Choice Based Credit System

140 Credit (3-Year UG Hons.) MAKAUT Framework

w.e.f 2020-21

BSc.In Gaming and Mobile Application Development

CBCS – MAKAUT UG degree (Hons) 140 Credit FRAMEWORK (Revised)

Subject Type	**Semester I**	**Semester II**	**Semester III**	**Semester IV**	**Semester V**	**Semester VI**
CC	CC1, CC2	CC3, CC4	CC5,CC6,CC7	CC8,CC9,CC10	CC11,CC12	CC13, CC14
DSE					DSE1, DSE2	DSE3, DSE4
GE	GE1	GE2	GE3	GE4		
AECC	AECC 1	AECC 2				
SEC			SEC 1	SEC 2		
	4 (20)	5 (20)	4 (26)	5(26)	4 (24)	4 (24)

B.Sc in Gaming and Mobile Application Development

Program Outcomes or Graduate Attributes of BSc Gaming and Mobile Application Development under MAKAUT:

Graduates will be able to demonstrate the following program outcomes:

PO1- Gaming and Mobile Application Knowledge: Apply the knowledge of computer systems, data systems, graphic design and gaming specializations to the development of interactive gaming solution.

PO2- Design/Development of Solutions: Identify, formulate, review and design advanced gamingsolutions and game components or processes to build engaging and interactive games for diverse cultural user groups, for societal, academic and business innovations.

PO3- Gaming Professional and Society: Create,select and apply techniques, resources and modern gaming tools and techniques to contribute to societal,health,safety,legal and cultural issues and the consequent responsibilities relevant to the professional ethics

PO4- Individual and team work: Apply ethical principles and commit to professional ethics and responsibilities and norms of the gaming and mobile application practice as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO5- Communication: Communicate effectively on gaming activities with the gaming& IT community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO6- Lifelong Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the context of technological change.

Program Outcomes (PO) Mapping

PO #	Program Outcome	Mapped courses
1	Gaming and Mobile Application Knowledge	GAM 101, GAM 102, GAM 201, GAM 202, GAM 301, GAM 302, GAM 303, GAM 402, GAM 403, GAMGAM 501, GAM 502, GAM 543, GAM 544, GAM 601, GAM 643, GAM 644
2	Design/Development of Solutions	GAM 101, GAM 102, GAM 201, GAM 202, GAM 301, GAM 302, GAM 303, GAM 354, GAM 401, GAM 402, GAM 403, GAM 455, GAM 501, GAM 502, GAM 543, GAM 544, GAM 643, GAM 644
3	Gaming Professional and Society	GAM 101, GAM 201, GAM 202, GAM 301, GAM 302, GAM 303, GAM 354, GAM 401, GAM 402, GAM 403, GAM 501, GAM 502, GAM 543, GAM 544, GAM 601, GAM 643, GAM 644.
4	Individual and team work	GAM 102, GAM 164, GAM 202, GAM 301, GAM 401, GAM 543, GAM 544, GAM 643, GAM 644
5	Communication	GAM 164, GAM 301, GAM 543, GAM 544, GAM 643, GAM 644
6	Life-Long Learning	GAM 102, GAM 164, GAM 201, GAM 202, GAM 301, GAM 265, GAM 302, GAM 303, GAM 401, GAM 643

***GE Courses are not in the above mapped list. Based on the choice of the learner that would necessarily be part of PO6 and the relevant PO's**

B.Sc in Gaming & Mobile Application Development Curriculum Structure

1st Semester

Subject Type	Course Name	Credit Points	Credit Distribution			Mode of Delivery			Proposed Moocs
			Theory	Practical	Tutorial	Offline	Online	Blended	
CC 1 **GAM 101**	Engineering Math	6	5	0	1	✓			As per MAKAUT notification
CC 2 **GAM 102**	Programming using C	6	4	2	0	✓			
GE 1	Students will have to select from the GE Basket	6						✓	
AECC 1 **GAM 164**	English Communication	2	2	0	0	✓			
Semester Credits		**20**							

