Collisions. **Practical component:** 1. Design of interaction between the player and the world, optionally using the physics engine.	CO-4 BTL-3

MODULE 5: USER INTERFACE AND AUDIO	(6L+6P=12)
Layout - Menu system - Visual components - Event system – Skins - Audio assets - Different audio formats - Audio mixing. **Practical component:** 1. Design of menus and user interaction in mobile platform.	CO-5 BTL-3

TEXT BOOKS
1. Nystrom Robert, "Game Programming Patterns", Third edition, Genever Benning, 2014
REFERENCE BOOKS

1.	Paris Buttfield-Addison "Unity Game Development Cookbook: Essentials for Every Game", 1st Edition, O'Reilly Media, 2019
2	John Pile Jr," 2D Graphics Programming for Games", First Edition, CRC Press, 2016
E BOOKS	
1.	https://www.google.co.in/books/edition/Game_Programming_Patterns/9fIwBQAAQBAJ ?hl=en&gbpv=&dq=Nystrom+Robert,+Game+Programming+Patterns, &printsec=frontcover
MOOC	
1.	https://www.coursera.org/specializations/game-design-and-development

COURSE TITLE	HARDWARE IN GAME PROGRAMMING			CREDITS	4
COURSE CODE	CAC0355	**COURSE CATEGORY**	DE	**L-T-P-S**	**2-1-2-1**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	**15%**	**20%**	**50%**

Course Description	This course gets into the insights of the CPU and then other hardware such as RAM, storage memory, motherboard, cooling, power supply, optical drive and monitor which helps in improving the performance of the game. Also, describes about the graphics card which is the most important part of the gaming.
Course Objective	1. To gain insight into the knowledge of CPU, Motherboard and its chipsets for games 2. To elaborate on the video graphics cards and sound cards. 3. To describe memory and the storage requirements for gaming. 4. To have understanding on the different components required for networking for gaming solutions. 5. To explain the techniques of troubleshooting encountered while gaming and also to relate different gaming accessories
Course Outcome	Upon completion of this course, the students will be able to 1. Explain the fundamental hardware components for gaming. 2. Identify the features of the video graphics cards and the sound cards. 3. Apply memory and the storage components for gaming applications. 4. Formulate the requirements to prevent various lags due to network issues in games. 5. Compare the different hardware accessories required for gaming and also elaborate on troubleshooting techniques for games.
Prerequisites: Nil	

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	2	2	2	1	2	2	2	2
CO-2	2	1	1	2	1	-	2	2	2
CO-3	3	2	-	1	2	2	3	3	3
CO-4	2	1	2	1	2	3	2	-	2
CO-5	3	2	2	1	2	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: MOTHERBOARD AND CHIPSETS	(6L+6P=12)

The Central Processing Unit: The Heart and Soul of the PC, Introducing the CPU. Moving In: A Look Inside the CPU. Players Betting Chips in the CPU Game. The Gamer's CPU, The Chipset: The PC's Crossing Guard, North Versus South. Today's High-Performance Chipsets. Blueprint for the Typical Motherboard. Not a Component to Skimp On: Choosing a Motherboard. Popular Manufacturers and Their Boards **Practical component:** Use the PC diagnostic tools to monitor the temperature of the graphics card. **Suggested Readings:** Impact of computer hardware for Video Games	**CO-1** **BTL-2**

MODULE 2: VIDEO CARD AND SOUND	(6L+6P=12)

The Graphics Card's Key Role in Game Performance. Building a 3D Image. Efficient Use of Memory Bandwidth-Performance in 3D Graphics. Performance and Quality in 2D Graphics. The Contenders. Analog Versus Digital. Sound Cards and Other PC Audio Solutions. AMR/CNR/ACR Cards. Sound in 3D. What Makes for Good Sound? Sound Card Recommendations, Speakers. **Practical component:** Enabling Vertical Synchronization. **Suggested Readings:** Video Games production companies in game consoles	**CO-2** **BTL-2**

MODULE 3: MEMORY AND STORAGE	(6L+6P=12)

The Role of System Memory. Memory Types: It's Dynamic. Future Memory Technologies. How Does Memory Impact Game Performance? Memory Modules. Memory Sizes. Why All Memory Isn't Created Equally, Why You Need Mass Storage Mediums. Hard Disk Storage. Interface Influences on Performance. RAID: Tool for Professionals Only or Useful Gaming Hardware Technology, too? Optical Storage. The Future of Storage. **Practical component:** Tracking RAM Upgrades. **Suggested Readings:** Understanding RAM's Role for Gaming	**CO-3** **BTL-3**

