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

4th Semester Course Structure

Subject Type	Course Name	Course Code	Credit Points	Credit Distribution			Mode of Delivery			Proposed Moocs
				Theory	Practical	Tutorial	Offline #	Online	Blended	
CC 8	Design & Analysis of Algorithm using Advanced Data Structure	GAM(T) 401	6	4	0	0	✓			As per MAKAUT Notification
		GAM 491		0	2	0				
CC 9	Game Development	GAM(T) 402	6	4	0	0	✓			
		GAM 492		0	2	0				
CC 10	Mobile Application Development	GAM(T) 403	6	4	0	0	✓			
		GAM 493		0	2	0				
GE 4	Students will have to select from the GE Basket		6						✓	
SEC 2	Python Programming	GAM 455	2	0	2	0	✓			
Semester Credits			**26**							

 # Only in case offline classes are not possible due to reasons like COVID Pandemic the classes will be in synchronous online mode

CC 8: Design & Analysis of Algorithm using Advanced Data Structure
Code: GAM 401
Credits- 4L+2P

Course Objective: The course is designed to introduce the design, analysis and implementation of advanced data structures. Basic concepts in the specification and analysis of programs will be reviewed. The course will aim at mastering a variety of advanced abstract data types (ADT) and data structures as well as their implementations and different algorithm design techniques (brute-force, divide and conquer etc.). Implementation of data structures and algorithms in real time applications will be explored. The students will also apply and implement learned algorithm design techniques and data structures to solve problems.

Sl. No.	Course Outcome	Mapped modules
1	Understand and apply linear data structures - List, Stack and Queue.	M1,M2
2	Apply and implement learned algorithm design techniques and data structures to solve problems.	M1, M2,M3,M4,M5,M6
3	Understand and apply algorithmic techniques such as implementation using Heaps.	M1, M2, M3, M4, M5
4	Analyse and apply the knowledge of problem solving techniques using hash tables and collision resolution techniques.	M1,M2, M3, M4, M5
5	Identify and apply the various concepts of trees structures	M2,M3,M4, M5
6	Application & analysis of variety of advanced abstract data types (ADT) and data structures and their implementations.	M2, M3,M4, M5,M6

Theory- GAM (T) 401

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M1	Complexity of algorithms and basics of data structures	8	20	2,3	
M2	Dictionary and Sorting	8	10	2,3	
M3	Implementation using Heaps	8	20	2,3	
M4	Hashing	8	20	3,4	
M5	Search Trees	8	20	2,3	
M6	Applications in Algorithm Design and Analysis	8	10	3,4	

		48	100		

Practical- GAM 491

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M1	Complexity of algorithms and basics of data structures using java	6	10	2,3	
M2	Dictionary and Sorting using java	6	20	3	
M3	Implementation of Heaps using java	4	20	2,3	
M4	Hashing using java	4	20	3,4	
M5	Search Trees using java	4	20	3	
M6	Applications in Algorithm Design and Analysis using java	4	10	3,4	
		28	100		

Syllabus

Module I: Complexity of algorithms and basics of data structures
 Algorithms, Performance analysis - time complexity and space complexity, Asymptotic Notation - Big Oh, Omega and Theta notations, Complexity Analysis.
Stack ADT, Queue ADT, Stacks and Queues in java. util, array and linked list representations, infix to postfix conversion using stack, Circular queue-insertion and deletion, Dequeue ADT.

Module II: Dictionary and Sorting
Basics of Dictionaries, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

Module III: Advanced topics in Heap
Priority queue ADT using Heap, Implementation using Heap, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Vector classes, Iterators in java.util.

Module IV: Hashing
Hash table representation, Hash functions, Collision Resolution Methods-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.
Hashing in java.util-HashMap, HashSet, Hashtable.

Module V: Search Trees
Binary search trees, search efficiency, insertion and deletion operations, importance of balancing, AVL trees, searching, insertion and deletions in AVL trees, Tries, 2-3 tree, B-tree. Introduction to Red –Black and Splay

Trees.
Red Black trees -Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.

Module VI: Applications in Algorithm Design and Analysis
Model for external sorting, Multiway merge, Polyphase merge, Pattern matching algorithms - Brute force, String Matching -the Boyer –Moore algorithm, KMP Algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem, Backtracking -N-queen's problem.

Suggested Readings:

1. S. Sahni, "Data structures, Algorithms and Applications in Java", Universities Press. [ISBN:0-07-109217-x

2. Adam Drozdek, "Data structures and Algorithms in Java", 3rd edition, Cengage Learning. [ISBN:978-9814239233]
3. R.Lafore "Data structures and Algorithms in Java", Pearson education. ISBN: 9788 131718124.
4. J.P.Tremblay and G.A.Cheston "Data structures and Software Development in an ObjectOriented Domain", Java edition, Pearson Education.
5. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
6. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.

