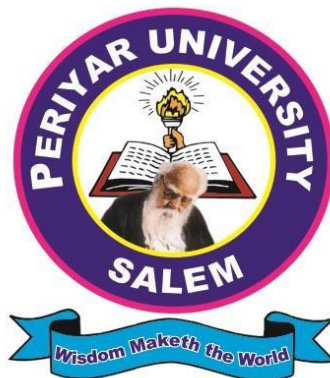# PERIYAR UNIVERSITY

(NAAC A Grade-STATE UNIVERSITY – NIRF RANK 68, ARIIA RANK 4)

Periyar Palkalai Nagar, Salem-636 011

DEPARTMENT OF COMPUTER SCIENCE

B. Voc

Augmented Reality and Virtual Reality

REGULATIONS AND SYLLABUS

(Effective from the academic year 2020-21 and thereafter)

PERIYAR UNIVERSITY

(With effect from the academic year 2020-2021 onwards)

1. Preamble

The Department of Computer Science aims in serving the students, employed and budding entrepreneurs through creative paths that enrich and empower their academic and professional passions expanding our collective contributions to the world. Augmented Reality and Virtual Reality is an interdisciplinary programme.

The Department was sanctioned permission to offer B. Voc. AR and VR programme from the academic year 2020 -21.

Programme Objectives of B. Voc. AR and VR

- Designed as an Empowerment Vocational Degree / Advanced Diploma / Diploma program for those who think big and are willing to take on newer horizons of unprecedented challenges.

- To provide a technology to combine the virtual word and real world by overlaying the digital interactive content through holographic images to interface end user.

2. Eligibility for admission and Duration

Those who have passed +2 examinations in any stream approved by TNBSC/CBSE/ICSE or any Diploma/UG degree, approved by the Association of Indian Universities are eligible for admission. Vocational stream students are most preferred.

Duration - Three years (120 days per semester including 30 days of Apprenticeship)

3. National Skill Qualification Framework Level (NSQF)

NSQF Level	Credits		Total credits for Award	Exit Program Level	Duration
	General Education	Skill Component			
4	12	18	30	Certificate in AR and VR – Graphic Designer	6 Months
5	24	36	60	Diploma in AR and VR – 2D Animator	12 Months
6	48	72	120	Advanced Diploma in AR and VR – Animation Director	24 Months
7	72	108	180	B. Voc. in AR and VR – AR and VR Developer	36 Months

- Credit refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week.

- **One credit** is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week. Accordingly, one Credit would mean equivalent of 14-15 periods of 60 minutes each or 28 – 30 hrs of workshops / labs.

- For **internship / field work,** the credit weightage for equivalent hours shall be 50% of that for lectures / tutorials.

- For **self-learning**, based on e-content or otherwise, the credit weightage for equivalent hours of study shall be 50% of that for lectures / tutorials.

4. Teaching Methodologies

The **Classroom Teaching** would be through conventional lectures, video presentations and use of OHP and Power point presentations. The lecture would be such that the students should participate actively in the discussion, student's seminar and multi sensory approach in learning. The scientific discussions would be arranged to improve their communicative skills.

In the laboratory, instructions would be given for the experiments followed by demonstration and finally the students have to do the experiments individually. Periodic tests would be conducted and for the students of slow learners would be given special attention. Along with Lectures, Tutorials and Laboratory sessions, through **Self learning** (Flipped Classroom pedagogy) the student will be given,

- **PBL (Project Based Learning)** – Learning through Gamification

- **Webinars** by Industry Experts on specific job roles

- **Apprenticeship** in the industry on the job roles trained with the support of **MESC (Media and Entertainment Skill Council) / NASSCOM** and Industry

- **Industrial Visit - Schematic work process** on the job roles trained in each semester (as mentioned later in the structure of the programme) will facilitate skills and professional career in the same field.

5. Level Descriptors

The curriculum is designed in a manner that at the end of semester-1, year-1, year-2 and year-3 students are able to meet below mentioned level descriptors for level 4, 5, 6 and 7 of NSQF respectively.

Level	Semester	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level-4	1	Digital Technic - 1(Practical)	Problem Solving Techniques	Digital Technic - 2(Practical)	Visual Design - 1	Digital Technic - 1 and 2 (Practical)
Level-5	1	Digital Technic - 1(Practical)	Problem Solving Techniques Lab	Digital Technic - 2(Practical)	Visual Design - 1	Digital Technic - 1 and 2 (Practical)
	2	Digital Technic - 3(Practical)	Python	Digital Technic - 4(Practical)	UI / Animation Design	Digital Technic - 3 and 4 (Practical)
Level-6	3	Digital Technic - 5 and 6 (Practical)	3D Design	Digital Technic - 5 and 6 (Practical)	Visual Design – 2/ GE-Communication	Digital Technic - 5 and 6 (Practical)
	4	Advanced 3D and Match moving techniq		Communication design	Digital Technic - 7 and 8(Practical)	Digital Technic - 7 and 8(Practical)
Level-7	5	VR Design	Introduction to VR	Digital Technic - 9(Practical)	Introduction to Programming	Digital Technic - 9(Practical)
	6		Mobile AR / VR	Interactive Narrative	Introduction to AR	Project

6. SSC - NOS – QP Mapping

YEAR	SEMESTER	EXIT / JOB PROFILE	MESC QP
1	1	Certificate in AR and VR design - Graphic Designer	MES/Q0601
	2	Diploma in AR and VR design - 2D Animator	MES/Q0701
2	3	No Exit Option	MES/Q1302
	4	Advanced diploma in AR and VR – Animation Director	
3	5	No Exit Option	MES/Q1001 MES/Q1002
	6	B.Voc in AR and VR - AR and VR Developer	

7. CBCS-STRUCTURE OF THE PROGRAMME

The programme structure comprises of two components.