2nd Semester

Subject Type	Course Name	Credit Points	Credit Distribution			Mode of Delivery			Proposed Moocs
			Theory	Practical	Tutorial	Offline	Online	Blended	
CC 3 GAM 201	Digital Visualisation	6	5	0	1	✓			As per MAKAUT notification
CC 4 GAM 202	Object Oriented Programming	6	4	2	0	✓			
GE 2	Students will have to select from the GE Basket	6						✓	
AECC 2 GAM 265	Environmental Science	2	2	0	0	✓			
Semester Credits		**20**							

Subject Type	Course Name	Credit Points	Credit Distribution			Mode of Delivery			Proposed Moocs
			Theory	Practical	Tutorial	Offline	Online	Blended	
CC 5 GAM 301	Database Programming	6	4	2	0	✓			As per MAKAUT notification
CC 6 GAM 302	Fundamentals of Data Structure using C	6	4	2	0	✓			
CC 7 GAM 303	Graphics Programming and Animation using OpenGL	6	4	2	0	✓			
GE 3	Students will have to select from the GE Basket	6						✓	
SEC 1 GAM 354	Mobile database skills	2	0	2	0	✓			
Semester Credits		**26**							

4th Semester

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

5th Semester

Subject Type	**Course Name**	**Credit Points**	**Credit Distribution**			**Mode of Delivery**			**Proposed Moocs**
			Theory	Practical	Tutorial	Offline	Online	Blended	
CC 11 **GAM 501**	Game AI	6	4	2	0	✓			As per MAKAUT notification
CC 12 **GAM 502**	Computer Vision & Pattern Recognition	6	4	2		✓			
DSE 1	Elective 1	6	1	0	5			✓	
DSE 2	Elective 2	6	1	0	5			✓	
Semester Credits		**24**							

6th Semester

Subject Type	**Course Name**	**Credit Points**	**Credit Distribution**			**Mode of Delivery**			**Proposed Moocs**
			Theory	Practical	Tutorial	Offline	Online	Blended	
CC 13 **GAM 601**	Rigging & Animation for Games	6	4	2	0	✓			As per MAKAUT notification
CC 14 **GAM 602**	Virtual & Augmented Reality	6	4	2	0	✓			
DSE 3	Capstone Project	6	1	0	5			✓	
DSE 4	Dissertation & Viva Voce	6	1	0	5			✓	
Semester Credits		**24**							
Total		**140**							

Code: GAM-101

Course Objective: The course is designed to introduce the students to core mathematical concepts of basic analysis, one-variable calculus and linear algebra. The students will then be able to learn more advanced concepts of multi-variable calculus, complex analysis and Laplace transforms, which form the second part of the course. On successful completion of the course, the students will have the requisite mathematical understanding to apply in the design of gaming and mobile applications.

Sl	Course Outcome	Mapped modules
1	Remember the concept of basic analysis	M1
2	Remember and understand the analysis of complex numbers	M1, M2
3	Understand the methods of one and several variable calculus	M1, M3
4	Understand and Apply the techniques of linear algebra	M4
5	Understand and Apply the theory of ordinary differential equations	M1, M3, M5
6	Understand and apply the methods of Laplace transforms	M1, M3, M5, M6

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
M 1	**REAL ANALYSIS**	5	10	1	
M 2	**ANALYSIS OF COMPLEX VARIABLES**	7	15	1,2	
M 3	**CALCULUS**	22	35	2	
M 4	**LINEAR ALGEBRA**	8	15	2,3	
M 5	**ORDINARY DIFFERENTIAL EQUATIONS**	7	15	2,3	
M 6	**LAPLACE TRANSFORMS**	7	10	2,3	
		56	**100**		

Detailed Syllabus

Paper: Engineering Math
Code: GAM 101
Contact Hours / Week: 5L + 1T
Credits: 6

Module 1: REAL ANALYSIS

De Moivre's theorem and roots of complex numbers. Euler's theorem, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses. Convergence and Divergence of Infinite series, Comparison testd'Alembert's ratio test. Higher ratio test, Cauchy's root test. Alternating series, Leibnitz test, Absolute and conditional convergence. **(Total hours -5)**