CC 9: Game Development
Code: GAM 402
Credits- 4L +2P

Course Objective - Video games are a booming multi-billion-dollar industry and with its flourishing independent gaming culture and public funds for game developers. This course - in conjunction with the lab component - is a practical and conceptual introduction to game design and development. The juxtaposition between theory and practice is a cornerstone of the course and students will have ample opportunities to try out concepts and theories. Individually or in small groups, students will design, develop and test the 2D or 3D games, mostly using C# and MonoGame & Unity framework.

Sl No	Course Outcome	Mapped modules
1	Remember and Understand what computer Gaming is and its various aspects , design, logic and tools	M1,
2	Remember and Understand the design of the various Gaming using MonoGame framework, tools and components of Visual Studio	M1 , M2
3	Remember and Understand the design of the various Gaming using Unity framework, tools and components of Unity Editor	M1,M4
4	Understand & Apply the graphics display techniques in Game development	M1,M2,M3
5	Understand and apply the Input & Output and OOPs game programing using C#	M1
6	Application & Analysis using guided game programming laboratory work in Unity Framework , MonoGame and C#	M2 ,M3,M4

Theory- GAM (T) 402

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M 1	Basics of Computer Gaming in C#, MonoGame and Unity framework	20	60	1,2	
M 2	Game development using MonoGame Template using Visual Studio and C#	10	15	2,3	
M 3	Game development using Unity Editor using Unity Platform and C#	10	15	2,3	
M 4	Designing, Building and testing a full fledge game with multi-level and multi-player support	10	10	2,3,6	
		50	**100**		

Practical- GAM 492

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M2	Game development using MonoGame Template using Visual Studio and C#	8	20	2,3	
M3	Game development using Unity Editor using Unity Platform and C#	8	20	2,3	
M4	Building and testing a full fledge game with multi-level and multi-player support	10	60	2,3	
		26	100		

SSyllabus

Module I: Introduction to C#, Mono Game and Unity Framework
Introduction to C# as game programing language Structure: Throughout this part of the semester, students will be instructed in various aspects of game prototyping using C#. We will go over general syntax and code structures in C#, how to use the Mono Game, Unity editor, and how to work with Mono Game, Unity objects through code. Game programing basics, Game loop, Game logic, Game objects and interaction, reacting to player input, Communication and interaction between objects, Maintaining the number of lives, adding sound, music and maintaining of score of a game. Dealing with different screen sizes, Menus and levels, Game state management, showing level progression, loading game levels from files, Animated game objects handling, Game Physics – Jumping, falling, Collision detection, slippery and friction etc. Assignments: Individual assignments each week. There will be frequent, small "quizzes" reviewing concepts and syntax, as well as exercises in Mono Game and Unity itself. All assignments are completion as homework.

Module II: Classic Game Project -I
Classic Game Project using Mono Game Windows Project Template using Visual Studio
Structure: Students will work in pairs to create a game prototype using Mono Game Windows Project Template using Visual Studio.
Assignment:
Set up Visual Studio Development environment and Mono Game platform.
How to create new game project and how to compile and run it.
Build a simple single user interactive GUI game.

Module III: Classic Game Project –II
Classic Game Project using Unity Editor
Structure: Students will work in pairs to create a game prototype using Unity Editor.
Assignment:
Set up Unity Editor environment and Unity platform.
How to create new game project and how to compile and run it.
Build a simple multi user interactive GUI game.

Module IV: Final Game Project
Final Game Project – Designing, Development and Testing
Structure: Students will work in pairs to create an original game prototype.

Assignments: Pair assignment due during the final exam period. Students will create a new, unique game prototype. This will be based on their work throughout the semester and should both showcase all of the skills that they've learned throughout the semester and express a unique game design vision.

Reference Book:

1. Learning C# by Programming Games By Wouter van Toll, Arjan Egges, Jeroen D. Fokker , 2019, Springer

2. Introduction to Game Programming Using C# and Unity 3D by By Vahe Karamian , 2016 , Noorcon Incorporated

3. Learning C# by Developing Games with Unity 2019 By Harrison Ferrone , Packet Publishing

4. Introduction to Game Programming with C++, September 2007 by Alan Thorn

CC 10: Mobile Application Development
Code: GAM 403
Credits- 4L +2P

Course Objective - This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise and m-commerce systems. Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software capable of meeting the requirements of stakeholders.