Course Component	No. of Courses	Hours of learning / Week	Marks	Credits
General Education Component				
Language I – Tamil / Hindi/ Malayalam	2	3	200	06
Language II – English	2	3	200	06
Core Courses	2+3	3/4	500	6+12
Elective Theory	5	4	500	20
Elective Lab	5	4	500	10
Core Practical	5	4	500	10
Value Education Courses	02	1	200	2
Online Courses	04	1	-	-
Total				**72**
Skill Component				
Core Courses	6	4	600	24
Core Practical	14	6	1400	56
Apprenticeship / Industrial Visit	05	-	250	10
Project	01	-	200	18
Total				**108**

Core Courses (CC):

Course Code	Name of the Course	Category	No. of Hours/Week L/T	P	Credits
General Education Component					
20BARVRL01/ 20BARVRH01/ 20BARVRM01	Language 1 – Tamil -I / Hindi - I/ Malayalam-I	CC	3	-	3
20BARVRE01	Language 2 – English - I	CC	3	-	3
20BARVRL02/ 20BARVRH02/ 20BARVRM02	Language 1 – Tamil -II / Hindi - II/ Malayalam-II	CC	3	-	3
20BARVRE02	Language 2 – English-II	CC	3	-	3
20BARVRG01	Problem Solving Techniques	CC	3	-	3
20BARVRG03	Python Programming	CC	3	-	3
20BARVRG05	Data Structures	CC	4	-	4
20BARVRG07	Java Programming	CC	4	-	4
20BARVRG09	C# Programming	CC	4	-	4
Skill Component					
20BARVRS01	Visual Design	CC	4	-	4
20BARVRS05	Animation Design Theory	CC	4	-	4
20BARVRS06	User Interface Design Theory	CC	4	-	4
20BARVRS09	3D Design	CC	4	-	4
20BARVRS13	Digital Marketing Techniques	CC	4	-	4
20BARVRS17	Design Patterns for real time Programming	CC	4	-	4

Elective Courses (EC):

S. No.	Course code	Name of the Course	No. of Hours /Week		Credits
			L/T	P	
1	20BARVREL01	Artificial Intelligence	4	-	4
2	20BARVREL02	Artificial Intelligence Lab	-	4	2
3	20BARVREL03	Predictive Analytics	4	-	4
4	20BARVREL04	Predictive Analytics Lab	-	4	2
5	20BARVREL05	Internet of Things	4	-	4
6	20BARVREL06	Internet of Things Lab	-	4	2
7	20BARVREL07	Digital Image Processing	4	-	4
8	20BARVREL08	Digital Image Processing Lab	-	4	2
9	20BARVREL09	Machine Learning Techniques	4	-	4
10	20BARVREL10	Machine Learning Techniques Lab	-	4	2
11	20BARVREL11	Web Mining	4	-	4
12	20BARVREL12	Web Mining Lab	-	4	2
13	20BARVREL13	Data Visualization Techniques	4	-	4
14	20BARVREL14	Data Visualization Techniques Lab	-	4	2
15	20BARVREL15	Blockchain Technology	4	-	4
16	20BARVREL16	Blockchain Technology Lab	-	4	2
17	20BARVREL17	Deep Learning	4	-	4
18	20BARVREL18	Deep Learning Lab	-	4	2
19	20BARVREL19	Digital Marketing	4	-	4
20	20BARVREL20	Digital Marketing Lab	-	4	2

Core - Practical (CP):

Course code	Name of the Course	Category	No. of Hours / Week			Credits
			L/T	P	S	
General Education Component						
20BARVRG02	Problem Solving Techniques Lab	CP	-	4	-	2
20BARVRG04	Python Programming Lab	CP	-	4	-	2
20BARVRG06	Data Structures Lab	CP	-	4	-	2
20BARVRG08	Java Programming Lab	CP	-	4	-	2
20BARVRG10	C# Programming Lab	CP	-	4	-	2
		CP	-	4	-	2
Skill Component						
20BARVRS02	Digital Design Lab	CP	2	4	-	4
20BARVRS03	Image Editing Lab	CP	2	4	-	4
20BARVRS04	Digital Illustration Lab	CP	2	4	-	4
20BARVRS07	User Interface Design Lab	CP	2	4	-	4
20BARVRS08	2D Animation Lab	CP	2	4	-	4
20BARVRS10	Modelling and Texturing Lab	CP	1	4	2	4
20BARVRS11	Architectural Visualization Lab	CP	1	4	2	4
20BARVRS12	Game Design Lab	CP	1	4	2	4
20BARVRS14	Advanced 3D modelling technique Lab	CP	1	4	2	4
20BARVRS15	Digital Sculpting technique Lab	CP	1	4	2	4
20BARVRS16	360 Video Editing Lab	CP	1	4	2	4
20BARVRS18	Digital lighting Techniques Lab	CP	1	4	2	4
20BARVRS19	Virtual Reality Lab	CP	1	4	2	4
20BARVRS20	Augmented Reality Lab	CP	1	4	2	4

Online Courses (OC):

Name of the Course	Category	No. of Hours / Week			Credits
		L	T	P	
SWAYAM/MOOC-I	OC	-	-	1	-
SWAYAM/MOOC-II	OC	-	-	1	-
SWAYAM/MOOC-III	OC	-	-	1	-
SWAYAM/MOOC-IV	OC	-	-	1	-

Curriculum Framework for Each Semester

L – Lecture, T – Tutorial, P – Practical, S - Self Learning, IA – Internal Assessment, EA - External Assessment

Exit Program Level	Part	Course Code	Course	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		CIA	EA	Total
			SEMESTER – I									
		GENERAL EDUCATION COMPONENT										
	I	20BARVRL01/ 20BARVRH01/ 20BARVRM01	Language 1 - Tamil / Hindi - I/ Malayalam- I	3	-	-	3	-	3	25	75	100
	II	20BARVRE01	Language 2 - English - I	3	-	-	3	-	3	25	75	100
	III	20BARVRG01	Problem Solving Techniques	3	-	-	3	-	3	25	75	100
	III	20BARVRG02	Problem Solving Techniques Lab	-	2	-	2	-	4	40	60	100
	IV	20BARVRV01	Value Education 1 - Yoga	-	-	1	1	-	1	25	75	100
			Online Course	1	-	-	-	-	1	-	-	-
		SKILL COMPONENT										
	V	20BARVRS01	Visual Design	3	-	1	-	4	3	25	75	100
	VI	20BARVRS02	Digital Design Lab	2	2	-	-	4	6	40	60	100
	VII	20BARVRS03	Image Editing Lab	2	2	-	-	4	6	40	60	100
	VIII	20BARVRS04	Digital Illustration Lab	2	2	-	-	4	6	40	60	100
		19BARVRA01	Apprenticeship /Industry Visit	-	-	2	-	2	-	20	30	50
			Total				**12**	**18**	**36**	**305**	**645**	**950**

Exit Program Level column (rotated): NSQF Level – 4: Certificate in AR and VR Design