MODULE 4: NETWORKING FOR GAMING	(6L+6P=12)
Networking and Multiplayer Gaming. Specialty Networks. Setting Up a Gaming LAN. Getting Online. Setting Up Your Game for Network Play. The Future, CPU Cooling, The Role and Evolution of PC Operating Systems. Hardware Compatibility. Installing the OS. Drivers and OS Updates. **Practical component:** Study of 4G dongle, 4G or 5G Home Broadband and Mobile Wi-Fi Device for improving gaming performance. **Suggested Readings:** Networking effects in the Gaming	CO-4 BTL-2
MODULE 5: ACCESSORIES AND TROUBLESHOOTING	(6L+6P=12)
Monitors. What to Look for in a Monitor. Monitor Brand Picks. Input Devices. Keyboards. Mice. Joysticks and Gamepads, Overclocking Your CPU. Overclocking Your Video Card. Other Tweaks. Benchmarks-Grading Your PC, Troubleshooting. **Practical component:** Minimizing game lags. **Suggested Readings:** Troubleshooting Games	CO-5 BTL-2

TEXT BOOKS	
1.	Anand Lal Shimpi , The Anand, "Tech Guide to PC Gaming Hardware", 1st Edition, Pearson Education (US), 2001.

REFERENCE BOOKS	
1.	Clements, " Principles of Computer Hardware", 4th Edition , Oxford University Press India,2013.
2.	Robert Bruce Thompson, Barbara Fritchman Thompson, "PC Hardware in a Nutshell", O'Reilly Media, 3rd Edition, 2013.

E BOOKS	
1.	https://www.wepc.com/how-to/build-a-gaming-pc/

MOOC	
1.	https://www.coursera.org/lecture/game-design-and-development-2/game-technology-part-4-hardware-Q0vP0
2.	https://www.edx.org/professional-certificate/harvardx-computer-science-for-game-development

COURSE TITLE	BUSINESS AND LEGAL ISSUES FOR VIDEO GAME DEVELOPERS			CREDITS	4
COURSE CODE	CAC0356	COURSE CATEGORY	DE	L-T-P-S	2-1-2-1
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Practical Assessment		ESE	
15%	15%	20%		50%	
Course Description	This course outlines the practical business and legal issues relevant for video game developers and will thus improve their ability to get the most out of the IP system.				

Course Objective	1. To know the global structure of video game industry 2. To gain knowledge on the role of video game publisher and intellectual property of video game industry 3. To understand the various licensing IP for Games and issues dealing with the console platform manufacturers 4. To comprehend the legally significant features of computer games as an object of social relations and the basic principles of legal regulation in this area. 5. To understand the main approaches to the legal regulation of intellectual property, personal data and content in the video game industry
Course Outcome	Upon completion of this course, the students will be able to 1. Apply the current video game industry landscape and changing landscape of the video game industry. 2. Demonstrate Developer concerns when considering a publisher, publisher concerns when considering a developer and publishing agreement. 3. Illustrate licensing agreement, rights granted, platform, territory and term, licensing fee and indemnification. 4. Solve legal issues, confidentiality, assignment, term and termination, choice of law and venue. 5. Develop a video game application as per government regulation and policies.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	2	1	2	2	2	2
CO-2	2	3	1	2	1	2	-	2	2
CO-3	3	2	-	1	2	2	3	3	3
CO-4	2	3	3	2	-	3	2	2	2
CO-5	3	2	2	1	2	2	3	3	3

<div align="center">1: Weakly related, 2: Moderately related and 3: Strongly related</div>

MODULE 1: GLOBAL STRUCTURE OF VIDEO GAME INDUSTRY	(6L+6P=12)

The Current Video Game Industry Landscape – The changing landscape of the Video Game Industry – Impact of the changing Landscape and its effects on game development – The role of the publisher – The publishing agreement. **Practical component** 1. Teaching Relativity 2. Making Thumbprint Art **Suggested Readings:** https://www.crcpress.com/rsc/downloads/SB3_Practices_of_Game_Design__Indie_Game_Marketing_FreeBook.pdf http://www.ebizmba.com/articles/video-game-websites	CO-1 BTL-3

MODULE 2: LICENSING IP FOR GAMES & INTELLECTUAL PROPERTY	(6L+6P=12)

