SHRI GURU RAM RAI UNIVERSITY

[ESTD. BYGOVT.OF UTTARAKHAND, VIDE SHRIGURURAMRAI UNIVERSITY ACTNO.03OF 2017&RECOGNIZEDBYUGCU/S(2F)OF UGCACT1956]

PROPOSED CURRICULUM AND SYLLABI
(NEP-2020, UGCF – 2022)

For

FIRST THREE YEARS OF UNDER-GRADUATE (UG) MULTIDISCIPLINARY PROGRAMME

OR

B.Sc. (Honors with Research) in Mathematics

DEPARTMENT OF MATHEMATICS

SCHOOL OF BASIC AND APPLIED SCIENCES

S.G.R.R UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

AS PER GUIDELINES OF COMMON MINIMUM SYLLABUS BY UTTARAKHAND GOVERNMENT ACCORDING TO NATIONAL EDUCATION POLICY-2020

(W.E.F. ACADEMIC SESSION 2023-24)

MEMBER OF BOARD OF STUDIES

DEPT OF MATHEMATICS
SCHOOL OF BASIC AND SCIENCE
SHRI GURU RAM RAI UNIVERSITY
PATEL NAGAR, DEHRADUN, UTTARAKHAND

S. no.	Name & Designation	Signature
1	PROF. (DR.) ARUN KUMAR CHAIRPERSON	
2	DR. A S PARMAR CONVENER	
3	PROF. (DR.) SANJAY KUMAR PADALIYA EXTERNAL EXPERT	
4	DR. RASHI BHARGAVA MEMBER	
5	DR. ASHOK SINGH BHANDARI MEMBER	

DEPARTMENT OF MATHEMATICS,
SCHOOL OF BASIC AND APPLIED SCIENCES,
S.G.R.R. UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

Structure of UG Multidisciplinary Programme
(with Three Core disciplines)

1. Introduction to UG Multidisciplinary Degree Programme with Mathematics

As per the recommendations of the Undergraduate Curriculum Framework 2022 (UGCF 2022), the undergraduate degree course in Multidisciplinary Programme with mathematics is a six/ eight semester course spread over three/ four academic years. The teaching – learning process is student-centric and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific
Core(DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives(DSEs), Generic Electives(GEs), Skill Enhancement Courses(SECs), Ability Enhancement courses(AECs) and Value Addition Courses(VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

2. Course Type

Discipline Specific Core Courses (DSCC)
Discipline Specific Elective Courses (DSEC)
General Electives Courses (GEC)
Ability Enhancement Courses (AEC)
Skill Enhancement Elective Courses (SEEC)
IAPC: Internship/Apprenticeship / Project/ Community Outreach
VAC: Value Addition Course

3. Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

3.1) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Mathematics programme, DSCs are the core credit courses of Mathematics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

3.2) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics

from which a student will choose to study based on his/ her interest.
3.3) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.
3.4) **Ability Enhancement course (AEC):** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.
3.5) **Skill Enhancement Course (SEC):** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.
3.6) **Value Addition Course (VAC):** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and team work which will help in all round development of students.
3.7) **Internship/Apprenticeship / Project/ Community Outreach (IAPC) :Students can choose IAPC as an optional with SEC.**

4. Programme Duration and Exit Options:
The minimum credit to be earned by a student per semester is 22 credits. The mandatory number of credits which have to be secured for the purpose of award of Undergraduate Certificate/ Undergraduate Diploma/Appropriate Bachelor's Degree in Multidisciplinary Programme with Mathematics are listed in the following Table 1.

Table 1: Qualification Type and Credit Requirements

S. No.	Type of Award	Stage of Exit	Mandatory Credits to be Secured for the Award
1.	Undergraduate Certificate in Sciences (with Three Core disciplines)	After successful completion of Semester II	44
2.	Undergraduate Diploma in Science	After successful completion of Semester IV	88
3.	Bachelor of Science	After successful completion of Semester VI	132
4.	Bachelor of Science (Honours with Research) in Mathematics(Major) and Discipline - 2(Minor)	After successful completion of Semester VIII with minimum 28 GE credits in Discipline- 2 (Minor)	176

Major Discipline (Mathematics): A student pursuing four-year undergraduate programme in Mathematics (Core course) shall be awarded B.Sc. Honors degree
with Major in Mathematics on completion of VIII Semester, if he/she secures in Mathematics at least 50% of the total credits i.e., at least 88 credits in Mathematics
out of the total of 176 credits. He/she shall study 20 DSCs and at least 2 DSEs of Mathematics in eight semesters
Minor Discipline (Discipline - 2): A student of B.Sc. (Hons.) in Mathematics may be awarded Minor in a discipline, other than Mathematics, on completion of VIII Semester, if he/she earns minimum 28 credits from seven GE courses of that discipline.

Combinations with other two core disciplines: Dept of Mathematics offer following combinations with core Multidisciplinary/interdisciplinary streams
PCM, PMG, PMS, PMD
P-Physics, C-Chemistry, M-Mathematics, S-Statistics, D-Defense, G-Geology

Note: It is advice to students, choose any one of the above combination to study with core discipline Mathematics.

Table 2: Structure of Undergraduate Programme in Mathematics under UGCF – 2022

Sem.	Discipline Specific Core Courses (DSC)		Discipline Specific Elective Courses (DSEC)/Generic Elective Courses (GEC)		Ability Enhancement Course (AEC)		Skill Enhancement Course(SEC)/ (Internship/Apprenticeship / Project/ Community Outreach) (IAPC)/ (Project/ Dissertation)		Value Addition Course (VAC)		Total Credits
	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (2)	Courses distribution (Theory or Theory + Practical)	Credits (2)		Credits (2)	22
I	DSC-A1	4	GE-1	4	AEC-1	2	SEC-1	2	VAC-1	2	22
	DSC-B1	4									
	DSC-C1	4									
II	DSC-A2	4	GE-2	4	AEC-2	2	SEC-2	2	VAC-2	2	22
	DSC-B2	4									
	DSC-C2	4									
III	DSC-A3	4	DSE1/GE-3	4	AEC-3	2	SEC-3 / IAPC-1	2	VAC-3	2	22
	DSC-B3	4									
	DSC-C3	4									
IV	DSC-A4	4	DSE2 / GE-4	4	AEC-4	2	SEC-4 / IAPC-2	2	VAC-4	2	22
	DSC-B4	4									
	DSC-C4	4									
V	DSC-A5	4	One DSE-3 and One GE-5	4+4			SEC-5 / IAPC-3	2			22
	DSC-B5	4									
	DSC-C5	4									
VI	DSC-A6	4	One DSE-4 and One GE-6	4+4			SEC-6 / IAPC-4	2			22
	DSC-B6	4									
	DSC-C6	4									
VII	DSC-7	4	DSE-5 /GE-7	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-6 /GE-8	4							
			DSE-7/GE-9	4							
VIII	DSC-8	4	DSE-8/GE-10	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-9/GE-11	4							
			DSE-10/GE-12	4							