Exit Program Level	Part	Subject Code	Subject Name	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		IA	EA	Total
				SEMESTER – II								
NSQF Level – 5: Diploma in AR and VR Design		**GENERAL EDUCATION COMPONENT**										
	I	20BARVRL02/ 20BARVRH02/ 20BARVRM02	Language 1 - Tamil -II/ Hindi - II / Malayalam- II	3	-	-	3	-	3	25	75	100
	II	20BARVRE02	Language 2 - English - II	2	1	-	3	-	4	25	75	100
	III	20BARVRG03	Python Programming	3	-	-	3	-	3	25	75	100
	III	20BARVRG04	Python Programming Lab	-	2	-	2	-	4	40	60	100
	IV	19BARVRV02	Value Education 2 - Environmental Studies	1	-		1	-	1	25	75	100
	IV		Online Course	1	-	-	-	-	1	-	-	-
		SKILL COMPONENT										
	III	20BARVRS05	Animation Design Theory	4	-	-	-	4	4	25	75	100
	III	20BARVRS06	User Interface Design Theory	4	-	-	-	4	4	25	75	100
	III	20BARVRS07	User Interface Design Lab	2	2	-	-	4	6	40	60	100
	III	20BARVRS08	2D Animation Lab	2	2	-	-	4	6	40	60	100
	V	19BARVRA02	Apprenticeship / Industry Visit	-	-	-	-	2	-	20	30	50
			Total				**12**	**18**	**36**	**290**	**660**	**950**

Exit Program Level	Part	Course Code	Course	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		IA	EA	Total
			SEMESTER – III									
		GENERAL EDUCATION										
	III	20BARVRG05	Data Structures	4	-	-	4	-	4	25	75	100
	III	20BARVRG06	Data Structures Lab	-	2	-	2	-	4	40	60	100
	III		Elective-I	4	-	-	4	-	4	25	75	100
	III		Elective – I Lab	-	2	-	2	-	4	40	60	100
	IV		Online Course						1			
		SKILL COMPONENT										
No Exit Option	III	20BARVRS09	3D Design	4	-	-	-	4	4	25	75	100
	III	20BARVRS10	Modelling and Texturing Lab	1	2	1	-	4	5	40	60	100
	III	20BARVRS11	Architectural Visualization Lab	1	2	1	-	4	5	40	60	100
	III	20BARVRS12	Game Design Lab	1	2	1	-	4	5	40	60	100
	V	19BARVRA03	Apprenticeship / Industry Visit			2	-	2	-	20	30	50
			Total				**12**	**18**	**36**	**295**	**555**	**850**

Exit Program Level	Part	Course Code	Course	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		IA	EA	Total
			SEMESTER – IV									
	GENERAL EDUCATION COMPONENT											
	I	20BARVRG07	Java Programming	4	-	-	4	-	4	25	75	100
	II	20BARVRG08	Java Programming Lab	-	2	-	2	-	4	40	60	100
	III		Elective -II	4	-	-	4	-	4	25	75	100
	III		Elective – II Lab	-	2	-	2	-	4	40	60	100
	IV		Online Course	-	-	-	-	-	1	-	-	-
	SKILL COMPONENT											
	III	20BARVRS13	Digital Marketing Techniques	4	-	-	-	4	4	25	75	100
	III	20BARVRS14	Advanced 3D modelling technique Lab	1	2	1	-	4	5	40	60	100
	III	20BARVRS15	Digital Sculpting technique Lab	1	2	1	-	4	5	40	60	100
	III	20BARVRS16	360 Video Editing Lab	1	2	1	-	4	5	40	60	100
	V	19BARVRA04	Apprenticeship / Industry Visit	-	-	2	-	2	-	20	30	50
			Total				**12**	**18**	**36**	**295**	**555**	**850**

(Exit Program Level column, vertical text: **NSQF Level – 6: Advanced Diploma in AR and VR**)

Exit Program Level	Part	Course Code	Course	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		IA	EA	Total
			SEMESTER - V									
			GENERAL EDUCATION									
	I	20BARVRG09	C# Programming	4	-	-	4	-	4	25	75	100
	II	20BARVRG10	C# Programming Lab	-	2	-	2	-	4	40	60	100
	III		Elective - III	4	-	-	4	-	4	25	75	100
	III		Elective – III Lab	-	2	-	2	-	4	40	60	100
	IV		Online Course	-	-	-	-	-	1	-	-	-
No Exit Option			**SKILL COMPONENT**									
	IV	20BARVRS17	Design Patterns for real time Programming	4	-	-	-	4	4	25	75	100
	IV	20BARVRS18	Digital lighting Techniques Lab	1	2	1	-	4	5	40	60	100
	V	20BARVRS19	Virtual Reality Lab	1	2	1	-	4	5	40	60	100
	VI	20BARVRS20	Augmented Reality Lab	1	2	1	-	4	5	40	60	100
		19BARVRA05	Apprenticeship / Industry Visit	-	-	2	-	2	-	20	30	50
			Total				**12**	**18**	**36**	**255**	**555**	**850**

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Exit Program Level	Part	Course Code	Course	CREDIT			Total Credit		Hours per week	Marks		
				L/T	P	S	General	Skill		IA	EA	Total
			SEMESTER - VI									
			GENERAL EDUCATION COMPONENT									
B. Voc. in AR and VR	III		Elective - IV	4			4	-	4	25	75	100
	III		Elective – IV Lab		2		2		4	40	60	100
	III		Elective - V	4			4	-	4	25	75	100
	III		Elective – V Lab		2		2		4	40	60	100
			SKILL COMPONENT									
	IV	20BARVRP01	Project	-	-	-	-	18	20	50	150	200
			Total				**12**	**18**	**36**	**180**	**420**	**600**

Part I - Tamil/Hindi/Malayalam

Part II – English

Part III – Core/Elective (General Education and Skill Component)

Part IV – Value Education/Online Course

8. Examinations and Scheme of Evaluation

Examinations will be conducted in semester pattern. Candidates failing in any course (both General Education and Skill Component) will be permitted to appear for such failed course in the same syllabus structure at subsequent examinations for within next 5 years. Failing which, the candidate has to complete the course in the present existing syllabus structure.

Evaluation will be done both on a continuous basis and at the end of the semester. The first evaluation will be in the 4th week, the second in the 8th week, third in the 12th week, fourth in the 18th week and the end – semester examination in the 20th week. The General Education Component is assessed by the University and Skill Education Component by the University and Sector Skill Council.

9. Passing Minimum Marks

Theory:

The candidate shall be declared to have passed the examination if the candidate secure not less than 40 marks put together out of 100 marks (CIA+EA). Minimum 40% should be secured (30 out of 75) in EA of each theory subject.

Practical:

The candidate shall be declared to have passed the examination if the candidate secure not less than 40 marks put together out of 100 marks (CIA+EA). Minimum 40% should be secured (34 out of 60) in EA of each practical subject.

10. Grading System

Evaluation of performance of students is based on ten-point scale grading system as given below.