The importance of the Intellectual Property – Copyright, Trade Secret, Trademark, Patents, Patent Invalidity, Rights of Publicity and Moral Rights and IP Strategy – The licensing agreement – The issues in licensing agreement – Properties and futures. **Practical component** 1. Turning Glitches Into Art **Suggested Readings:** https://www.crcpress.com/rsc/downloads/SB3_Practices_of_Game_Design__Indie_Game_Marke	CO-2 BTL-2

ting_FreeBook.pdf https://www.coursera.org/learn/introduction-to-videogame-law-russian-perspective#syllabus	

MODULE 3: MUSIC AND DEALING WITH THE CONSOLE PLATFORM MANUFACTURES	**(6L+6P=12)**
Introduction - Hiring a Composer, Music master, Libraries and cost – Approving agreements – developing and manufacturing issues – Legal Issues – Moving Forward. **Practical component** 1. Calculating Square Roots and Graphing Quadratic Functions **Suggested Readings** https://www.crcpress.com/rsc/downloads/SB3_Practices_of_Game_Design__Indie_Game_Mar ke ting_FreeBook.pdf	CO-3 BTL-3
MODULE 4: DIGITAL DISTRIBUTION AND MOBILE GAMING MARKET	**(6L+6P=12)**
PC Digital distribution – The long form agreements - Dealing with distributor, Publisher – developer relationship – Monetization models – Regulatory considerations – TAX - IP – Compliance and changing landscape. **Practical component** 1. Exploring Memories **Suggested Readings** https://www.crcpress.com/rsc/downloads/SB3_Practices_of_Game_Design__Indie_Game_Mar ke ting_FreeBook.pdf	CO-4 BTL-2
MODULE 5: THE REGULATION AND CONFIDENTIALITY AGGREMENTS	**(6L+6P=12)**
Introduction – Data Privacy – Consumer Protection – Advertising and Marketing – Regulation and Ratings. The confidentiality agreements purpose – Major Issues and Terms – Deal Demos – Common Clauses in Agreements. **Practical component** 1. Beating The Turing Test **Suggested Readings** https://www.crcpress.com/rsc/downloads/SB3_Practices_of_Game_Design__Indie_Game_Mar ke ting_FreeBook.pdf	CO-5 BTL-2

TEXT BOOKS	
1.	William, Stallings. *"Effective Cyber security: A Guide to Using Best Practices and Standards"*, First Edition, Addison - Wesley Professional Publishers, 2018.
REFERENCE BOOKS	
1.	Jason Nolan, Daniel Harley, "Emerging Trends in Virtual Reality for Gaming: an assessment of best practices from research and development in the gaming industry", Ryerson University. Journal contribution, 2016.
E BOOKS	
1.	http://ict.usc.edu/pubs/Virtual%20Reality%20and%20Interactive%20Digital%20Game%20Technology-%20New% 20Tools%20to%20Address%20Obesity%20and%20Diabetes.pdf.
MOOC	
1.	https://developer.oculus.com/documentation/mobilesdk/latest/
2.	https://blog.disqus.com/vote-the-top-10-best-gaming-websites

COURSE TITLE	3D CHARACTER DEVELOPMENT		CREDITS	4
COURSE CODE	CAC0357	COURSE CATEGORY	DE	L-T-P-S	2-1-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course will provide the basis of 3D character modeling and development with a wide range of expertise on communication and tools – from the quality of execution to the ability to synchronize with the idea that captures the essence of the 3D character's behavior, habits, appearance, distinctive traits, and expressions
Course Objective	1.To develop a storyboard for the 3D character modeling 2. To translate the storyboard into a 3D animated character 3. To identify the various types of 3D character animation 4. To design the facial expressions of the 3D character 5. To create an animated 3D character with its unique styles
Course Outcome	Upon completion of this course, the students will be able to 1. Develop a storyboard for character development. 2. Convert the storyboards to 3D animation. 3 Identify the types of 3D character animation 4. Apply the facial expressions for 3D characters 5. Create an animation according to their own character styles.