5.1 Semester-wise Distribution of Discipline Specific Core (DSC) Courses:
A student will study three Discipline Specific Core Courses each in Semesters I to VI and one core course each in semesters VII and VIII. The semester wise distribution of DSC courses over eight semesters is listed in Table 3

Table 3: Semester-wise Distribution of Discipline Specific Core (DSC) Courses (Basket I)

	Discipline Specific Core Courses (4 Credits each)			Contact Hours			Credit
S. No	**Semester**	**Course Code**	**Name Of The Course**	**L**	**T**	**P**	**C**
1.	I	MATDC101	Differential Calculus	3	1	0	4
2.	II	MATDC201	Abstract Algebra	3	1	0	4
3.	III	MATDC301	ODE & PDE-I	3	1	0	4
4.	IV	MATDC401	Real Analysis	3	1	0	4
5.	V	MATDC501	Linear Algebra	3	1	0	4
6.	VI	MATDC601	Complex Analysis-I	3	1	0	4
7.	VII	MATDC701	ODE & PDE –II	3	1	0	4
8.	VIII	MATDC801	Complex Analysis II	3	1	0	4

5.2 Details of Discipline Specific Elective Courses (DSEC):
The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics from which a student will choose to study based on his/ her interest. A student of Bachelor of Science (Hons.) Mathematics gets an option of choosing one DSE of Mathematics in each of the semesters III to VI, while the student has an option of choosing a maximum of three DSEC courses of Mathematics in semesters VII and VIII. The semester wise distribution of DSEC courses over eight semesters is listed in Table 4.

Table 4: Semester-wise Distribution of Discipline Specific Elective Courses (Basket II)

	Discipline Specific Elective Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of the Course	L	T	P	C
1.	V	MATDE501	Theory of Equations	3	1	0	4
2.	VI	MATDE601	Matrices	3	1	0	4
3.	VII	MATDE701	Analytical Geometry	3	1	0	4
4.	VII	MATDE702	Transportation and Game theory	3	1	0	4
5	VII	MATDE703	Fundamentals of Differential Geometry	3	1	0	4
6	VII	MATDE704	Statics	3	1	0	4
7	VII	MATDE705	Number Theory	3	1	0	4
8	VIII	MATDE801	Discrete Mathematics	3	1	0	4
9	VIII	MATDE802	Mathematical Statistics	3	1	0	4
10	VIII	MATDE803	Dynamics	3	1	0	4
11	VIII	MATDE804	Numerical Analysis	3	1	0	4
12	VIII	MATDE805	Multivariate Calculus	3	1	0	4

Note: In addition to the above proposed courses, students may select courses from the Swayam.org as MOOCs courses upto the permissible limit and course must be 4 credits.

5.3 Details of Skill Enhancement Courses (SEC):

To enhance the skills required for advanced studies, research and employability of students various Skill Enhancement Courses will be offered to students as listed in Table 5.

Table 5: Semester-wise Distribution and Details of Skill Enhancement Courses (SEC) (Basket III)

	Skill Enhancement Courses (2 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATSC 101	Bio Mathematics	2	0	0	2
2.	II	MATSC 201	Laplace transforms	2	0	0	2
3.	III	MATSC 301	Elementary Algebra & Trigonometry	2	0	0	2
4.	IV	MATSC 401	Numerical Methods for ODE	2	0	0	2
5	V	MATSC 501	Theory of equations	2	0	0	2
6	VI	MATSC 601	Differential geometry	2	0	0	2
7	VII	MATSC 701	Finite Field	2	0	0	2
8	VIII	MATSC 801	Measure and integration	2	0	0	2

Table 6: Semester-wise Distribution and Details of Internship/Apprenticeship/Project/Community Outreach (IAPC) (Basket IV)

1	III	MATI301	Internship-I	0	0	0	2
2	III	MATA301	Apprenticeship-I	0	0	0	2
3	III	MATP301	Project-I	0	0	0	2
4	III	MATCO301	Community Outreach-I	0	0	0	2
5	IV	MATI401	Internship-II	0	0	0	2
6	IV	MATA401	Apprenticeship-II	0	0	0	2
7	IV	MATP401	Project-II	0	0	0	2
8	IV	MATCO401	Community Outreach-II	0	0	0	2
9	V	MATI501	Internship-III	0	0	0	2
10	V	MATA501	Apprenticeship-III	0	0	0	2
11	V	MATP501	Project-III	0	0	0	2
12	V	MATCO501	Community Outreach-III	0	0	0	2
13	VI	MATI601	Internship-IV	0	0	0	2
14	VI	MATA3601	Apprenticeship-IV	0	0	0	2
15	VI	MATP601	Project-IV	0	0	0	2
16	VI	MATCO601	Community Outreach-IV	0	0	0	2

Table 7: (Project/ Dissertation) (Basket V)

1	VII	MATD701	Dissertation on Major-I	0	0	0	6
2	VII	MATD702	Dissertation on Minor-I	0	0	0	6
3	VII	MATAP703/ MATEP704	Academic Project-I/Entrepreneurship-I	0	0	0	6
4	VIII	MATD801	Dissertation on Major-II	0	0	0	6
5	VIII	MATSD802	Dissertation on Minor-II	0	0	0	6
6	VIII	MATAP803/ MATEP804	Academic Project-II/Entrepreneurship-II	0	0	0	6

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

UG Mathematics

Department of Mathematics

Details of Generic Elective (GE) Courses:
Generic Elective courses provide multidisciplinary or interdisciplinary education to students.

