**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**
**Syllabus of B. Sc. Gaming & Mobile Application Development**
**(Effective for 2020-2021 Admission Session)**
**Choice Based Credit System**
**140 Credit (3-Year UG) MAKAUT Framework**
**w.e.f 2020-21**

## 6th semester

| Subject Type | Course Name | Credit Points | Credit Distribution | | | Mode of Delivery | | | ProposedMoocs |
|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Tutorial | Offline | Online | Blended | |
| CC 13<br>**GAM 601 & 691** | Rigging & Animation for Games | 6 | 4 | 2 | 0 | ✓ | | | As per MAKAUT notification |
| CC 14<br>**GAM 602 & 692** | Virtual & Augmented Reality | 6 | 4 | 2 | 0 | ✓ | | | |
| DSE 3 (Any one)- GAM 681 (A) | Minor Project | 6 | 1 | 5 | 0 | | | ✓ | |
| DSE 3- GAM 681 (B) | Internship-I | 6 | 1 | 5 | 0 | | | | |
| DSE 4(Any one) - GAM 682 (A) | Major Project | 6 | 1 | 5 | 0 | | | | |
| DSE 4- GAM 682 (B) | Internship- II | 6 | 1 | 5 | 0 | | | ✓ | |
| **Semester Credits** | | 24 | | | | | | | |
| **Total** | | 140 | | | | | | | |

**Note:** Minor/Major Project/Internship- (Students have to engage in a full length/capstone project with a pre-specified Internal Guide (faculty member) throughout the semester). Industry collaboration is highly encouraged in case of Internship.

(At least two-three times progress needs to be checked and evaluation needs to be done through PCA.) It will be followed by a report submission and viva as part of University examination.

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**
**Syllabus of B. Sc. Gaming & Mobile Application Development**
**(Effective for 2020-2021 Admission Session)**
**Choice Based Credit System**
**140 Credit (3-Year UG) MAKAUT Framework**
**w.e.f 2020-21**

**Course: CC13**
**Paper: Rigging and Animation for Games**
**Code: GAM 601/691**
**Credits: 6 (4T+2P)**

**Course Objective:** In this paper the student will know how to make a human model walk, run and jump in a path. The model's body movement is also taught. They are taught how to lip sync with the dialogues with two or more characters. At the end of the course, the students are expected to know about various functional components of rigging and animation, their utilities, significance and practical applications through Maya/3ds MAX Studio, in order to solve real life computer animation problems.

| Sl | Course Outcome | Mapped modules |
|---|---|---|
| 1 | Understand how to animate a model in 3D Viewport | M1, M2 |
| 2 | Gaining key knowledge in key frames and Graph editor | M2, M3 |
| 3 | Understanding various types of constraints to constrain a character model | M3, M4 |
| 4 | Understanding rigging human model and constrain the rig as per anatomy of the model | M4, M5 |
| 5 | Applying a real world motion to a 3D created object | M4, M5 |
| 6 | Gaining knowledge on Facial expression for 3D animation | M5, M6 |

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**
**Syllabus of B. Sc. Gaming & Mobile Application Development**
**(Effective for 2020-2021 Admission Session)**
**Choice Based Credit System**
**140 Credit (3-Year UG) MAKAUT Framework**
**w.e.f 2020-21**

| Module Number | Content | Total Hours | %age of questions | Blooms Level | Remarks |
|---|---|---|---|---|---|
| M1 | Concept Of Rigging | 6 | 10% | 1,2,3 | |
| M2 | Intro To IK Solver And IK Chain | 4 | 10% | 1,2,3 | |
| M3 | Bending And Twisting Of Knee | 4 | 20% | 1,2,3 | |
| M4 | Animation Principles | 4 | 20% | 1,2,3,4 | |
| M5 | Animating Two Leg And Four Leg With Dialogues | 6 | 30% | 1,2,3,4 | |
| M6 | Full Featured Short Animation Project | 6 | 10% | 3,4 | |
| | | **30** | **100** | | |

**Syllabus**

**Module 1:** CONCEPT OF RIGGING

Understanding the rigging IK and Fk Constraints. Forward Vs. Inverse Kinematics, A simple leg example. Forward Kinematics with Simple leg example. Inverse Kinematics, Constraints Working with Locators. Adding Pole Vector constraints to the elbows and Constraining the wrists to locators. Testing the character, Rigging Methods and Process. Create the IK handles, Restricting the heel rotation, Build a foot control hierarchy. Creating a control attribute and Set Driven Key, Adding Selection handles for Arms and shoulders

*Relevant Practical Exercises in Maya/3dsMAX for Computer Animation*

**Module 2:** INTRO TO IK SOLVER AND IK CHAIN

Intro to IK ROTATE PLANE SOLVER, Working with the IK Rotate Plane solver. Creating the arm joints and setting preferred angle, Setting up the IK Rotate Plane solver. Translating the end effector of the IK chain.