Module 2: ANALYSIS OF COMPLEX VARIABLES

Derivatives of complex functions, Analytic functions, Cauchy-Riemann equations, Standard mappings – linear, square, inverse and bilinear. Complex line integral, Cauchy's integral theorem, Cauchy's integral formula, Zeros and Singularities / Taylor series, Laurentseries, Calculation of residues. Residue theorem,Evaluation and real integrals.**(Total hours -7)**

Module 3: CALCULUS

Successive differentiation. Leibnitz theorem (without proof) McLaurin's and Taylor's expansion of functions, errors and approximation. Asymptotes of Cartesian curves. Curvature of curves in Cartesian, parametric and polar coordinates, Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardiode, Lemniscate of Bernoulli,equiangular spiral). Reduction Formulae for evaluating. Finding area under the curves, Length of the curves, volume and surface of solids of revolution. (**Total hours -7)**

Partial differentiation, ordinary derivatives of first and second order in terms of partial derivatives, Euler's theorem on homogeneous functions, change of variables, Taylor's theorem of two variables and its application to approximate errors. Maxima and Minima of two variables, Lagrange's method of undermined multipliers and Jacobians. **(Total hours -8)**

Scalar and Vector point functions, Gradient, Divergence, Curl with geometrical physical interpretations, Directional: derivatives, Properties. Line integrals and application to work done, Green's Lemma, Surface integrals and Volume integrals, Stokes' theorem and Gauss divergence theorem (both without proof). (**Total hours -8)**

Module 4:LINEAR ALGEBRA
Rank of matrix, Linear transformations, Hermitian and skew – Hermitian forms, Inverse of matrix by elementary operations. Consistency of linear simultaneous equations, Diagonalization of a matrix, Eigen values and eigen vectors. Cayley – Hamilton theorem (without proof).
(Total hours -8)

Module 5: ORDINARY DIFFERENTIAL EQUATIONS
First order differential equations – exact and reducible to exact form. Linear differential equations of higher order with constant coefficients. Solution of simultaneous differential equations. Variation of parameters, Solution of homogeneous differential equations – Cauchy and Legendre forms.**(Total hours – 7)**

Module 6: LAPLACE TRANSFORMS
Existence condition for Laplace transform, Laplace transform of standard functions, Properties, Inverse Laplace transform of functions using partial fractions, Convolution and coinvolution theorem. Solving linear differential equations using Laplace transform. Unit step function, Impulse function and Periodic function and their transforms. **(Total hours – 7)**

Readings

1. Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
2. Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa, 2003 (2nd Ed.).
3. "Advanced Engineering Mathematics", Dr. A. B. Mathur, V. P. Jaggi (Khanna publications)
4. Wylie, R., "Advanced Engineering Mathematics", McGraw-Hill, 1995.
5. Garg, Reena, Engineering Mathematics-I, Khanna Publishing House, 2017.
6. Garg, Reena& Chandrika, Prasad, Advanced Engineering Mathematics, Khanna Publishing House, 2018.
7. Mitin, V. V.; Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001

Paper: Programming using C

Code: GAM-102

Course Objective: This course is designed to introduce the students to the concepts of Creation, development and application of programs and applications. Students will be able to initiate initial *programming* processes and solve complex issues or problems. Students not only will learn how to think, but also how to begin thinking using different logic to solve the program. Besides, by learning the basicprogramming constructs they can easily be able to grasp any other new computer languages in future.