Table 8: Various GE courses offered by the Mathematics Department are listed below (Basket VI)

	Generic Elective (GE) Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATGE101	Basic Applied Mathematics	3	1	0	4
2.	I	MATGE201	Applied Calculus	3	1	0	4
3.	I	MATGE301	Numerical Methods	3	1	0	4
4.	II	MATGE401	Graph Theory	3	1	0	4
5	II	MATGE501	Probability & Statistics	3	1	0	4
6	II	MATGE601	Linear Programming	3	1	0	4
7	III	MATGE701	Advanced Numerical Analysis	3	1	0	4
8	III	MATGE801	Advanced Linear Programming	3	1	0	4

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

Table 9: Ability Enhancement Course (Basket VII)

Semester	Course Type	Course Code	Course Title	L	T	P	C
I	AEC	AEC-104	Environment Science-I	2	0	0	2
II		AEC-204	Environment Science-II	2	0	0	2
III		AEC-304	English Communication-I	2	0	0	2
IV		AEC-404	English Communication-II	2	0	0	2

SHRI GURU RAM RAI UNIVERSITY

[ESTD. BYGOVT.OF UTTARAKHAND, VIDE SHRIGURURAMRAI UNIVERSITY ACTNO.03OF 2017&RECOGNIZEDBYUGCU/S(2F)OF UGCACT1956]

PROPOSED CURRICULUM AND SYLLABI
(NEP-2020, UGCF – 2022)

For

FIRST THREE YEARS OF UNDER-GRADUATE (UG) MULTIDISCIPLINARY PROGRAMME

OR

B.Sc. (Honors with Research) in Mathematics

DEPARTMENT OF MATHEMATICS

SCHOOL OF BASIC AND APPLIED SCIENCES
S.G.R.R UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

AS PER GUIDELINES OF COMMON MINIMUM SYLLABUS BY UTTARAKHAND GOVERNMENT ACCORDING TO NATIONAL EDUCATION POLICY-2020
(W.E.F. ACADEMIC SESSION 2023-24)

MEMBER OF BOARD OF STUDIES

DEPT OF MATHEMATICS
SCHOOL OF BASIC AND SCIENCE
SHRI GURU RAM RAI UNIVERSITY
PATEL NAGAR, DEHRADUN, UTTARAKHAND

S. no.	Name & Designation	Signature
1	PROF. (DR.) ARUN KUMAR CHAIRPERSON	
2	DR. A S PARMAR CONVENER	
3	PROF. (DR.) SANJAY KUMAR PADALIYA EXTERNAL EXPERT	
4	DR. RASHI BHARGAVA MEMBER	
5	DR. ASHOK SINGH BHANDARI MEMBER	

DEPARTMENT OF MATHEMATICS,
SCHOOL OF BASIC AND APPLIED SCIENCES,
S.G.R.R. UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

Structure of UG Multidisciplinary Programme
(with Three Core disciplines)

1. Introduction to UG Multidisciplinary Degree Programme with Mathematics

As per the recommendations of the Undergraduate Curriculum Framework 2022 (UGCF 2022), the undergraduate degree course in Multidisciplinary Programme with mathematics is a six/ eight semester course spread over three/ four academic years. The teaching – learning process is student-centric and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific Core(DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives(DSEs), Generic Electives(GEs), Skill Enhancement Courses(SECs), Ability Enhancement courses(AECs) and Value Addition Courses(VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

2. Course Type

Discipline Specific Core Courses (DSCC)
Discipline Specific Elective Courses (DSEC)
General Electives Courses (GEC)
Ability Enhancement Courses (AEC)
Skill Enhancement Elective Courses (SEEC)
IAPC: Internship/Apprenticeship / Project/ Community Outreach
VAC: Value Addition Course

3. Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

3.1) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Mathematics programme, DSCs are the core credit courses of Mathematics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

3.2) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics

from which a student will choose to study based on his/ her interest.

3.3) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.

3.4) **Ability Enhancement course (AEC):** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.

3.5) **Skill Enhancement Course (SEC):** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

3.6) **Value Addition Course (VAC):** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and team work which will help in all round development of students.

3.7) **Internship/Apprenticeship / Project/ Community Outreach (IAPC) :Students can choose IAPC as an optional with SEC.**

4. Programme Duration and Exit Options:

The minimum credit to be earned by a student per semester is 22 credits. The mandatory number of credits which have to be secured for the purpose of award of Undergraduate Certificate/ Undergraduate Diploma/Appropriate Bachelor's Degree in Multidisciplinary Programme with Mathematics are listed in the following Table 1.

Table 1: Qualification Type and Credit Requirements

S. No.	Type of Award	Stage of Exit	Mandatory Credits to be Secured for the Award
1.	Undergraduate Certificate in Sciences (with Three Core disciplines)	After successful completion of Semester II	44
2.	Undergraduate Diploma in Science	After successful completion of Semester IV	88
3.	Bachelor of Science	After successful completion of Semester VI	132
4.	Bachelor of Science (Honours with Research) in Mathematics(Major) and Discipline - 2(Minor)	After successful completion of Semester VIII with minimum 28 GE credits in Discipline- 2 (Minor)	176

Major Discipline (Mathematics): A student pursuing four-year undergraduate programme in Mathematics (Core course) shall be awarded B.Sc. Honors degree
with Major in Mathematics on completion of VIII Semester, if he/she secures in Mathematics at least 50% of the total credits i.e., at least 88 credits in Mathematics
out of the total of 176 credits. He/she shall study 20 DSCs and at least 2 DSEs of Mathematics in eight semesters

Minor Discipline (Discipline - 2): A student of B.Sc. (Hons.) in Mathematics may be awarded Minor in a discipline, other than Mathematics, on completion of VIII Semester, if he/she earns minimum 28 credits from seven GE courses of that discipline.

Combinations with other two core disciplines: Dept of Mathematics offer following combinations with core Multidisciplinary/interdisciplinary streams
PCM, PMG, PMS, PMD
P-Physics, C-Chemistry, M-Mathematics, S-Statistics, D-Defense, G-Geology

Note: It is advice to students choose any one of the above combination to study with core discipline Mathematics.

Table 2: Structure of Undergraduate Programme in Mathematics under UGCF – 2022

Sem.	Discipline Specific Core Courses (DSC)		Discipline Specific Elective Courses (DSEC)/Generic Elective Courses (GEC)		Ability Enhancement Course (AEC)		Skill Enhancement Course(SEC)/ (Internship/Apprenticeship / Project/ Community Outreach) (IAPC)/ (Project/ Dissertation)		Value Addition Course (VAC)		Total Credits
	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (2)	Courses distribution (Theory or Theory + Practical)	Credits (2)		Credits (2)	22
I	DSC-A1	4	GE-1	4	AEC-1	2	SEC-1	2	VAC-1	2	22
	DSC-B1	4									
	DSC-C1	4									
II	DSC-A2	4	GE-2	4	AEC-2	2	SEC-2	2	VAC-2	2	22
	DSC-B2	4									
	DSC-C2	4									
III	DSC-A3	4	DSE1/GE-3	4	AEC-3	2	SEC-3 / IAPC-1	2	VAC-3	2	22
	DSC-B3	4									
	DSC-C3	4									
IV	DSC-A4	4	DSE2 / GE-4	4	AEC-4	2	SEC-4 / IAPC-2	2	VAC-4	2	22
	DSC-B4	4									
	DSC-C4	4									
V	DSC-A5	4	One DSE-3 and One GE-5	4+4			SEC-5 / IAPC-3	2			22
	DSC-B5	4									
	DSC-C5	4									
VI	DSC-A6	4	One DSE-4 and One GE-6	4+4			SEC-6 / IAPC-4	2			22
	DSC-B6	4									
	DSC-C6	4									
VII	DSC-7	4	DSE-5 /GE-7	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-6 /GE-8	4							
			DSE-7/GE-9	4							
VIII	DSC-8	4	DSE-8/GE-10	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-9/GE-11	4							
			DSE-10/GE-12	4							