Prerequisites: 3D Character Development

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-12	PSO-1	PSO-2	PSO-3
CO – 1	3	2	2	2	1	2	2	2	2
CO – 2	3	2	1	2	1	3	2	2	2
CO – 3	2	3	2	-	2	2	3	3	3
CO – 4	3	2	3	3	3	3	-	2	2
CO - 5	-	3	2	1	2	2	3	3	3

1: Weakly related, 2: Moderately related, and 3: Strongly related

MODULE 1: INTRODUCTION TO STORYBOARD – 3D CHARACTER	(6L+6P=12)
Understanding the 2D storyboard - introduction to 3D camera animation according to storyboard - the concept of character placement and layout in a scene - understanding the concept of staging - basics of creating animation scene file for animation - referencing and reference editor. **Practical component:** Creation of storyboard sketches **Suggested Readings:** Storyboard layout	**CO-1** **BTL-2**

MODULE 2: 3D CHARACTER ANIMATION	(6L+6P=12)
Concept of 3D character animation - blocking the animation - creating character weight in 3D animation, different feelings in the character - understanding of timing and blocking characters. **Practical component:** Basic animation techniques in 3D **Suggested Readings:** Concepts of character animation, character weights, and timing	**CO-2** **BTL-3**

MODULE 3: TYPES OF 3D CHARACTER ANIMATION	(6L+6P=12)
Types of 3D character animation - 3D character cartoon animation - realistic animation - character snappy animation - character walk - character feelings - body part action change mood. **Practical component:** Character design using 3D animation software **Suggested Readings:** Cartoon animation, types of 3D animation	**CO-3** **BTL-2**

MODULE 4: FACIAL EXPRESSIONS – 3D CHARACTER	(6L+6P=12)
Techniques Character facial expressions - techniques of lips sync - animating other languages by pronunciations - creating secondary action for a character - authentic character dialogue performance – Traditional approach -Importance of Guideline- Line of action **Practical component:** Creating various expressions on the designed character **Suggested Readings:** Facial expression, lip sync techniques	**CO-4** **BTL-3**

MODULE 5: ANIMATION STYLES	(6L+6P=12)
Understanding the difference between animation styles - the concept of quadruped animation and its styles - Characterization to model - creating own styles of animation - chains whip action - common animation scenarios in comparison to the real-world -trends in the animation industry and outsourcing demands - future of character animation. **Practical component:** Create scenes to place the designed character **Suggested Readings:** Styles of animation, real-world based animation	**CO-5** **BTL-2**

TEXT BOOKS	
1.	Richard Williams, "The Animator's Survival Kit", First Edition, Faber and Faber Publisher , 2001.

REFERENCE BOOKS	
1.	Bob Thomas, "The Art of Animation: The Story of the Disney Studio Contribution to a New Art", First Edition, Simon and Schuster Publication, 1958
2.	Shamus Culhane , "Animation: From Script to Screen", illustrated edition, Columbus publisher, 1989.

E BOOKS	
1.	Richard Williams - The Animator's Survival Kit
2.	https://jo2bigornia.tripod.com/download/TimingAnimation.pdf

MOOC	
1.	https://www.edx.org/course/basic-3d-animation-using-blender
2.	https://www.coursera.org/learn/interactive-3d-characters-social-virtual-reality

COURSE TITLE	PRINCIPLES OF SOUND DESIGN			CREDITS	4
COURSE CODE	CAC0358	COURSE CATEGORY	DE	L-T-P-S	2-1-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	In this course students will learn the fundamental concepts of sounds. By the end of the course, students will gain knowledge about theories and concepts that underly while designing sound for games.
Course Objective	1. To understand the fundamentals of sound 2. To gain knowledge about the physics behind sound 3. To differentiate speech, music and noise 4. To understand the principles of reflection and refraction in sound 5. To understand comb – filter effects
Course Outcome	Upon completion of this course, the students will be able to 1. Develop a propagation model for a sound system 2. Implement a simple vibratory system 3. Differentiate between sound and noise 4. Create a simple wind music 5. Apply comb filter effects while combing music and speech signals
Prerequisites: Nil	

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	1	1	2	1	2	1
CO-2	1	-	2	-	1	1	2	2	2
CO-3	2	1	2	1	2	2	-	1	1
CO-4	1	2	1	2	1	1	1	2	2
CO-5	1	2	2	1	2	1	2	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: FUNDAMENTALS OF SOUND (6L+6P=12)

The Simple Sinusoid - Sine-Wave Language - Propagation of sound -The dance of the particles - How a sound wave is propagated - Sound in free space - Wavelength and Frequency - Complex Waves -Harmonics - Phase - Partials - Octaves -The concept of spectrum - Electrical, Mechanical, and Acoustical Analogs