Ten Point Scale			
Grade of Marks	Grade points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

11. Marks Distribution

11.1 Theory:

Maximum Marks   : 100 Marks

External [EA]   : 75 Marks

Internal [CIA]   : 25 Marks

Theory Internal Marks Distribution (25 Marks)

Attendance   : 5 Marks
Assignment   : 5 Marks
Test   : 15 Marks

11.2 Practical

Maximum Marks   : 100 Marks

External [EA]   : 60 Marks

Internal [CIA]   : 40 Marks

Practical Internal Marks Distribution (40 Marks)

Record   : 15 Marks
Examinations   : 25 Marks

Practical External Marks Distribution (60 Marks)

For each practical question the marks should be awarded as follows

i) Algorith/Flowchart   - 20%

ii) Writing the program in the main answer book - 30%

iii) Test and debug the program   - 30%

iv) Display the correct output   - 20%

(Marks may be proportionately reduced for the errors committed in each of the above)

12.   Question Paper Pattern

12.1 Theory

Time duration: 3 Hours   Maximum: 75 Marks

PART- A: (15× 1 = 15 marks)
Answer all the questions
(Objective type three questions from each unit)

PART- B: (2 × 5 = 10 marks)
Answer any two questions out of five questions
(Questions must be of type analytical)

PART- C: (5× 10 = 50 marks)
Answer all the questions
(Either or type for each unit)

12.2 Practical
1. **Two** Either/OR type question from the given list   : 60 Marks

13.   Equivalence of the Programme

Candidates who have completed B. Voc. AR and VR are equivalent to graduates specialising in AR and VR and in B.Sc. CS/BCA or all its related disciplines awarded by any UGC recognized Universities and Institutions.

14.   CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class. All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within two academic years from the year of admission to the course only are eligible for University Ranking.

15.   COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2020-21, i.e., for students who are to be admitted to the first year of the course during the academic year 2020-21 and thereafter.

B. Voc. AR and VR – SYLLABUS (2020-2021 Onwards)

SEMESTER-I

COURSE-20BARVRG01   Credits: 3

PROBLEM SOLVING TECHNIQUES

Course Objective
- It aims to provide exposure to problem-solving through programming.
- To apprehend the basic concepts of C- Programming language.
- To develop a greater understanding of the issues involved in programming language design and implementation

Unit-I
Problem Solving Techniques- Algorithms - Top-down Approach of Algorithms- Program Verification- Efficiency of an Algorithm- Flow Charts- Development of algorithms for simple problems.

Unit-II
Fundamental Algorithms - Exchanging the values of Two Variables - Counting - Summation of a set of Numbers - Factorial Computation- - Generation of the Fibonacci sequence - Reversing the Digits of an Integer - Base Conversion Character to Number Conversion.

Unit-III
Overview of C – Constants, Variables, Data types – Operators – Expressions - The Decision Control Structure – The Loop control Structure – The Case Control Structure

Unit-IV
Functions and Pointers - Passing Values between Functions- Advanced Features of Functions- – Arrays – Pointers and Arrays - Two Dimensional Arrays – Array of Pointers – Three Dimensional Array – Puppetting On Strings - Standard Library String Functions.

Unit-V
Structures - Why Use Structures - Array of Structures - Uses of Structures File Input / Output – Data Organization – File Operations – File Modes – String (Line) or Record I/O in Files – Text Files and Binary Files – Database Management.

Course Outcomes
- Correlate problem solving method and needed information towards solving problems
- Understand the logics of the problem solving techniques
- To code and test a given logic in C programming language
- Develop the solutions using conditional and iterative statements, user defined functions to solve real time problems

Text Book

1. E. Balagurusamy, - Computing Fundamentals and C Programming‖, Tata McGraw-Hill, 2008. (Unit- I)
2. R.G.Dromey, How to Solve by Computer, Pearson Education, Inc, Reprint 2009. (Unit-II)
3. Yashavant P. Kanetkar, ―Let Us C, Fifth Edition, Sridhara Publication, India, 2008.(Unit-III,IV,V)

Reference Book

1. SeymourLipschutz, ― Essentials Computer Mathematics‖, Schaums outlines series, Tata McGrawHill Edition, 2004.
2. Kernigan Brian W., and Dennis M. Ritchie, ―The C Programming Language, Second Edition, Prentice Hall, 1988.
3. Balagurusamy E,―Programming in ANSI C‖, Third Edition

COURSE-20BARVRG02   **Credits: 2**

PROBLEM SOLVING TECHNIQUES - LAB

Course Objective
- To acquire problem solving skills
- To be able to write programs in C Language
- To recognize structured programming concepts
- To enhance their exploring and problem solving skills and use the same for writing programs in C

List of Programs
1. Write a C program to find the total and average percentage obtained by a student for 6 subjects.
2. Write a C program to check whether a given character is vowels or not using Switch – Case Statement
3. Write a C program to print the numbers 1 to 10 along with their squares
4. Write a C program to find the sum of 'n' numbers using do-while statement
5. Write a C program to check whether the word is palindrome or not
6. Write a C program to find the square root of a given number
7. Write a C program to compute the factorial of an integer
8. Write a C program to generate the Fibonacci sequence using recursive function
9. Write a C program to find smallest and largest number present in an array
10. Write a C program to sort the elements of an increasing order

Course Outcomes
- Interpret the concepts in problem solving
- Analyse real time problems and implement the solutions for it
- Develop c programs using conditional and iterative statements

COURSE-20BARVRS01   **Credits: 4**

VISUAL DESIGN

Course Objectives:

This course enables the students:

- To develop creativity in advertising
- To understand the basics of typography, grids in layout design, color modes
- To conceive the design concepts of Virtual Reality

UNIT I - Types of advertising

Broadcast media - print media - social media - Basic elements of visual design - Principles of visual design - Creating - Headlines and Body content - Pre-press technology and Post-press technology- Prepress processes - Press - Post press technology

UNIT II - Grids in layout design

Anatomy of a grid - Types of layout design - Mixed design - Design process - Brand Management - Branding - Brand identity design - Design thinking process

UNIT III - Designing for VR

Visual aid - UI depth and eye strain - Constant velocity - Maintaining head tracking - Guiding with light - Leveraging scale - Spatial audio - Gaze Cues Image Size and resolution - Pixel density - Eye buffers - Optimal resolution- Creating Panoramic Images

UNIT IV - Color Modes

Changing color mode - Type tool options - Work path from type - Layers panel - Types of layers - Features of layers - Shape tools and Painting Tools - Brush tools - Gradient tools - Effects panel - Graphics panel - Photo effects

UNIT V - Filter Gallery

Applying filters - Smart filters - Channels panel - Actions panel - Change settings - Exclude commands - Inserting a non-recordable menu command - Batch command - Rollovers - Creating buttons - Make layer duplicates - Create rollover states 360-degree illustrations for VR - Panorama - Planning and drawing 360-degree illustration - Exporting for VR

Course Outcomes:

On the successful completion of the course, students will

- Be able to work with typography and grids in layout design

- Efficiently use various color modes

- Have the ability to record an action and create rollover states

Reference Books:

1. Karl Aspelund , "The Design Process", 3rd Edition, 2014

2. Brian Wood, "Adobe Illustrator CC Classroom", 1st Edition, 2019

3. Joseph A. Gatto, "Exploring Visual Design: The Elements and Principles", 2010

COURSE-20BARVRS02   **Credits: 4**

DIGITAL DESIGN LAB

Course Objectives:

This course enables the students:

- To learn and understand the basics of digital electronics

- To design basic logic, combinational and sequential circuits

- To create a visual-verbal connection between the content and the image using traditional and/or digital media

Implement the following in Digital Design:

1. Create posters using principles like Positive & Negative space, Emphasis, Repetition and contrast

2. Design Icons for the given concepts

3. Color the given Images with Mono chromatic colors scheme

4. Color the given Image with triadic colors scheme

5. Color the given Image with minimalistic colors scheme

6. Shade the given image as per instructions

7. Paint textures as per given instruction

8. Design posters with Dots and lines for the given themes

9. Create patterns for gift wrapping paper

10. Create Expressive poster using text for the given concepts

Course Outcomes:

On the successful completion of the course, students will,

- Construct, analyse, and troubleshoot simple combinational and sequential circuits

- Develop the ability to design and troubleshoot a simple state machine

COURSE-20BARVRS03   **Credits:4**

IMAGE EDITING LAB

Course Objectives:

This course enables the students:

- To develop expertise in image editing operations and related techniques

- To create an image and perform various image processing operations

Implement the following in Image Editing:

1. Turn day image into a night image
2. Retouch the given image
3. Draw an apple with shading
4. Blur the Background apart of subject for the given image
5. Design a logo or Mascot for the given brand
6. Design a flag
7. Create a movie poster with the given genre
8. Create an image that depict literal interpretations (ex. Honeymoon - a moon made of honey)
9. Draw a candle with shadows and smoke
10.   Mix up body parts creatively

Course Outcomes:

On the successful completion of the course, students will

- Understand and utilize the language and terms used in fine art, illustration, animation, graphic arts, and photography
- Develop expertise in life-drawing
- Have the ability to produce a well-designed layout and brochure

COURSE-20BARVRS04   **Credits:4**

DIGITAL ILLUSTRATION LAB

Course Objectives:

This course enables the students:

- Develop specialized drawing skills that can be applied in the fields of illustration and graphic design

- Create a visual-verbal connection between the content and the image using traditional and/or digital media

Implement the following in Digital Illustration:

1. Create a simple cartoonic airplane with colors
2. Create a simple cartoon character with cool colors
3. Create a glass jar and color it with shadows
4. Design a Logo
5. Design a Business card
6. Design any of the 5 vegetables that you like
7. Design any 5 flat icons with colors
8. Design a Male and Female human logo
9. Design a pattern and color it with warm colors
10. Create a text and make it as a 3d text using colors and shadows

Course Outcomes:

On the successful completion of the course, students will

- Become proficient in the features of Adobe Illustrator and Photoshop
- Have the ability to create a well-designed layout, brochure or other design materials for print or web

COURSE-20BARVRG03   **Credits: 3**

PYTHON PROGRAMING

Course Objectives:

This course enables the students:

- To understand the basic concepts of object oriented programming and core python scripting elements

- To be familiar with graphics and image processing concepts

- To perform complexity analysis on searching and sorting algorithms

Unit I

Introduction-Fundamental ideas of Computer Science - The Software Development Process - Strings, Assignment, and Comments - Numeric Data types and Character sets - Expressions - Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop.

Unit II

Accessing Characters and substrings in strings- Data encryption-Strings and Number systems-String methods -Text Files- Lists - Defining simple Functions - Dictionaries

Unit III

Functions - A Quick review - Design with recursive Functions - Managing a Program's namespace - Getting inside Objects and Classes - Structuring Classes with Inheritance and Polymorphism

Unit IV

Simple graphics - Image Processing - The behavior of terminal-based Programs and GUI-based Programs - Coding simple GUI-based Programs - Windows and Window Components - Command buttons and responding to events

Unit V

Measuring the efficiency of Algorithms - Complexity Analysis - Search Algorithms - Search for a minimum - Sequential search of a List - Basic sort Algorithms - Selection sort - Bubble sort - Insertion sort

Text Book:

1. K.A. Lambert, " Fundamentals of Python: first programs", Second Edition, Cengage Learning, 2018

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, 2016
2. M. L. Hetland, "Beginning Python: from novice to professional", Third Edition, Apress, 2017

Course Outcomes:

On the successful completion of the course, students will

- Develop a basic understanding of object oriented programming concepts with python

- Discover how to work with strings, functions and image

- Assess the efficiency of algorithms

COURSE-20BARVRG04   **Credits: 2**

PYTHON PROGRAMING LAB

Course Objectives:

This course enables the students:

- To master the fundamentals of writing python scripts
- To perform various image processing operations
- To develop searching, sorting, clustering and classification algorithms with the aid of python standard libraries

Implement the following in Python:

1. Program to Create a Class which Performs Basic Calculator Operations.
2. Program to perform Inheritance.
3. Program to read and count the Occurrences of a Word in a Text File.
4. Program to perform Binary Search.
5. Program to perform Selection Sort.
6. Program to perform different Morphological operations.
7. Program to perform different Edge Detection methods.
8. Program to find objects in an image using Template Matching.
9. Program to perform classification using K-NN algorithm.
10. Program to perform clustering using K-Means algorithm.

Course Outcomes:

On the successful completion of the course, students will

- Develop the basic programming skills in python
- Perform various image processing, searching and sorting operation**s**
- Be able to implement clustering and classification tasks

COURSE-20BARVRS05   **Credits: 4**

ANIMATION DESIGN THEORY

Course Objectives:

This course enables the students:

- To understand the fundamental principles and tools of animation and media

- To develop the skills in 2D production, motion graphics, stop motion and basic traditional animation

- To identify the components needed to create interactivity

UNIT I

Introduction to 2D Animation - Basic concepts of 2D techniques - Principles of motion study - 2D Workflow Script - Storyboard - Concept art - Animation-Introduction to workspace - Understanding document types - Setting up projects and changing project types - Introduction to panels - Working with timeline

UNIT II

Strokes and fills - Creating lines and Shapes - Object drawing mode - Pen tool drawing states - Adjusting segments - Arranging objects - Exporting art

UNIT III

Working with timeline - Working with libraries - Symbols - Instances - Editing properties - Graphic filters - Filters overview - Animated filters - Working with filters

UNIT IV

Basic 2D Animation - Animating transformation - Motion path - Nested Animations - Adding frames - Moving keyframes - Motion tween animations - Tween span - Property keyframe - Tweenable objects and properties

UNIT V

Frame by Frame animation - Converting classic motion tweens - Using onion skinning - Shape tweens - Mask layer - Unlink layers - Motion Editor - Property curves - Applying presets and custom eases - Resultant curve - Exporting the final output - Different file formats

Course Outcomes:

On the successful completion of the course, students will

- Create animated sequences from the development of the original concept through design to final film or video production

- Coordinate and manage the production of a student film, including the aspects of cinematography, art direction and editing.