*Relevant Practical Exercises in Maya/3dsMAX Studio*

**Module 3:** BENDING AND TWISTING OF KNEE

IK AND FK COMBINATION FOOT, Skeleton set,up,Setting up Single Chain IK, Parenting the lK and Orient constraints Parenting the lK , Bending toes and twisting the knee. Adding attributes

*Relevant Practical Exercises in Maya/3dsMAX Studio*

**Module 4:** ANIMATION PRINCIPLES

Animation Principles and Process, Basic Animation with types of Balls. Working with Animation Editor and Tools. Animation Basics, Key frame Animation, Nonlinear Animation, Path Animation, Motion Capture Animation. Geometry Caching with Animation Layers, Animation Menus, Animation Tools, Animation Windows and Editors, Animation Nodes

*Relevant Practical Exercises in Maya/3dsMAX Studio*

**Module 5:** ANIMATING TWO LEG AND FOUR LEG WITH DIALOGUES

Advanced Character Animation with Two Leg Animation (walk, run, Jump, Weight lifting etc.). Four Leg Animation (walk, run, Jump) Lip sync Animation. Single Character Animation with Dialogues , Two or more character interacting animations with Dialogues. Workflow with Graph, Trax, Dope.

*Relevant Practical Exercises in Maya/3dsMAX Studio*

**Module 6:** FULL FEATURED SHORT ANIMATION PROJECT

*Short Rigged Animation Project in Maya/3dsMAX Studio*

**Suggested Readings:**

1. TEXT BOOKS:
    a. Kelly L. Murdock – "Autodesk Maya Basics Guide 2015", 21 November 2014
    b. Kelly L. Murdock – "Kelly L. Murdock's Autodesk 3ds Max 2015 Complete Reference Guide", Perfect Paperback – 8 Oct 2014
2. REFERENCE BOOKS:
    a. Matt Chandler "3ds Max Projects: A Detailed Guide to Modeling, Texturing, Rigging, Animation and Lighting Paperback" – Import, 1 Mar 2014
    b. Todd Palamar "Mastering Autodesk Maya 2016" , Autodesk Official Press 1st Edition

CC 14
**Course: Virtual and Augmented Reality**
**Code: GAM602 & 692**

**Course Objective:** This course is an introduction to the application of AR/VR to the design of gaming applications. This course approaches game development from three perspectives: the application of AR principles that enable development of intuitive games, the application of VR that enable development of interactive games, application of AR/ VR elements using Unity platform.

| Sl | Course Outcome | Mapped modules |
|---|---|---|
| 1 | Understand different forms of Augmented Reality and their applications. | M1 |
| 2 | Learn to detect multiple image targets. AR Concepts - Game World and UI | M1, M2 |
| 3 | Design an interactive app using AR Virtual buttons | M2, M3 |
| 4 | Understand how modern VR headsets "trick the brain" into believing it is somewhere else | M4 |
| 5 | Learn take advantage of Unity's Events to trigger actions on interactive objects. | M4, M5 |
| 6 | Create interactive VR game plays with advanced Unity features, including Ray Casting and | M3, M4, M5, M6 |

| | | |
|---|---|---|
| | Navigation (Path Finding) | |

Theory

| Module Number | Content | Total Hours | %age of questions | Blooms Level | Remarks |
|---|---|---|---|---|---|
| M 1 | Fundamentals of augmented reality (AR) | 7 | 20 | 1,2 | |
| M 2 | Real world mechanics | 10 | 15 | 2,3 | |
| M 3 | Develop mobile AR applications in Unity for iOS and Android devices | 7 | 15 | 3,4 | |
| M 4 | Fundamentals of VR | 7 | 20 | 1,2 | |
| M 5 | Unity tools for VR | 10 | 15 | 2,3 | |
| M 6 | Create interactive VR game plays with advanced Unity features | 7 | 15 | 3,4 | |
| | | **48** | **100** | | |

**Practical**

| Module Number | Content | Total Hours | %age of questions | Blooms Level | Remarks |
|---|---|---|---|---|---|
| M 3 | Develop mobile AR applications in Unity for iOS and Android devices | 14 | 40 | 3,4 | |
| M 6 | Create interactive VR game plays with advanced Unity features | 14 | 60 | 3,4 | |
| | | **28** | **100** | | |

**Module I: Fundamentals of augmented reality (5T)**
Introduction – What is VR, Difference between AR and VR, Application of AR to games, How AR works in gaming.

**Module II: Real world mechanics (10T)**
Smartphone sensors, principle of vectors, 2D and 3D space, laws of Physics, game rules and mechanics, character mechanics, graph theory, finite state mechanics, player mechanics, game interface design, environmental mechanics.