5.1 Semester-wise Distribution of Discipline Specific Core (DSC) Courses:
A student will study three Discipline Specific Core Courses each in Semesters I to VI and one core course each in semesters VII and VIII. The semester wise distribution of DSC courses over eight semesters is listed in Table 3

Table 3: Semester-wise Distribution of Discipline Specific Core (DSC) Courses (Basket I)

	Discipline Specific Core Courses (4 Credits each)			Contact Hours			Credit
S. No	**Semester**	**Course Code**	**Name Of The Course**	**L**	**T**	**P**	**C**
1.	I	MATDC101	Differential Calculus	3	1	0	4
2.	II	MATDC201	Abstract Algebra	3	1	0	4
3.	III	MATDC301	ODE & PDE-I	3	1	0	4
4.	IV	MATDC401	Real Analysis	3	1	0	4
5.	V	MATDC501	Linear Algebra	3	1	0	4
6.	VI	MATDC601	Complex Analysis-I	3	1	0	4
7.	VII	MATDC701	ODE & PDE –II	3	1	0	4
8.	VIII	MATDC801	Complex Analysis II	3	1	0	4

5.2 Details of Discipline Specific Elective Courses (DSEC):
The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics from which a student will choose to study based on his/ her interest. A student of Bachelor of Science (Hons.) Mathematics gets an option of choosing one DSE of Mathematics in each of the semesters III to VI, while the student has an option of choosing a maximum of three DSEC courses of Mathematics in semesters VII and VIII. The semester wise distribution of DSEC courses over eight semesters is listed in Table 4.

Table 4: Semester-wise Distribution of Discipline Specific Elective Courses (Basket II)

	Discipline Specific Elective Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of the Course	L	T	P	C
1.	V	MATDE501	Theory of Equations	3	1	0	4
2.	VI	MATDE601	Matrices	3	1	0	4
3.	VII	MATDE701	Analytical Geometry	3	1	0	4
4.	VII	MATDE702	Transportation and Game theory	3	1	0	4
5	VII	MATDE703	Fundamentals of Differential Geometry	3	1	0	4
6	VII	MATDE704	Statics	3	1	0	4
7	VII	MATDE705	Number Theory	3	1	0	4
8	VIII	MATDE801	Discrete Mathematics	3	1	0	4
9	VIII	MATDE802	Mathematical Statistics	3	1	0	4
10	VIII	MATDE803	Dynamics	3	1	0	4
11	VIII	MATDE804	Numerical Analysis	3	1	0	4
12	VIII	MATDE805	Multivariate Calculus	3	1	0	4

Note: In addition to the above proposed courses, students may select courses from the Swayam.org as MOOCs courses upto the permissible limit and course must be 4 credits.

UG Mathematics

Department of Mathematics

5.3 Details of Skill Enhancement Courses (SEC):

To enhance the skills required for advanced studies, research and employability of students various Skill Enhancement Courses will be offered to students as listed in Table 5.

Table 5: Semester-wise Distribution and Details of Skill Enhancement Courses (SEC) (Basket III)

	Skill Enhancement Courses (2 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATSC 101	Bio Mathematics	2	0	0	2
2.	II	MATSC 201	Laplace transforms	2	0	0	2
3.	III	MATSC 301	Elementary Algebra & Trigonometry	2	0	0	2
4.	IV	MATSC 401	Numerical Methods for ODE	2	0	0	2
5	V	MATSC 501	Theory of equations	2	0	0	2
6	VI	MATSC 601	Differential geometry	2	0	0	2
7	VII	MATSC 701	Finite Field	2	0	0	2
8	VIII	MATSC 801	Measure and integration	2	0	0	2

Table 6: Semester-wise Distribution and Details of Internship/Apprenticeship/Project/Community Outreach (IAPC) (Basket IV)

1	III	MATI301	Internship-I	0	0	0	2
2	III	MATA301	Apprenticeship-I	0	0	0	2
3	III	MATP301	Project-I	0	0	0	2
4	III	MATCO301	Community Outreach-I	0	0	0	2
5	IV	MATI401	Internship-II	0	0	0	2
6	IV	MATA401	Apprenticeship-II	0	0	0	2
7	IV	MATP401	Project-II	0	0	0	2
8	IV	MATCO401	Community Outreach-II	0	0	0	2
9	V	MATI501	Internship-III	0	0	0	2
10	V	MATA501	Apprenticeship-III	0	0	0	2
11	V	MATP501	Project-III	0	0	0	2
12	V	MATCO501	Community Outreach-III	0	0	0	2
13	VI	MATI601	Internship-IV	0	0	0	2
14	VI	MATA3601	Apprenticeship-IV	0	0	0	2
15	VI	MATP601	Project-IV	0	0	0	2
16	VI	MATCO601	Community Outreach-IV	0	0	0	2

Table 7: (Project/ Dissertation) (Basket V)

1	VII	MATD701	Dissertation on Major-I	0	0	0	6
2	VII	MATD702	Dissertation on Minor-I	0	0	0	6
3	VII	MATAP703/ MATEP704	Academic Project-I/Entrepreneurship-I	0	0	0	6
4	VIII	MATD801	Dissertation on Major-II	0	0	0	6
5	VIII	MATSD802	Dissertation on Minor-II	0	0	0	6
6	VIII	MATAP803/ MATEP804	Academic Project-II/Entrepreneurship-II	0	0	0	6

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

UG Mathematics

Department of Mathematics

Details of Generic Elective (GE) Courses:
Generic Elective courses provide multidisciplinary or interdisciplinary education to students.