Sl	**Course Outcome**	**Mapped modules**
1	Remember and understand the basic concepts of Computer Fundamentals	M1
2	Remember and understand the concepts of basic programming logic	M1, M2
3	Understand the concepts of I/O, decision making, branching and control statements	M2, M3
4	Understand and apply the ideas of arrays and structures	M2, M3, M4
5	Apply the concepts of string operations	M2, M3, M4, M5
6	Application and analysis offunctions, pointers and header files	M2, M3, M4, M5, M6

Module Number	**Content**	**Total Hours**	**%age of questions**	**Blooms Level (if applicable)**	**Remarks (If any)**
M 1	**Computer fundamentals**	4	5	1,2	
M 2	**Programming Basics**	12	10	1,2	
M 3	**Formatted I/o, Decision Making Branching & Looping**	12	30	2	
M 4	**Arrays & Structures**	8	20	2,3	
M 5	**Strings**	10	10	3	
M 6	**Function, Pointer and Header Files**	10	25	3,4	
		56	**100**		

Detailed Syllabus

Paper: Programming using C
Code: GAM-102
Contacts Hours / Week: 4L + 2P
Credits: 6

Module 1-Computer fundamentals:
Introduction to components of a computer system: disks, memory, processor, where a program is stored and executed, operating system, compilers. Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation, Number Systems & Binary Arithmetic
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, objectand executable code.**(Total Hours-4)**

Module 2- Programming Basics:
The emphasis should be more on programming techniques rather than the language itself. The C Programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.
Brief History of Development of C language, Features of C language, Process of compiling and running a C program.Definition of Tokens, variables, Constant, Classification of constants, data types (Primary data types, User defined data types, Derived data types). Different types of Operators (Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special), expressions, type conversion, Operator precedence, associatively rules on operators.**(Total Hours-8)**

Assignments - Write C program to -Implement (main(), printf, scanf) , Print your (name , college name and address), Input an integer number and print it, Input two integer numbers and find sum and difference, Input floating point number and print it, Understand the purpose of header files such as <stdio.h> and <conio.h>
Write C program to - Declare variable of different data types and print them, Implement different types of integer and floating-point constants
Write C program to - Input integer number and apply different arithmetic operators (+,-,*,/,%), Implement ++ and – operators, Implement assignment operators, Implement bitwise operators.**(Total Hours –4)**

Module 3 – Formatted I/o, Decision Making Branching & Looping

scanf() Format code, printf() Format code, reading and writing character variable, character testing functions (isdigit(), islower(), isupper(), tolower(), toupper()). If statement, if..else, Nested if ..else, else if ladder, switch, ternary operator, goto statement (forward and backward jump)
Different types of loop (while, for, do), entry control loop, exit control loop, Applying break and continue within loop**(Total Hours – 6)**

Assignments -Write C programs to - Input character constant and print, Implement scanf() Format code, Implement printf() Format code, Implement isdigit(), islower(), isupper(), tolower() and other functions within<ctype.h>

Write C programs to – Implement relational operators using if statements, implement logical operators using if statements, implement simple if statement, Input two number and find larger number, Input three numbers and find largest, Implement else if ladder, Implement switch … case, Input two numbers and find larger number using ternary operator, Implement nested ternary operator, Implement pseudo loop using goto statement.
Write C programs to - Implement while loop, Implement for loop, Implement do-while loop, Print all even numbers from 2 to 20, Print all odd numbers from 1 to 30, Print all prime numbers from 1 to 50, Print the first 15 Fibonacci terms, Implement nested loop, Print different number patterns, Apply break statement within a loop, Apply continue statement within a loop, Input a 3-digit number to find sum of digits, Input a 3-digit number and print in reverse order, Find factorial of a number.**(Total Hours – 6)**

Module – 4 Array& Structures
One dimensional array, Two dimensional array, Example using integer and floating array, Concepts of Structure**(Total Hours – 4)**

Assignments - Write C programs to - Implement an array arr[10] scanf value and print, Implement an array arr[10] scanf value and print value in reverse order, Implement an array arr[3][3] scanf value and print values, Find the sum of even and odd numbers within an array separately, Find the row wise sum of an 2-d array arr[4][4]. **(Total Hours – 4)**

Module – 5 String
Character Array, Library functions related to string (strcat(), strcmp(), strcpy(), strlen()) **(Total Hours – 5)**

Assignments - Write C programs to - Implement scan and print string, implement different string functions such as strcat(), strcmp(), strcpy(), strlen() ,Note – include <string.h> in the programs. **(Total Hours – 5)**

Module – 6 Function, Pointer and Header Files

Definition, Standard library functions, user-defined functions, recursion, scope of variables in function (auto, extern, static, register). Pointer Definition, pointer expression, pointer to an array, pointer to a function. Definition of Header file, Use of header files, Different header files.