Practical Component

1. Develop a propagation model of a sound system

2. Measure the wave length and frequency for a given audio clip

CO-1 BTL-2

MODULE 2: PHYSICS OF SOUND (6L+6P=12)

Sound and vibration - Characters of simple vibratory system - springs and masses - sound propogation - sound pressure wave form - frequency domain - complex period sound - aperiodic sounds – resonance - resonant frequency and format frequency - decibel scale – harmonics – octaves - linear scale and logarithmic scale

Practical Component

1. Develop a simple vibratory system for sound propagation

2. Using the decibel scale, measure the range of a given audio clip

CO-2 BTL-3

MODULE 3: SPEECH, MUSIC AND NOISE (6L+6P=12)

The Voice System - Artificial larynx - Sound spectrograph - Sound sources for speech - Vocal tract molding of speech - Formation of voiced sounds - Formation of unvoiced sounds - Digital speech synthesis - Music - Wind instruments - Nonharmonic overtones - Dynamic range of speech and music - Power in Speech and Music - Frequency Range of Speech and Music - Auditory Area - Noise - The good kind - Random noise - White and pink noise - Signal Distortion - Harmonic Distortion

Practical Component

1. Model a simple wind instrument using online tools

2. Differentiate white and pink noise from the given audio clip

CO-3 BTL-3

MODULE 4:REFLECTION AND REFRACTION OF SOUND (6L+6P=12)

Reflection of Sound - Reflections from Flat Surfaces - Doubling of Pressure at Reflection -Reflections from Convex and concave Surfaces - Reflections from Parabolic Surfaces - Reflections inside a Cylinder -Standing Waves -Reflection of Sound from Impedance - Irregularities -The Corner Reflector - Echo-Sounding - Perceptive Effects of Reflections - Refraction of Sound - Refraction of sound in solids -Refraction of sound in the atmosphere - Refraction of sound in the ocean -Refraction of sound in enclosed spaces

Practical Component

1. Measure the reflection of sound for a given convex structure

2. Measure the reflection of sound for a given concave structure

CO-4 BTL-2

MODULE 5: COMB FILTER EFFECTS	(6L+6P=12)

Comb-Filter Effects -What Is a Comb Filter? - Superposition of Sound -Tonal Signals and Comb Filters -Combing of music and speech signals -Combing of direct and reflected sound -Comb Filters and Critical Bands -Comb Filters in Stereo Listening -Coloration and Spaciousness -Combing in Stereo Microphone Pickups -Audibility of Comb-Filter Effects-Comb filters in practice -Estimating comb-filter response **Practical Component** 1. Apply comb filter effects for the given audio clip 2. Combine music and speech signal together and use appropriate techniques as required.	CO-5 BTL-3

TEXT BOOKS	
1.	Everest A. F, "Master Handbook of Acoustics", Sixth Edition, McGrawHill Education Press, 2016.

REFERENCE BOOKS	
1.	Sonnenschein, "Sound Design: The Expressive Power of Music, Voice and Sound Effects in Cinema" , first edition, Michael Wiese Productions, 2001.
2.	Burgess, R. J," The History of Music Production", First edition, Oxford University Press, 2014.
3.	Sinclair, J. "Principles of Game Audio and Sound Design: Sound Design and Audio Implementation for Interactive and Immersive Media", First edition, Focal Press, 2020.
4.	Murray. L, "Sound Design Theory and Practice: Working with Sound", First edition, Routledge publication, 2019.

E BOOKS	
1.	http://homepages.wmich.edu/~hillenbr/206/ac.pdf

MOOC	
1.	https://www.coursera.org/learn/music-synthesizer
2.	https://www.coursera.org/learn/audio-engineering
3.	https://www.coursera.org/specializations/music-production

COURSE TITLE	VISUAL SCRIPTING			CREDITS	4
COURSE CODE	CAC0370	COURSE CATEGORY	DE	L-T-P-S	2-1-2-0
Version	1.0	Approval Details	XX ACM, XX.XX.2022	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Practical Assessment	ESE
15%	15%	20%	50%

Course Description	This course enables the students to learn game programming without coding using unity tool.
Course Objective	1. To get accustomed to the terminologies of visual scripting 2. To understand the Unity tool settings. 3. To understand basic script screen and units. Understand 4. To learn basics of gaming using visual scripting. 5. To comprehend in adding components to games