Table 8: Various GE courses offered by the Mathematics Department are listed below (Basket VI)

	Generic Elective (GE) Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATGE101	Basic Applied Mathematics	3	1	0	4
2.	I	MATGE201	Applied Calculus	3	1	0	4
3.	I	MATGE301	Numerical Methods	3	1	0	4
4.	II	MATGE401	Graph Theory	3	1	0	4
5	II	MATGE501	Probability & Statistics	3	1	0	4
6	II	MATGE601	Linear Programming	3	1	0	4
7	III	MATGE701	Advanced Numerical Analysis	3	1	0	4
8	III	MATGE801	Advanced Linear Programming	3	1	0	4

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

Table 9: Ability Enhancement Course (Basket VII)

Semester	Course Type	Course Code	Course Title	L	T	P	C
I	AEC	AEC-104	Environment Science-I	2	0	0	2
II		AEC-204	Environment Science-II	2	0	0	2
III		AEC-304	English Communication-I	2	0	0	2
IV		AEC-404	English Communication-II	2	0	0	2

SHRI GURU RAM RAI UNIVERSITY

[ESTD. BYGOVT.OF UTTARAKHAND, VIDE SHRIGURURAMRAI UNIVERSITY ACTNO.03OF 2017&RECOGNIZEDBYUGCU/S(2F)OF UGCACT1956]

PROPOSED CURRICULUM AND SYLLABI
(NEP-2020, UGCF – 2022)

For

FIRST THREE YEARS OF UNDER-GRADUATE (UG) MULTIDISCIPLINARY PROGRAMME

OR

B.Sc. (Honors with Research) in Mathematics

DEPARTMENT OF MATHEMATICS

SCHOOL OF BASIC AND APPLIED SCIENCES
S.G.R.R UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

AS PER GUIDELINES OF COMMON MINIMUM SYLLABUS BY UTTARAKHAND GOVERNMENT ACCORDING TO NATIONAL EDUCATION POLICY-2020
(W.E.F. ACADEMIC SESSION 2023-24)

MEMBER OF BOARD OF STUDIES

DEPT OF MATHEMATICS
SCHOOL OF BASIC AND SCIENCE
SHRI GURU RAM RAI UNIVERSITY
PATEL NAGAR, DEHRADUN, UTTARAKHAND

S. no.	Name & Designation	Signature
1	PROF. (DR.) ARUN KUMAR CHAIRPERSON	
2	DR. A S PARMAR CONVENER	
3	PROF. (DR.) SANJAY KUMAR PADALIYA EXTERNAL EXPERT	
4	DR. RASHI BHARGAVA MEMBER	
5	DR. ASHOK SINGH BHANDARI MEMBER	

DEPARTMENT OF MATHEMATICS,
SCHOOL OF BASIC AND APPLIED SCIENCES,
S.G.R.R. UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

Structure of UG Multidisciplinary Programme
(with Three Core disciplines)

1. Introduction to UG Multidisciplinary Degree Programme with Mathematics

As per the recommendations of the Undergraduate Curriculum Framework 2022 (UGCF 2022), the undergraduate degree course in Multidisciplinary Programme with mathematics is a six/ eight semester course spread over three/ four academic years. The teaching – learning process is student-centric and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific Core(DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives(DSEs), Generic Electives(GEs), Skill Enhancement Courses(SECs), Ability Enhancement courses(AECs) and Value Addition Courses(VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

2. Course Type

Discipline Specific Core Courses (DSCC)
Discipline Specific Elective Courses (DSEC)
General Electives Courses (GEC)
Ability Enhancement Courses (AEC)
Skill Enhancement Elective Courses (SEEC)
IAPC: Internship/Apprenticeship / Project/ Community Outreach
VAC: Value Addition Course

3. Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

3.1) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Mathematics programme, DSCs are the core credit courses of Mathematics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

3.2) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics

from which a student will choose to study based on his/ her interest.

3.3) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.

3.4) **Ability Enhancement course (AEC):** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.

3.5) **Skill Enhancement Course (SEC):** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

3.6) **Value Addition Course (VAC):** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and team work which will help in all round development of students.

3.7) **Internship/Apprenticeship / Project/ Community Outreach (IAPC) :Students can choose IAPC as an optional with SEC.**

4. Programme Duration and Exit Options:

The minimum credit to be earned by a student per semester is 22 credits. The mandatory number of credits which have to be secured for the purpose of award of Undergraduate Certificate/ Undergraduate Diploma/Appropriate Bachelor's Degree in Multidisciplinary Programme with Mathematics are listed in the following Table 1.

Table 1: Qualification Type and Credit Requirements

S. No.	Type of Award	Stage of Exit	Mandatory Credits to be Secured for the Award
1.	Undergraduate Certificate in Sciences (with Three Core disciplines)	After successful completion of Semester II	44
2.	Undergraduate Diploma in Science	After successful completion of Semester IV	88
3.	Bachelor of Science	After successful completion of Semester VI	132
4.	Bachelor of Science (Honours with Research) in Mathematics(Major) and Discipline - 2(Minor)	After successful completion of Semester VIII with minimum 28 GE credits in Discipline- 2 (Minor)	176

Major Discipline (Mathematics): A student pursuing four-year undergraduate programme in Mathematics (Core course) shall be awarded B.Sc. Honors degree
with Major in Mathematics on completion of VIII Semester, if he/she secures in Mathematics at least 50% of the total credits i.e., at least 88 credits in Mathematics
out of the total of 176 credits. He/she shall study 20 DSCs and at least 2 DSEs of Mathematics in eight semesters

Minor Discipline (Discipline - 2): A student of B.Sc. (Hons.) in Mathematics may be awarded Minor in a discipline, other than Mathematics, on completion of VIII Semester, if he/she earns minimum 28 credits from seven GE courses of that discipline.

Combinations with other two core disciplines: Dept of Mathematics offer following combinations with core Multidisciplinary/interdisciplinary streams
PCM, PMG, PMS, PMD
P-Physics, C-Chemistry, M-Mathematics, S-Statistics, D-Defense, G-Geology

Note: It is advice to students, choose any one of the above combination to study with core discipline Mathematics.