Reference Books:

1. Williams, Richard , "The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators", 4th Edition, Macmillan , 2009

2. Jean Ann Wright, "Animation Writing and Development: From Script Development to Pitch (Focal Press Visual Effects and Animation)" 1st Edition, Taylor & Francis, 2013.

3. Preston J. Blair, "Animation 1: Learn to Animate Cartoons Step by Step", 2003

4. Russell Chun, "Adobe Animate CC Classroom in a Book (2018 release), 1st Edition, Adobe Press, 2018

COURSE-20BARVRS06   **Credits: 4**

USER INTERFACE DESIGN THEORY

Course Objectives:

This course enables the students:

- To recognize the fundamental user interface design principles and methodologies such as layout, controls and navigation

- To learn the tools and techniques of Photoshop and Illustrator in order to create user interface animations

- To develop a responsive mockup website and mobile with advanced features

UNIT-I

Introduction to Photoshop - Raster graphics - Performance Optimization - Color Calibration

Workspace overview - Photoshop controls - Interface - Layers and Panels - Navigation Pan - Rotate View tool - Navigator panel - Zoom in or out - Fit an image to the screen- Photoshop Tools - Usability features - Masks in UI Design - Lights and Shadows - Emphasis and Blending

UNIT-II

Color Scheme - Primary Color - Secondary colors - Neutral colors - Brainstorm - Typography - Web Safe Fonts - Font Themes - Size - Color and Contrast - Tracking - Leading - Soft Buttons - 3D Buttons - Realistic Buttons - Web Template Design - Components of a Web Page

UNIT-III

Logo Design Principles - Purpose - Target audience - Planning essentials - Web Layout Design - Rule of third - Rule of odds - Poster Design Principles - F shaped pattern - Visual Hierarchy - User friendly - Photoshop Etiquette - Stretching text and images - Proofread - Make easy to find

UNIT-IV

UI Illustrations - Creating visual triggers - Creative storytelling - Emotional appeal - Aesthitic satisfaction - Mobile GUI Design - Mobile GUI Guidelines - Android UI Design - Screen Components - IOS UI Design - Animations - UI Animations in Photoshop - UI Animation in Illustrator.

UNIT-V

Mockup Design - Responsive Web Design - Setting the stage - Basic mechanics - Typography and Layout - Navigation patterns - Advanced Enhancement -Performance - Page Designs - Metro UI Design - Mascot Design - Characters Purpose - Unique features - Exporting for Web, Mobile, Print - Design Optimization

Course Outcomes:

On the successful completion of the course, students will

- Gain insight into the basic theories and current research topics in user-centred interaction design

- Be able to create user interface animations with the aid of Photoshop and Illustrator

- Have the ability to develop an interactive mockup website and mobile with the design ideas in a constructive manner

Reference Books:

1. Diana MacDonald, "Practical UI Patterns for Design Systems: Fast-Track Interaction Design for a Seamless User Experience", Apress, 2019.

2. Jenifer Tidwell, "Designing Interfaces: Patterns for Effective Interaction Design" Second Edition, O'Reilly Media, Inc., 2010.

3. R. Moore "UI design with Adobe Illustrator", Berkely, California: Adobe Press, 2013.

4. Lesa Snider, "Photoshop CS6: The Missing Manual", 2nd Edition, O'Reilly Media Publisher, 2012

COURSE-20BARVRS07   **Credits: 4**

USER INTERFACE DESIGN LAB

Course Objectives:

This course enables the students:

- To design user interfaces that utilizes the latest technologies in mobile design patterns

- To create solutions for suggested user tasks, applying knowledge gained through the observation of several categories of design patterns used in contemporary apps and websites

Implement the following in UID:

1. Design a UI for a Game website

2. Design a UI for a female centric website

3. Design a UI suitable for both mobile and PC

4. Design a UI for a horror themed website

5. Design a one pager UI for a website

6. Design a one pager UI for a mobile

7. Design a mascot for an imaginary brand

8. Design a UI compatible for IOS

9. Design a mock-up website for a service sector company

10. Design a mobile (Android and IOS) mock-up website for an online store

Course Outcomes:

On the successful completion of the course, students will

- Develop the ability to construct Navigation that enables users to easily accomplish user interface design tasks

- Learn industry-standard methods for how to approach the design of a user interface, key theories and frameworks that underlie the design of most interfaces used in the current scenario

COURSE-20BARVRS08   **Credits: 4**

2D ANIMATION LAB

Course Objectives:

This course enables the students:

- To conceive various aspects of animation technology using a variety of two dimensional software
- To develop competencies and skills needed for becoming an effective Animator
- To develop concepts, storyboarding and production of several two dimensional animations

Implement the following in 2D Animation:

1. Ball bouncing across the screen
2. Character jumping
3. Walk cycle
4. Run cycle
5. Flour sack jumping
6. Kicking a ball
7. Character thinking
8. Variations for face expressions
9. Change a character emotion (Happy to sad, sad to angry etc.,)
10. Object falling into a body of water

Course Outcomes:

On the successful completion of the course, students will

- To develop storyboards and two dimensional animations including creating, importing and sequencing media elements to produce multi-media presentations
- Handle animation projects from its conceptual stage to the end product creation

COURSE-20BARVRG05   **Credits: 4**

DATA STRUCTURES

Course Objectives:

This course enables the students:

- To recognize the concepts of Abstract Data Types
- To analyze and perform various operations on linear and nonlinear data structures
- To understand the applications of hashing and Collision mechanism

Unit I

Introduction - Classification and Operations of Data Structures - Abstract Data Type - Arrays - Declaration - Accessing the Elements of an Array - Operations on Arrays - Linked Lists implementations - Singly Linked Lists - Circular Linked Lists - Doubly Linked Lists

Unit II

Linear Data Structures - Stack and Queue: - Stack - Operations - Applications - Evaluation of Arithmetic Expressions - Queue - Circular Queues - Dequeues - Priority Queues - Multiple Queues -Applications

Unit III

Trees - Introduction - Types of Trees - Creating a Binary Tree from a General Tree - Traversing a Binary Tree - Constructing a Binary Tree from Traversal Results - Applications of Trees - Binary Search Trees- Operations

Unit IV

Graphs - Introduction and Terminology - Directed Graphs - Bi-connected Components- Representation of Graphs- Graph Traversal Algorithms - Applications of Graphs

Unit V

Hashing and Collision - Introduction - Hash Tables and Functions - Different Hash Functions - Collisions - Collision Resolution by Open addressing -Applications of Hashing

TEXT BOOK:

1. Reema Thareja, "Data Structures Using C", Second Edition , Oxford University Press, 2014

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008
2. Adam Drozdek, "Data Structures and Algorithms in C++", Cengage Learning, 4th Edition, 2013.