	Upon completion of this course, the students will be able to
Course Outcome	1. Explain the basics of visual scripting. 2. Able to set up initial project platform for visual scripting 3. Able to add variables units and branching to the program. 4. Able to program simple player movements and scoring. 5. To add components like menus, levels, sounds to the program.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	2	1	2	3	3	1
CO-2	2	-	2	1	2	1	2	-	2
CO-3	3	2	3	2	-	2	3	3	3
CO-4	2	3	2	1	2	1	2	2	2
CO-5	3	3	3	2	1	2	3	3	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: DEFINITIONS OF VISUAL SCRIPTING	(6L+6P=12)

Unity Hub - Unity Editor Basic Windows - Unity Editor Windows - Editor Layout- Render Pipelines- Package Manager- 2D and 3D - Visual Scripting - Post Processing - Ambient Occlusion URP - Text - Text MeshPro -Prefabs - Unity Package- Grids - Render Texture. **Practical Component** Working with unity editor	CO-1 BTL-2

MODULE 2: INTRODUCTION TO VISUAL SCRIPTING USING UNITY	(6L+6P=12)

Introduction to Visual Scripting - Define Graph and Scripting Machine-Adding Scriting Machine Component to the Game Object - Saving Project Asset - Introduction to Visual Scripting windows - Arrange Panels of Script Graph windows - Pan Zoom and return to the script graph windows. Preparing the Script Scene - Creating Script Machine - Creating Graphs - Setting up Script Graph Window- Program a Visual Script - Start and Update - Display Fuzzy Finder- Examining Unit - using Graph Inspector - Configuring a Unit - Changing Inline Values in a graph. **Practical Component** Creating and customizing graphs	CO-2 BTL-3

MODULE 3: PROGRAMMING USING VISUAL SCRIPTING IN UNITY	(6L+6P=12)

Configuring Variables - Creating variables in black board - Object Types- Graph variables- Object Variables- One Graph and two variable objects. Programming Fundamentals in visual scripting - Add a New Graph - Get the rotation rate- Adding Time Unit- Adding Multiply Unit - Applying calculated value - Branch the flow- Change position with vector3- Switch. **Practical Component** Creating Variables in black board	CO-3 BTL-3

MODULE 4: BASIC UNITY PROGRAMMING IN GAMING PERSPECTIVE	(6L+6P=12)

Physics behind gaming - Player Movement -Player Speed - player jumping -is grounded- super units- visual scripting groups - animations - Cinemachine- platform visuals- Spikes - Visual scripting events - UI - Player falls to death - Coins - Level win - multiple level - post processing - Shared graph . **Practical Component** Creating a shared graph	**CO-4** **BTL-3**

MODULE 5: ADVANCED UNITY PROGRAMMING IN GAMING PERSPECTIVE	(6L+6P=12)

Shared Graph -Sound- Music- Game win - menus in games- Coin animation - trails - double jumps- moving platforms- moving hazards- Touch inputs -Introduction to action RPG **Practical Component** Creating menus in games	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Sergey Mohov, "Practical Game Design using Unity and Play Maker", First Edition, Pact Publishers, 2016.

REFERENCE BOOKS	
1.	Lucas Bertolini, "Hands-On Game Development without Coding: Create 2D and 3D games with Visual Scripting in Unity", 1st Edition, Pact Publishers, 2018

E BOOKS	
1.	https://docs.unity3d.com/2021.1/Documentation/Manual/com.unity.visualscripting.html

MOOC	
1.	https://www.udemy.com/course/master-visual-scripting-in-unity-by-making-advanced-games

COURSE TITLE	ADVANCED MODELLING AND TEXTURING			CREDITS	4
COURSE CODE	CAC0371	**COURSE CATEGORY**	DE	**L-T-P-S**	**2-1-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**	**LEARNING LEVEL**	**BTL-3**
ASSESSMENT SCHEME					
First Periodical Assessment	**Second Periodical Assessment**	**Practical Assessment**		**ESE**	
15%	**15%**	**20%**		**50%**	
Course Description	This course helps to develop skill and knowledge in 3D modelling and Texturing for game design.				

Course Objective	1. To produce simple 3D user interface for gaming platform. 2. To apply suitable key frames for 3D user interface 3. To choose rigging and armature features for 3D modelling. 4. To identify appropriate texturing techniques for real time application. 5. To prepare UV and textures compatible with Physically-based rendering (PBR) for real-time rendering.
Course Outcome	Upon completion of this course, the students will be able to 1. Produce simple 3D user interface for gaming platform. 2. Apply suitable key frames for 3D user interface 3. Analyze rigging and armature features for 3D modelling. 4. Identify appropriate texturing techniques for real time application. 5. Prepare UV and textures compatible with Physically-based rendering (PBR) for real-time rendering.