Table 2: Structure of Undergraduate Programme in Mathematics under UGCF – 2022

Sem.	Discipline Specific Core Courses (DSC)		Discipline Specific Elective Courses (DSEC)/Generic Elective Courses (GEC)		Ability Enhancement Course (AEC)		Skill Enhancement Course(SEC)/ (Internship/Apprenticeship / Project/ Community Outreach) (IAPC)/ (Project/ Dissertation)		Value Addition Course (VAC)		Total Credits
	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (2)	Courses distribution (Theory or Theory + Practical)	Credits (2)		Credits (2)	22
I	DSC-A1	4	GE-1	4	AEC-1	2	SEC-1	2	VAC-1	2	22
	DSC-B1	4									
	DSC-C1	4									
II	DSC-A2	4	GE-2	4	AEC-2	2	SEC-2	2	VAC-2	2	22
	DSC-B2	4									
	DSC-C2	4									
III	DSC-A3	4	DSE1/GE-3	4	AEC-3	2	SEC-3 / IAPC-1	2	VAC-3	2	22
	DSC-B3	4									
	DSC-C3	4									
IV	DSC-A4	4	DSE2 / GE-4	4	AEC-4	2	SEC-4 / IAPC-2	2	VAC-4	2	22
	DSC-B4	4									
	DSC-C4	4									
V	DSC-A5	4	One DSE-3 and One GE-5	4+4			SEC-5 / IAPC-3	2			22
	DSC-B5	4									
	DSC-C5	4									
VI	DSC-A6	4	One DSE-4 and One GE-6	4+4			SEC-6 / IAPC-4	2			22
	DSC-B6	4									
	DSC-C6	4									
VII	DSC-7	4	DSE-5 /GE-7	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-6 /GE-8	4							
			DSE-7/GE-9	4							
VIII	DSC-8	4	DSE-8/GE-10	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-9/GE-11	4							
			DSE-10/GE-12	4							

5.1 Semester-wise Distribution of Discipline Specific Core (DSC) Courses:
A student will study three Discipline Specific Core Courses each in Semesters I to VI and one core course each in semesters VII and VIII. The semester wise distribution of DSC courses over eight semesters is listed in Table 3

Table 3: Semester-wise Distribution of Discipline Specific Core (DSC) Courses (Basket I)

	Discipline Specific Core Courses (4 Credits each)			Contact Hours			Credit
S. No	**Semester**	**Course Code**	**Name Of The Course**	**L**	**T**	**P**	**C**
1.	I	MATDC101	Differential Calculus	3	1	0	4
2.	II	MATDC201	Abstract Algebra	3	1	0	4
3.	III	MATDC301	ODE & PDE-I	3	1	0	4
4.	IV	MATDC401	Real Analysis	3	1	0	4
5.	V	MATDC501	Linear Algebra	3	1	0	4
6.	VI	MATDC601	Complex Analysis-I	3	1	0	4
7.	VII	MATDC701	ODE & PDE –II	3	1	0	4
8.	VIII	MATDC801	Complex Analysis II	3	1	0	4

5.2 Details of Discipline Specific Elective Courses (DSEC):
The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics from which a student will choose to study based on his/ her interest. A student of Bachelor of Science (Hons.) Mathematics gets an option of choosing one DSE of Mathematics in each of the semesters III to VI, while the student has an option of choosing a maximum of three DSEC courses of Mathematics in semesters VII and VIII. The semester wise distribution of DSEC courses over eight semesters is listed in Table 4.

Table 4: Semester-wise Distribution of Discipline Specific Elective Courses (Basket II)

	Discipline Specific Elective Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of the Course	L	T	P	C
1.	V	MATDE501	Theory of Equations	3	1	0	4
2.	VI	MATDE601	Matrices	3	1	0	4
3.	VII	MATDE701	Analytical Geometry	3	1	0	4
4.	VII	MATDE702	Transportation and Game theory	3	1	0	4
5	VII	MATDE703	Fundamentals of Differential Geometry	3	1	0	4
6	VII	MATDE704	Statics	3	1	0	4
7	VII	MATDE705	Number Theory	3	1	0	4
8	VIII	MATDE801	Discrete Mathematics	3	1	0	4
9	VIII	MATDE802	Mathematical Statistics	3	1	0	4
10	VIII	MATDE803	Dynamics	3	1	0	4
11	VIII	MATDE804	Numerical Analysis	3	1	0	4
12	VIII	MATDE805	Multivariate Calculus	3	1	0	4

Note: In addition to the above proposed courses, students may select courses from the Swayam.org as MOOCs courses upto the permissible limit and course must be 4 credits.

UG Mathematics

Department of Mathematics

5.3 Details of Skill Enhancement Courses (SEC):

To enhance the skills required for advanced studies, research and employability of students various Skill Enhancement Courses will be offered to students as listed in Table 5.

Table 5: Semester-wise Distribution and Details of Skill Enhancement Courses (SEC) (Basket III)

	Skill Enhancement Courses (2 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATSC 101	Bio Mathematics	2	0	0	2
2.	II	MATSC 201	Laplace transforms	2	0	0	2
3.	III	MATSC 301	Elementary Algebra & Trigonometry	2	0	0	2
4.	IV	MATSC 401	Numerical Methods for ODE	2	0	0	2
5	V	MATSC 501	Theory of equations	2	0	0	2
6	VI	MATSC 601	Differential geometry	2	0	0	2
7	VII	MATSC 701	Finite Field	2	0	0	2
8	VIII	MATSC 801	Measure and integration	2	0	0	2

Table 6: Semester-wise Distribution and Details of Internship/Apprenticeship/Project/Community Outreach (IAPC) (Basket IV)

1	III	MATI301	Internship-I	0	0	0	2
2	III	MATA301	Apprenticeship-I	0	0	0	2
3	III	MATP301	Project-I	0	0	0	2
4	III	MATCO301	Community Outreach-I	0	0	0	2
5	IV	MATI401	Internship-II	0	0	0	2
6	IV	MATA401	Apprenticeship-II	0	0	0	2
7	IV	MATP401	Project-II	0	0	0	2
8	IV	MATCO401	Community Outreach-II	0	0	0	2
9	V	MATI501	Internship-III	0	0	0	2
10	V	MATA501	Apprenticeship-III	0	0	0	2
11	V	MATP501	Project-III	0	0	0	2
12	V	MATCO501	Community Outreach-III	0	0	0	2
13	VI	MATI601	Internship-IV	0	0	0	2
14	VI	MATA3601	Apprenticeship-IV	0	0	0	2
15	VI	MATP601	Project-IV	0	0	0	2
16	VI	MATCO601	Community Outreach-IV	0	0	0	2

Table 7: (Project/ Dissertation) (Basket V)

1	VII	MATD701	Dissertation on Major-I	0	0	0	6
2	VII	MATD702	Dissertation on Minor-I	0	0	0	6
3	VII	MATAP703/ MATEP704	Academic Project-I/Entrepreneurship-I	0	0	0	6
4	VIII	MATD801	Dissertation on Major-II	0	0	0	6
5	VIII	MATSD802	Dissertation on Minor-II	0	0	0	6
6	VIII	MATAP803/ MATEP804	Academic Project-II/Entrepreneurship-II	0	0	0	6

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

UG Mathematics

Department of Mathematics

Details of Generic Elective (GE) Courses:
Generic Elective courses provide multidisciplinary or interdisciplinary education to students.