Course Outcomes:

At the end of the course, the student should be able to:

- Understand the fundamentals of abstract data types for linear data structures
- To apply different linear and non-linear data structures for solving real world problems
- Analyze and implement appropriate hashing and collision resolution method

DATA STRUCTURES LAB

Course Code: 20BARVRG06   **Credits: 2**

Course Objectives:

This course enables the students:

- To develop programs to solve problems using data structures such as arrays, linked lists, stacks, and queues
- To implement tree traversal methods
- To code hashing technique with chaining

Implement the following using C ++:

1. Array Implementation of Stack
2. Linked List Implementation of Stack
3. Array implementation of Queue
4. Linked List Implementation of Queue
5. Singly Linked List with its Operations
6. Doubly Linked List with its Operations
7. Circular Linked list with its Operations
8. Tree Traversals with Binary Tree
9. Depth First Search of a Graph
10. Hashing with chaining

Course Outcomes:

At the end of the course, the student should be able to:

- Understand the Object Oriented Programming principles
- Identify the appropriate data structure for a given problem
- Effectively use various C++ library functions

COURSE-20BARVRS09   **Credits: 4**

3D DESIGN

Course Objectives:

This course enables the students:

- To understand the concepts of 3D- Three Dimension.
- To gain Theoretical knowledge of how to create Three-dimensional (3D) Environment.
- Demonstrate the ability to map detailed textures to 3D objects in theoretical way.
- To gain Theoretical knowledge on Lighting and Rendering for the 3D objects and 3D environment.
- To Understand the Basics of Animation.

UNIT 1 Introduction to 3D

3D Modelling - Types of 3D Modelling - Digital Sculpting - Procedural Modelling - Image Based Modelling - Tool-Box - Navigate the Camera - Show or Hide - Change the Display of Objects - Display Scene Information - Level of Detail (LOD) - Walk Through The Scene - Create and Edit Objects - Types of Objects - Create Basic 3D Objects and Curves - Duplicate - Cut, Copy, Paste - Delete, Undo, Redo & Repeat - Edit Components Numeric Values Directly - Component Editor - Transform Objects and Components - Change The Pivot Point - Align and Snap - Matching object attribute values.

UNIT – 2 Modelling

Polygonal Modelling - Editing Polygons - Transforming Polygonal Components - Combining, Separating, and Splitting - Smoothing polygons - Colouring Polygons - Retopology - Polygonal Modelling Reference - Modelling Menu Set - Polygonal Modelling Tools - Nurbs Modelling - Creating NURBS Surfaces - Editing NURBS - UV's - Mapping UV's - Editing UV's - Sculpt a mesh - Sculpt using symmetry.

Unit – 3 Shading and Texturing

Surface material Attributes - Surface Material Specular Shading Attributes Surface Materials- Displacement Materials - Volumetric Materials - Shading - Assign Materials To The Surface - Create Layer - Shaders - Reflect Or Refract Light - Overview of texture nodes - 2D textures - Environment Texture - Layered Texture - File Textures - Procedural Textures - Shading Editor – Hypershade.

UNIT - 4 Animation

Animation Basics - Animated rotation - Create Time Warping Effects - Edit animation preferences - Playback Animation - Keyframe Animation - Edit Curves - Driven Keys - Breakdowns – In Between - Time Editor - Character Animation - Skeletons - Skeleton components - Skinning - IK handles overview - HumanIK - Constraints - Graph Editor - Animation Layers And Animation File Formats - Base Animation - Animation Layer Editor.

UNIT – 5 Rendering

Hardware, software, and vector rendering - Maya Software Renderer - Maya Hardware 2.0 Renderer - Maya Vector Renderer - ARNOLD FOR MAYA RENDERER - Camera Setup - Depth of field - Focus and Blur - Using A Stereoscopic Camera - Create A Multi-Camera Rig - Working in Viewport 2.0 - Viewport 2.0 Limitations- Linear Workflows And Color Management - Limitations of color management.

Course Outcome:

On the successful completion of the course, students will:

- Understand the concept of 3D Three Dimension in General.
- Understand the 3D Industrial Pipeline process and ability to apply the pipeline in their 3D projects.
- Be able to Start working on 3D related software and learned the Tools and Techniques.
- Have a brief knowledge about Modeling, Texturing, Lighting and Rendering, Rigging and animation.

Reference Books:

1) The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators 4th Edition – 2009

2) Jean Ann Wright, "Animation Writing and Development: From Script Development to Pitch (Focal Press Visual Effects and Animation) 1st Edition"

3) Preston J. Blair, "Animation 1: Learn to Animate Cartoons Step by Step" (Cartooning, Book 1) Paperback – 2003

4) Russell Chun "Adobe Animate CC Classroom in a Book" 1st Edition, 2018

COURSE-20BARVRS10   **Credits: 4**

MODELLING AND TEXTURING LAB

Course Objectives:

This course enables the students:

- To have a clear knowledge of the interface and the different tools.
- To develop skills for creating 3D assets.
- Gain knowledge on Lighting and Rendering process.
- Understand the basics of Rigging and Animation process.

Implement the following in Modelling and Texturing Software Tool:

1. Create 3D model Surface of mud pot set using the given reference.
2. Create A Model of Dining Table set using basic polygon modeling tools.
3. Make a model of soda can and apply the given texture using UV Unwraping techniques.
4. Create 3D model of Wine Bottle and Glass, Render it using Maya mental ray Glass Materials.
5. Create 3D model of Reading Table and props required on it and set up the Lighting for the same and render it.
6. Set up a 3-point light setup for Given product model and take Render Images for product modeling.
7. Create Simple Cartoon Character and Give appropriate Texture and Render it.
8. Make Realistic Ball Bounce Animations For Different Balls using Keyframe Animation.
9. Set up Interior and Exterior Lighting For The Given 3D Building model Using Background Shader and Surface Shaders.
10. Make a 3D model of ROBO, Set up Rig and Controls for it and make Walk cycle Animation.

Course Outcome:

On the successful completion of the course, students will:

- Work with and navigate the unique features of the digital 3D modelling workspace to create 3D objects.
- Create a 3D environment featuring lighting and textures.
- Create basic 3D models and animations.
- Evaluate digital 3D projects, identify items for improvement, and implement changes.