Prerequisites: Basic Knowledge about Animation

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	3	2	3	3	2
CO-2	2	-	2	2	3	3	2	-	3
CO-3	3	3	3	3	-	2	3	3	2
CO-4	2	2	2	2	3	3	2	2	3
CO-5	3	3	3	3	2	2	3	3	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: DEFINITIONS OF VISUAL SCRIPTING	(6L+6P=12)
Unity Hub - Unity Editor Basic Windows - Unity Editor Windows - Editor Layout- Render Pipelines- Package Manager- 2D and 3D - Visual Scripting - Post Processing - Ambient Occlusion URP - Text - Text MeshPro -Prefabs - Unity Package- Grids - Render Texture. **Practical Component** Create 2D Character and 3D Character using Unity	**CO-1** **BTL-2**

MODULE 2: INTRODUCTION TO VISUAL SCRIPTING USING UNITY	(6L+6P=12)
Introduction to Visual Scripting - Define Graph and Scripting Machine-Adding Scriting Machine Component to the Game Object - Saving Project Asset - Introduction to Visual Scripting windows - Arrange Panels of Script Graph windows - Pan Zoom and return to the script graph windows. Preparing the Script Scene - Creating Script Machine - Creating Graphs - Setting up Script Graph Window- Program a Visual Script - Start and Update - Display Fuzzy Finder- Examining Unit - using Graph Inspector - Configuring a Unit - Changing Inline Values in a graph. **Practical Component** Create a visual graph for fuzzy finder	**CO-2** **BTL-3**

MODULE 3: PROGRAMMING USING VISUAL SCRIPTING IN UNITY	(6L+6P=12)
Configuring Variables - Creating variables in black board - Object Types- Graph variables- Object Variables- One Graph and two variable objects. Programming Fundamentals in visual scripting - Add a New Graph - Get the rotation rate- Adding Time Unit- Adding	**CO-3** **BTL-3**

Multiply Unit - Applying calculated value - Branch the flow- Change position with vector3- Switch. **Practical Component** Add a time unit to a given Video clip	
MODULE 4: BASIC UNITY PROGRAMMING IN GAMING PERSPECTIVE	**(6L+6P=12)**
Physics behind gaming - Player Movement -Player Speed - player jumping -is grounded- super units- visual scripting groups - animations - Cinemachine- platform visuals- Spikes - Visual scripting events - UI - Player falls to death - Coins - Level win - multiple level - post processing - Shared graph . **Practical Component** Create vertical and horizontal movement for the given character	**CO-4** **BTL-3**
MODULE 5: ADVANCED UNITY PROGRAMMING IN GAMING PERSPECTIVE	**(6L+6P=12)**
Shared Graph -Sound- Music- Game win - menus in games- Coin animation - trails - double jumps- moving platforms- moving hazards- Touch inputs -Introduction to action RPG **Practical Component** Add menu to a given game layout	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Sergey Mohov, "Practical Game Design using Unity and Play Maker", Pact Publishers, 2016.

REFERENCE BOOKS	
1.	Lucas Bertolini, **"**Hands-On Game Development without Coding: Create 2D and 3D games with Visual Scripting in Unity", Pact Publishers, 2018

E BOOK	
1.	https://books.google.co.in/books/about/Texturing_Modeling.html?id=bDlSJd8GfMcC&redir_esc=y

MOOC	
1.	https://www.udemy.com/course/3d-animation-and-modeling-master-class/

COURSE TITLE	\multicolumn{4}{c}{**STOP MOTION ANIMATION**}			**CREDITS**	**4**
COURSE CODE	**CAC0372**	**COURSE CATEGORY**	**DE**		**L-T-P-S**	**2-1-2-0**
Version	**1.0**	**Approval Details**	**XX ACM, XX.XX.2022**		**LEARNING LEVEL**	**BTL-3**
ASSESSMENT SCHEME						
First Periodical Assessment	**Second Periodical Assessment**	\multicolumn{3}{c}{**Practical Assessment**}			**ESE**
15%	**15%**	\multicolumn{3}{c}{**20%**}			**50%**
Course Description	\multicolumn{6}{l}{The course will take the students through various aspects of Stop Motion Animation using a wide range of materials and techniques. Emphasis will be on the creation, conceptualization and visualization of the storyboards. Developing concepts, storyboarding and production of several stop motion animations will be accomplished. Skill development in the software to develop storyboards in sequencing media elements to create multimedia presentations.}					