Table 8: Various GE courses offered by the Mathematics Department are listed below (Basket VI)

	Generic Elective (GE) Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATGE101	Basic Applied Mathematics	3	1	0	4
2.	I	MATGE201	Applied Calculus	3	1	0	4
3.	I	MATGE301	Numerical Methods	3	1	0	4
4.	II	MATGE401	Graph Theory	3	1	0	4
5	II	MATGE501	Probability & Statistics	3	1	0	4
6	II	MATGE601	Linear Programming	3	1	0	4
7	III	MATGE701	Advanced Numerical Analysis	3	1	0	4
8	III	MATGE801	Advanced Linear Programming	3	1	0	4

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

Table 9: Ability Enhancement Course (Basket VII)

Semester	Course Type	Course Code	Course Title	L	T	P	C
I	AEC	AEC-104	Environment Science-I	2	0	0	2
II		AEC-204	Environment Science-II	2	0	0	2
III		AEC-304	English Communication-I	2	0	0	2
IV		AEC-404	English Communication-II	2	0	0	2

SHRI GURU RAM RAI UNIVERSITY

[ESTD. BYGOVT.OF UTTARAKHAND, VIDE SHRIGURURAMRAI UNIVERSITY ACTNO.03OF 2017&RECOGNIZEDBYUGCU/S(2F)OF UGCACT1956]

PROPOSED CURRICULUM AND SYLLABI
(NEP-2020, UGCF – 2022)

For

FIRST THREE YEARS OF UNDER-GRADUATE (UG) MULTIDISCIPLINARY PROGRAMME

OR

B.Sc. (Honors with Research) in Mathematics

DEPARTMENT OF MATHEMATICS

SCHOOL OF BASIC AND APPLIED SCIENCES
S.G.R.R UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

AS PER GUIDELINES OF COMMON MINIMUM SYLLABUS BY UTTARAKHAND GOVERNMENT ACCORDING TO NATIONAL EDUCATION POLICY-2020
(W.E.F. ACADEMIC SESSION 2023-24)

MEMBER OF BOARD OF STUDIES

DEPT OF MATHEMATICS
SCHOOL OF BASIC AND SCIENCE
SHRI GURU RAM RAI UNIVERSITY
PATEL NAGAR, DEHRADUN, UTTARAKHAND

S. no.	Name & Designation	Signature
1	PROF. (DR.) ARUN KUMAR CHAIRPERSON	
2	DR. A S PARMAR CONVENER	
3	PROF. (DR.) SANJAY KUMAR PADALIYA EXTERNAL EXPERT	
4	DR. RASHI BHARGAVA MEMBER	
5	DR. ASHOK SINGH BHANDARI MEMBER	

DEPARTMENT OF MATHEMATICS,
SCHOOL OF BASIC AND APPLIED SCIENCES,
S.G.R.R. UNIVERSITY, DEHRADUN-248001, UTTARAKHAND

Structure of UG Multidisciplinary Programme
(with Three Core disciplines)

1. Introduction to UG Multidisciplinary Degree Programme with Mathematics

As per the recommendations of the Undergraduate Curriculum Framework 2022 (UGCF 2022), the undergraduate degree course in Multidisciplinary Programme with mathematics is a six/ eight semester course spread over three/ four academic years. The teaching – learning process is student-centric and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific
Core(DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives(DSEs), Generic Electives(GEs), Skill Enhancement Courses(SECs), Ability Enhancement courses(AECs) and Value Addition Courses(VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

2. Course Type

Discipline Specific Core Courses (DSCC)
Discipline Specific Elective Courses (DSEC)
General Electives Courses (GEC)
Ability Enhancement Courses (AEC)
Skill Enhancement Elective Courses (SEEC)
IAPC: Internship/Apprenticeship / Project/ Community Outreach
VAC: Value Addition Course

3. Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

3.1) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Mathematics programme, DSCs are the core credit courses of Mathematics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

3.2) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics

from which a student will choose to study based on his/ her interest.

3.3) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.

3.4) **Ability Enhancement course (AEC):** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.

3.5) **Skill Enhancement Course (SEC):** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

3.6) **Value Addition Course (VAC):** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and team work which will help in all round development of students.

3.7) **Internship/Apprenticeship / Project/ Community Outreach (IAPC) :Students can choose IAPC as an optional with SEC.**

4. Programme Duration and Exit Options:

The minimum credit to be earned by a student per semester is 22 credits. The mandatory number of credits which have to be secured for the purpose of award of Undergraduate Certificate/ Undergraduate Diploma/Appropriate Bachelor's Degree in Multidisciplinary Programme with Mathematics are listed in the following Table 1.

Table 1: Qualification Type and Credit Requirements

S. No.	Type of Award	Stage of Exit	Mandatory Credits to be Secured for the Award
1.	Undergraduate Certificate in Sciences (with Three Core disciplines)	After successful completion of Semester II	44
2.	Undergraduate Diploma in Science	After successful completion of Semester IV	88
3.	Bachelor of Science	After successful completion of Semester VI	132
4.	Bachelor of Science (Honours with Research) in Mathematics(Major) and Discipline - 2(Minor)	After successful completion of Semester VIII with minimum 28 GE credits in Discipline- 2 (Minor)	176

Major Discipline (Mathematics): A student pursuing four-year undergraduate programme in Mathematics (Core course) shall be awarded B.Sc. Honors degree
with Major in Mathematics on completion of VIII Semester, if he/she secures in Mathematics at least 50% of the total credits i.e., at least 88 credits in Mathematics
out of the total of 176 credits. He/she shall study 20 DSCs and at least 2 DSEs of Mathematics in eight semesters

Minor Discipline (Discipline - 2): A student of B.Sc. (Hons.) in Mathematics may be awarded Minor in a discipline, other than Mathematics, on completion of VIII Semester, if he/she earns minimum 28 credits from seven GE courses of that discipline.

Combinations with other two core disciplines: Dept of Mathematics offer following combinations with core Multidisciplinary/interdisciplinary streams
PCM, PMG, PMS, PMD
P-Physics, C-Chemistry, M-Mathematics, S-Statistics, D-Defense, G-Geology

Note: It is advice to students, choose any one of the above combination to study with core discipline Mathematics.