COURSE-20BARVRS11   **Credits: 4**

ARCHITECTURAL VISUALIZATION LAB

Course Objectives:

This course enables the students:

- To make model, texture, and render professional-looking architectural imagery.
- Learn how to master the intricate user interfaces of Architectural Imagery Software Tools.
- To Gain an introduction to the digital design tools that are relevant in an architectural context.
- To learn Techniques and working methods related to visual 3D modelling, visualization and animation, etc.

Implement the following in Architectural Software Tool:

1. Create interior and exterior shells of a simple apartment for light bleed test.
2. Model a two storey exterior building with fine details with textures.
3. Model a kitchen cabinet with textures
4. Model a modern style dining table set and texture it.
5. Create a modern style bed with bedsheet and texture it.
6. Create any five decorative models for the apartment with textures.
7. Create a modern style kitchen and texture it.
8. Create a round interior stair case and texture it.
9. Model a modern bathroom and populate it with the objects and texture it.
10. Create a living room and populate it with the objects and texture it.

Course Outcomes:

On the successful completion of the course, students will,

- Be able to develop a broad knowledge of the use of computer tools in architectural design and simulation.

- Gain knowledge and experience that can help them succeed in making use of advanced digital tools in their further studies and later professional practice.

COURSE-20BARVRS12   **Credits: 4**

GAME DESIGN LAB

Course Objectives:

This course enables the students:

- Students will be able understand Unity Engine and its uses

- Ensures that they can implement Design Principles

- Ensures that the student understand Unity Production Pipeline

- Ensures that the students understand Unity Asset pipeline

Implement the following in the Game Design Software:

1. Create a 3D Level with the following setups implemented.

2. Skyboxes

3. Terrains with detailing with rocks, trees, grass, fog, water surface.

4. Object meshes with colliders

5. Lights and Shadows.

6. Create a 3D Level setups implemented:

7. Compile the Scripts and bake the navigation mesh for setting up playable area.

8. Create a 2d platform as per given brief.

9. Create a 3d side scroller for the 3D Level Design.

10. Create an Environmental Open world scene - Medieval.

Course Outcome:

On the successful completion of the course, students will:

- Generate innovative ideas, and go beyond the obvious and predefined related to Game.

- Deconstruct and analyse your own work and the work of others to evaluate the technical and aesthetic quality.

- Be able to create a Level Design for the Game.

COURSE-20BARVREL01   **Credits: 4**

ELECTIVE - I

ARTIFICIAL INTELLIGENCE

Course Objectives:

This course enables the students:

- To develop the ability of data preprocessing
- Understand the Complexity and how to handle Real World Data for Analysis or Research purpose.
- To learn about the Need of Machine Learning and its Concepts
- To conceive the basics of clustering with its measures

Unit I

Introduction to Data Mining - Data miners-Data Preprocessing: Data Cleaning - Handling Missing Data- Identifying Misclassifications-Graphical Methods for Identifying Outliers -Measures of Center and Spread - Data Transformation-Min–Max Normalization- Z-Score Standardization - Decimal Scaling- Simple Linear Regression: Introduction to Simple Linear Regression-The Least-Squares Estimates-The Coefficient of Determination, r-Standard Error of the Estimate s-Correlation Coefficient r-ANOVA Table for Simple Linear Regression – Multiple Linear Regression - Introduction to Multiple Regression-The Population Multiple Regression Equation-Inference in Multiple Regression- Regression with Categorical Predictors, Using Indicator Variables-Adjusting R-Square

Unit– II

Introduction: Neural Networks – Application scope of Neural Networks – Fuzzy Logic. Artificial Neural Networks: Fundamental Concept – Evaluation Neural Networks – Basic Models of Artificial Neural Networks: Learning - Terminologies of ANNs - McCullochPitts Neuron - Linear Separability - Hebb Network.

Unit – III

Supervised Learning Network: Perceptron Networks – Adaptive Linear Neuron - Multiple Adaptive Linear Neurons – Back-Propagation Networks. Associative Memory Networks: Introduction – Training Algorithm for Pattern Association – Hopfield Networks: Discrete Hopfield Networks – Continuous Hopfield Networks.

Unit – IV

K-Nearest Neighbor algorithm: Classification Task- k-Nearest Neighbor Algorithm-Distance Function - Combination Function-Simple Unweighted Voting-Weighted Voting-Quantifying Attribute Relevance: Stretching the Axes- Decision Tree: Requirements for Using Decision Trees- Classification and Regression Trees- C4.5 Algorithm- Decision Rules-Comparison of the C5.0 and CART Algorithms Applied to Real Data.

Unit – V

Clustering - Hierarchical Clustering Methods-Single-Linkage Clustering- Complete-Linkage Clustering - k-Means Clustering- Measuring Cluster Goodness: Rationale for Measuring Cluster Goodness-The Silhouette Method - Silhouette Example - Silhouette Analysis of the IRIS Data Set-The Pseudo-F Statistic-Example of the Pseudo-F Statistic -Pseudo-F Statistic Applied to the IRIS Data Set - Cluster Validation- Cluster Validation Applied to the Loans Data Set.

Course Outcomes:

On the successful completion of the course, students will,

- Apply various preprocessing techniques to the data under study
- To implement clustering techniques and measure its performance
- To construct efficient machine learning applications

Text Book

1. Daniel T. Larose and Chantal D. Larose, "Data mining and Predictive analytics", Second Edition, Wiley Publication, 2015.
2. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing", Third Edition , Wiley, 2018.

Reference Books:

1. Zed Shaw, Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful Book
2. Sheldon Axler, Linear algebra done right Textbook
3. A Matrix Algebra Approach to Artificial Intelligence Book by Xian-Da Zhang
4. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective Textbook

COURSE-20BARVREL02   **Credits: 2**

ARTIFICIAL INTELLIGENCE LAB

Course Objectives:

This course enables the students:

- To understand about syntactic and semantic difference

- To understand the Logic and can device Algorithm Development Capability

Implement the following using Python:

1. To convert the dataset into uniform format using numpy package
2. Program to perform data normalization
3. To handle missing values with forward fill, backward fill, mean and median.
4. To perform data visualization
5. To perform data clustering and measure its goodness
6. To perform classification using Decision Tree
7. To diagnose any disease using KNN classification and plot the results
8. To perform classification using Back Propagation Neural Network
9. To predict house pricing
10. To forecast the price of precious metal

Course Outcomes:

On the successful completion of the course, students will,

- Gain experience in developing algorithmic thinking

- Have clear understanding of Artificial Intelligence

- Gain experience in understanding real world Data problems