Course Objective	1. To identify the 12 principles of the stop motion animation 2. To acquire the technical skills and processes in creating the animation 3. To apply the appropriate animation techniques 4. To work on industry standard tools and software 5. To create an accurate and appealing stop motion animation
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the principles of animation 2. Acquire the technical skills and processes required to create stop-motion animation 3. Apply appropriate animation techniques 4. Work on industry standard tools and software to create stop motion animation. 5. Create accurate and appealing stop motion animation

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	2	2	2	1	2	2	-	2	3
CO-2	3	-	2	2	1	3	2	3	2
CO-3	2	2	1	1	1	2	3	2	-
CO-4	3	3	2	-	2	3	2	3	2
CO-5	2	2	1	2	1	2	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TYPES OF ANIMATION AND BASIC PRINCIPLES	(6L+6P=12)
Traditional Animation - Cell Animation or hand drawn Animation - Stop Motion Animation - Puppet Animation - Clay Animation - Cut-out Animation - Silhouette Animation - Model Animation - Object Animation - Computer Animation - 2D Animation - 3D Animation - The 12 Basic Principles of Animation. **Practical component:** Create basic animation based on the 12 principles **Suggested Readings:** 12 basic principles of animation	CO-1 BTL-1

MODULE 2: MECHANICS OF MOTION AND STAGE CRAFT	(6L+6P=12)
Introduction to Mechanics of motion - Anticipation and Acceleration - Timing - Ease in and ease out - Staging - Arcs - Transformation - Basic stage craft – Lighting – Sets - Cameras Clay animation - Basic timing. **Practical component:** Applying the motion techniques in the animation **Suggested Readings:** Motion mechanics	CO-2 BTL-2

MODULE 3: PROCESS AND TECHNIQUES OF STOP-MOTION ANIMATION	(6L+6P=12)
Camera angles - Character positioning - Frame by Frame controls - Positioning and actions of secondary characters and Props - Different types of stop motion animation - Traditional frame by frame capture – Claymation - Cut-out animation - Silhouette animation - Found Object Animation - Hand Drawn Animation. **Practical component:** Animate simple objects with different camera angles **Suggested Readings:** Types of stop-motion animation	**CO-3** **BTL-3**

MODULE 4: INTRODUCTION TO STOP-MOTION ANIMATION SOFTWARE	(6L+6P=12)
Introduction to available software for Stop - Motion Animation - Monkey Jump Software -Preparation of stop motion animation end - Products - Film - Television series - Advertisement - Education content - Application of stop motion animation techniques - Animating to sound **Practical component:** Create an ad using simple stop-motion animation of the product **Suggested Readings:** Stop-motion animation techniques, Background audio	**CO-4** **BTL-3**

MODULE 5: CONCEPT CREATION FOR STOP MOTION ANIMATION	(6L+6P=12)
Creating action and movement of form - Creating own concept and understanding the limitations and challenges of the medium - Execution of the concept - Addition of Background music and Sound effects **Practical component:** Create a stop-motion animation and add music & sound effects **Suggested Readings:** Sound effects	**CO-5** **BTL-3**

TEXT BOOKS	
1.	Ken A. Priebe," The Advanced Art of Stop Motion Animation',First Edition, Cengage Publication, 2011.

REFERENCE BOOKS	
1.	Barry Purves, "Stop motion: passion, process and performance", Second Edition, Elsevier Publisher, 2008.
2.	Susannah Shaw," Stop Motion: Craft Skills for Model Animation, Third Edition, Routledge Publication, 2017.

E BOOKS	
1.	http://index-of.co.uk/Animation/The_Advanced_Art_of_Stop_Motion_Animation.pdf

MOOC	
1.	https://www.coursera.org/projects/create-storyboard-canva
2.	https://www.udemy.com/course/basics-of-stop-motion-animation-using-canva-and-openshot/
3.	https://www.skillshare.com/classes/Stop-Motion-for-Beginners-Create-Expert-Animations-in-Dragonframe/1564937960?via=browse-rating-stop-motion-animation-layout-grid