Sl No	Course Outcome	Mapped modules
1	Remember and Understand what mobile app is and its various aspects , design, development, logic and tools	M1, M2
2	Remember and Understand the development of the various mobile apps using Android framework, tools and components of Android Studio	M2,M3
3	Remember and Understand the design of the various mobile apps using its communication framework, tools and other components of android framework	M1,M2,M3
4	Understand & Apply the graphics display techniques in mobile development	M1,M2,M4
5	Understand and apply the multimedia and multithreading in mobile apps development	M1,M2,M4
6	Application & Deployment of mobile apps	M5,M6

Theory- GAM (T) 403

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M 1	Basics of Mobile App development, Tools and Platforms – Android framework	15	20	1,2	
M 2	Apps development using Android Framework and Android Studio	15	30	1,2,3	
M 3	Apps development using android communication framework, Telephony framework	5	20	1,2,3	
M 4	Designing, Building Graphics and Multi-threaded mobile apps	5	10	1,2,3	
M 5	Packaging, Testing & Deployment of mobile apps	4	10	5,6	
M 6	Exploring Security and hacking aspects	4	10	4,5	
		48	100		

Practical- GAM 493

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M2	Apps development using Android Framework and Android Studio	10	20	2,3	
M3	Apps development using android communication framework, Telephony framework	8	60	2,3	
M4	Designing, Building Graphics and Multi-threaded mobile apps	5	10	2,3	
M5	Packaging, Testing & Deployment of mobile apps	5	10	6	
		28	100		

Syllabus

Module I: Introduction
Introduction to Mobile Computing - Introduction to Android Development Environment. Factors in Developing Mobile Applications - Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User

Module II: App Development
Framework, Architecture, Design, Technology Selection, Development Process, Development Tools. Intents on UIs, VUIs - Designing the Right UI, Multichannel and Multimodal UIs. Intents and Services- Android Intents and Services, Characteristics of Mobile Application, Successful Mobile Development. Storing and Retrieving Data - Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider, Text-to-Speech Techniques, Mobile App Development Hurdles etc.

Module III: Communications over Network and Web
Communications Via Network and the Web - State Machine, Correct Communications Model, Android Networking and Web. Telephony - Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony. Notifications and Alarms – Performance, Performance and Memory Management, Android Notifications and Alarms etc.

Module IV: Graphics and Threading
Graphics - Performance and Multithreading, Graphics and UI Performance, Android Graphics. Multimedia - Mobile Agents and Peer-to-Peer Architecture, Android Multimedia. Location - Mobility and Location Based Services, maps.

Module V: Packaging, Testing & Deployment
Packaging and Deploying, APK files, Testing – alpha, beta, Use of simulator, testing on real devices, Deploying in Marketplace, Performance Best Practices, Android Field Service App

Module: VI: Security and Hacking
Security - Active Transactions, Rooting, more on Security aspects like Secure profile – work profile, user profile. Hacking Android.

Reference Book:

1. Head First Android Development -A Brain-Friendly Guide By Dawn Griffiths, David Griffiths , 2015 , O'Reilly Media
2. Learn Android Studio 3 with Kotlin - Efficient Android App Development , By Ted Hagos , 2018, Apress
3. Android App Development , By Franceschi , 2016 , Jones & Bartlett Learning

4. Professional Mobile Application Development, 11 October 2012 by Jeff Mcherter and Scott Gowell

SEC 2: Python Programming
Code: GAM 455
Credits- 2P

Course Objective: This is an introductory course on python programming used in different applications. This course is a theoretical & practical approach to explore the various features of python programming. The course requires instructor's guidance of 2 hours/week including lectures, tutorials and lab classes.

Sl. No	Course Outcome	Mapped modules
1	To understand what python programming is and their area of applications	M1, M2
2	To understand the various features of the python programming	M2, M3
3	To apply various python modules on different applications	M3, M4
4	To apply the implementation of python programming	M4

Module Number	Headline	Total Hours	%age of questions	Blooms Level	Remarks (If any)
M 1	Basics 1 of python programming	8	30	1,2	
M 2	Basics 2 of python programming	8	30	1,2	
M 3	Python collection	6	30	2,3	
M 4	More features of Python Programming	6	10	2,3	
		28	100		

Module I: Basics 1 of Python Programming
Introduction - what is python, what's the use of a python, features of python programming, Python installation, Python IDE, Python comments, Python syntax, Python indentation, Python variables, Python data types, Python strings, Python Boolean, Python operators.

Module II: Basics 2 of Python Programming
Python If--Else, Python loop, Python function, Python arrays, Python class/objects, Python JSON, Python RegEx.

Module III: Python Collection
Python Lists, Python Tuples, Python sets, Python Dictionaries,

Module IV: More features of Python Programming
Python module (Numpy), Python file handling

Study and lab Resources:
1. Python Tutorial(W3Schools) - https://www.w3schools.com/python/
2. Python Tutorial (Tutorial point)- https://www.tutorialspoint.com/python/
3. Python Resources - https://www.python.org/
4. Learning Python – by Mark Lutz
5. Edureka - https://www.youtube.com/watch?v=WGJJIrtnfpk
6. Python.org- https://www.youtube.com/watch?v=rfscVS0vtbw