(Total Hours – 7)

Assignments - Write C program to –Implement different library functions, Implement UDF with no argument and no return type, Implement UDF with argument and no return value, Implement UDF with argument and with return value, Implement UDF with no return value and with return value, Implement auto, extern, static and register variables, Implement chaining of UDF, Implement recursion to find factorial

Write C program to -Implement Pointer, Implement pointer expression, Implement pointer to an array, Implement pointer to a function, implement simple macro, Implement nested macro.**(Total Hours – 3)**

Readings:

1. Problem Solving & Programming in C by R.S. Salaria, Khanna Publishing House
2. Programming in ANSI C by E Balagurusamy
3. Programming With C, Gottfried, TMH
4. The C Answer Book, Tondo, PHI
5. Programming & Problem Solving Through C Language, EXCEL BOOKS
6. Let us C, Yashavant P. Kanetkar, BBP Publications, Delhi

Paper: English Communication

Code: GAM-164

Course Objective: The course is designedto develop the student's communicative competence in English by giving adequate exposure in the four communication skills - LSRW - listening, speaking, reading and writing and the related sub-skills, thereby, enabling the student to apply the acquired communicative proficiency in social and professional contexts.

Sl	Course Outcome	Mapped modules
1	Students will be able to Remember & Understand the basic concepts of the usage of English grammar & vocabulary in communication.	M1
2	Students will be able to Comprehend facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts.	M1,M2
3	Students will be able to Synthesise and Apply acquired linguistic knowledge in producing various types of written texts	M1, M3
4	Students will be able to Comprehend facts and ideas from aural inputs and Synthesise and Apply acquired linguistic knowledge in giving spoken response	M1, M4

Module Number	Content	Total Hours	%age of questions	Blooms Level (if applicable)	Remarks (If any)
M 1	Functional grammar & Vocabulary	2	10	1,2	
M 2	Reading Skills	2	20	1,2	
M 3	Writing Skills	8	40	2,3,4,	
M 4	Listening & Speaking Skills	8	30	2,3,4	
		20	**100**		

Detailed Syllabus

Paper: English Communication
Code: GAM 164
Contact Hours / Week: 2L
Credits: 2

Module 1 : Functional Grammar & Vocabulary : Tense: Formation and application; Affirmative / Negative / Interrogative formation; Modals and their usage; Conditional sentences; Direct and indirect speech; Active and passive voice; usage of common phrasal verbs, synonyms & antonyms. 1L + 1T

Module 2 : Reading Skills: Comprehension passages; reading and understanding articles from technical writing. Interpreting texts: analytic texts, descriptive texts, discursive texts; SQ3R reading strategy. 1L + 1T

Module 3 : Writing Skills: Writing business letters - enquiries, complaints, sales, adjustment, collection letters, replies to complaint & enquiry letters; Job applications, Résumé, Memo, Notice, Agenda, Reports – types & format, E-mail etiquette, advertisements 4L + 4T

Module 4 : Listening & Speaking
Listening: Listening process, Types of listening; Barriers in effective listening, strategies of effective listening
Speaking: Presentations, Extempore, Role-plays, GD, Interview 4L + 4T

Suggested readings:

1. Bhatnagar, M &Bhatnagar, N (2010) Communicative English for Engineers and Professionals. New Delhi: Pearson Education.
2. Raman, M & Sharma, S (2017) Technical Communication. New Delhi: OUP.
3. Kaul, Asha (2005) The Effective Presentation: Talk your way to success. New Delhi: SAGE Publication.
4. Sethi, J &Dhamija, P.V. (2001), A Course in Phonetics and Spoken English. New Delhi:PHI.
5. Murphy, Raymond (2015), English Grammar in Use. Cambridge: Cambridge University Press