**Module III: Develop mobile AR applications in Unity for iOS and Android devices (5T + 20P)**
Application of AR mechanics on Unity assets, develop 2D and 3D characters, develop 2D and 3D mechanics.

**Module IV: Fundamentals of VR (5T)**
What is VR, Difference between AR and VR, Application of VR to games, How VR works, VR environment.

**Module V: Unity tools for VR (10T)**
Rendering realism, Exploring 360 degree media, Interacting with hand gestures, Teleporting, locomotion, comfort, Animation and VR storytelling, Optimizing performance.

**Module VI: Create interactive VR game plays with advanced Unity features (5T + 20P)**
Unity's XR platform, Application of real-world mechanics on Unity assets,

**Suggested Readings:**
1. Unity Virtual Reality Projects by Jonathan Linowes
2. Holistic Game Development with Unity: An All-in-One
3. Guide to Implementing Game Mechanics, Art, Design and Programming by Penny de Byl
4. The VR Book, Human-Centered Design for Virtual Reality, . Jason Jerarld, Ph.D. AMC Books

**Websites:**
- https://docs.unrealengine.com/en-US/Platforms/AR/index.html
- https://unity.com/unity/features/ar
- https://unity.com/solutions/ar-and-vr-games
- https://www.unrealengine.com/en-US/vr

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**
**Syllabus of B. Sc. Gaming & Mobile Application Development**
**(Effective for 2020-2021 Admission Session)**
**Choice Based Credit System**
**140 Credit (3-Year UG) MAKAUT Framework**
**w.e.f 2020-21**

**DSE 3**
**Course: Minor Project**
**Code: GAM 683 A**
**Contacts Hours / Week: 1L+ 5P**

**Course Objective:** As you draw closer to the end of your graduate program or an undergraduate program, you will be focusing on capstone project ideas. These are important projects that are bound to be completed by anyone at college. And, the projects call for great ideas that can actually make a difference.

Minor project focuses on tapping the intellectual and academic skills of students. It is a multi-faceted project which brings together various streams and subjects from the degree program a student is ought to specialize in.
One of the major reasons to invest in the capstone project is to understand what students have learned in the past few years. This is a discreet way of demonstrating their learnings to a bigger group of target audiences. Also, the project is meant to bring out the critical thinking abilities of the students. The ultimate aim of this project is to prepare students and ensure that they can find practical solutions with the help of critical thinking.
For the project to be recognized, students should be able to describe what they intend to achieve. This calls for sound speaking skills. To be more precise, the students need to be able to communicate and showcase their projects on a bigger stage. Apart from speaking skills, students are expected to have sound writing skills too. The reports need to be documented and submitted for review.
The document should carefully describe what your study (or project) is ought to focus upon. This means the documentation skills of the student needs to be of high standards. This project will be one of your last few steps in completing the degree program. With a great idea and a promising proposal – students are likely to feel motivated about their efforts. Time after time, the capstone project helps candidates reassert their chosen domain. It also forces the students to master their chosen area of study.

**Course: Internship-1**
**Code: GAM 683 B**
**Contacts Hours / Week: 1L+ 5P**

The above minor project to be conducted at relevant Industry.

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB**
**Syllabus of B. Sc. Gaming & Mobile Application Development**
**(Effective for 2020-2021 Admission Session)**
**Choice Based Credit System**
**140 Credit (3-Year UG) MAKAUT Framework**
**w.e.f 2020-21**

**DSE 4**
**Course: Major Project**
**Code: GAM 682 A**
**Contacts Hours / Week: 5P+ 1L**

**Course Objective:** The dissertation is the final stage of the undergraduate program and provides you with the opportunity to show that you have gained the necessary skills and knowledge in order to organise and conduct a project.

The aims of the major project are to:

• put into practice theories and concepts learned on the programme;
• provide an opportunity to study a particular topic in depth;
• show evidence of independent investigation;
• combine relevant theories and suggest alternatives;
• enable interaction with practitioners (where appropriate to the chosen topic);
• show evidence of ability to plan and manage a project within deadlines

After completion students should be able to:

• define, design and deliver an academically rigorous piece of research;
• understand the relationships between the theoretical concepts taught in class and their application in specific situations;
• show evidence of a critical and holistic knowledge and have a deeper understanding of their chosen subject area;
• appreciate practical implications and constraints of the specialist subject;
• Understand the process and decisions to be made in managing a project within strict deadlines

All dissertations are marked independently by the project assessors, and assessed by viva voce examination between the student and the assessors. The primary purpose of the viva voce examination is to assess the student's depth of understanding of the subject area and interpretation of the results obtained.

**DSE 4**
**Course: Internship-II**
**Code: GAM 682 B**
**Contacts Hours / Week: 5P+ 1L**

The above major project to be conducted at relevant Industry.