Table 2: Structure of Undergraduate Programme in Mathematics under UGCF – 2022

Sem.	Discipline Specific Core Courses (DSC)		Discipline Specific Elective Courses (DSEC)/Generic Elective Courses (GEC)		Ability Enhancement Course (AEC)		Skill Enhancement Course(SEC)/ (Internship/Apprenticeship / Project/ Community Outreach) (IAPC)/ (Project/ Dissertation)		Value Addition Course (VAC)		Total Credits
	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (4 or 3+1)	Courses distribution (Theory or Theory + Practical)	Credits (2)	Courses distribution (Theory or Theory + Practical)	Credits (2)		Credits (2)	22
I	DSC-A1	4	GE-1	4	AEC-1	2	SEC-1	2	VAC-1	2	22
	DSC-B1	4									
	DSC-C1	4									
II	DSC-A2	4	GE-2	4	AEC-2	2	SEC-2	2	VAC-2	2	22
	DSC-B2	4									
	DSC-C2	4									
III	DSC-A3	4	DSE1/GE-3	4	AEC-3	2	SEC-3 / IAPC-1	2	VAC-3	2	22
	DSC-B3	4									
	DSC-C3	4									
IV	DSC-A4	4	DSE2 / GE-4	4	AEC-4	2	SEC-4 / IAPC-2	2	VAC-4	2	22
	DSC-B4	4									
	DSC-C4	4									
V	DSC-A5	4	One DSE-3 and One GE-5	4+4			SEC-5 / IAPC-3	2			22
	DSC-B5	4									
	DSC-C5	4									
VI	DSC-A6	4	One DSE-4 and One GE-6	4+4			SEC-6 / IAPC-4	2			22
	DSC-B6	4									
	DSC-C6	4									
VII	DSC-7	4	DSE-5 /GE-7	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-6 /GE-8	4							
			DSE-7/GE-9	4							
VIII	DSC-8	4	DSE-8/GE-10	4			Dissertation on Major or Dissertation on Minor or Academic Project/Entrepreneurship	6			22
			DSE-9/GE-11	4							
			DSE-10/GE-12	4							

5.1 Semester-wise Distribution of Discipline Specific Core (DSC) Courses:
A student will study three Discipline Specific Core Courses each in Semesters I to VI and one core course each in semesters VII and VIII. The semester wise distribution of DSC courses over eight semesters is listed in Table 3

Table 3: Semester-wise Distribution of Discipline Specific Core (DSC) Courses (Basket I)

	Discipline Specific Core Courses (4 Credits each)			Contact Hours			Credit
S. No	**Semester**	**Course Code**	**Name Of The Course**	**L**	**T**	**P**	**C**
1.	I	MATDC101	Differential Calculus	3	1	0	4
2.	II	MATDC201	Abstract Algebra	3	1	0	4
3.	III	MATDC301	ODE & PDE-I	3	1	0	4
4.	IV	MATDC401	Real Analysis	3	1	0	4
5.	V	MATDC501	Linear Algebra	3	1	0	4
6.	VI	MATDC601	Complex Analysis-I	3	1	0	4
7.	VII	MATDC701	ODE & PDE –II	3	1	0	4
8.	VIII	MATDC801	Complex Analysis II	3	1	0	4

5.2 Details of Discipline Specific Elective Courses (DSEC):
The Discipline Specific Electives (DSEs) are a pool of credit courses of Mathematics from which a student will choose to study based on his/ her interest. A student of Bachelor of Science (Hons.) Mathematics gets an option of choosing one DSE of Mathematics in each of the semesters III to VI, while the student has an option of choosing a maximum of three DSEC courses of Mathematics in semesters VII and VIII. The semester wise distribution of DSEC courses over eight semesters is listed in Table 4.

Table 4: Semester-wise Distribution of Discipline Specific Elective Courses (Basket II)

	Discipline Specific Elective Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of the Course	L	T	P	C
1.	V	MATDE501	Theory of Equations	3	1	0	4
2.	VI	MATDE601	Matrices	3	1	0	4
3.	VII	MATDE701	Analytical Geometry	3	1	0	4
4.	VII	MATDE702	Transportation and Game theory	3	1	0	4
5	VII	MATDE703	Fundamentals of Differential Geometry	3	1	0	4
6	VII	MATDE704	Statics	3	1	0	4
7	VII	MATDE705	Number Theory	3	1	0	4
8	VIII	MATDE801	Discrete Mathematics	3	1	0	4
9	VIII	MATDE802	Mathematical Statistics	3	1	0	4
10	VIII	MATDE803	Dynamics	3	1	0	4
11	VIII	MATDE804	Numerical Analysis	3	1	0	4
12	VIII	MATDE805	Multivariate Calculus	3	1	0	4

Note: In addition to the above proposed courses, students may select courses from the Swayam.org as MOOCs courses upto the permissible limit and course must be 4 credits.

UG Mathematics

Department of Mathematics

5.3 Details of Skill Enhancement Courses (SEC):

To enhance the skills required for advanced studies, research and employability of students various Skill Enhancement Courses will be offered to students as listed in Table 5.

Table 5: Semester-wise Distribution and Details of Skill Enhancement Courses (SEC) (Basket III)

	Skill Enhancement Courses (2 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATSC 101	Bio Mathematics	2	0	0	2
2.	II	MATSC 201	Laplace transforms	2	0	0	2
3.	III	MATSC 301	Elementary Algebra & Trigonometry	2	0	0	2
4.	IV	MATSC 401	Numerical Methods for ODE	2	0	0	2
5	V	MATSC 501	Theory of equations	2	0	0	2
6	VI	MATSC 601	Differential geometry	2	0	0	2
7	VII	MATSC 701	Finite Field	2	0	0	2
8	VIII	MATSC 801	Measure and integration	2	0	0	2

Table 6: Semester-wise Distribution and Details of Internship/Apprenticeship/Project/Community Outreach (IAPC) (Basket IV)

1	III	MATI301	Internship-I	0	0	0	2
2	III	MATA301	Apprenticeship-I	0	0	0	2
3	III	MATP301	Project-I	0	0	0	2
4	III	MATCO301	Community Outreach-I	0	0	0	2
5	IV	MATI401	Internship-II	0	0	0	2
6	IV	MATA401	Apprenticeship-II	0	0	0	2
7	IV	MATP401	Project-II	0	0	0	2
8	IV	MATCO401	Community Outreach-II	0	0	0	2
9	V	MATI501	Internship-III	0	0	0	2
10	V	MATA501	Apprenticeship-III	0	0	0	2
11	V	MATP501	Project-III	0	0	0	2
12	V	MATCO501	Community Outreach-III	0	0	0	2
13	VI	MATI601	Internship-IV	0	0	0	2
14	VI	MATA3601	Apprenticeship-IV	0	0	0	2
15	VI	MATP601	Project-IV	0	0	0	2
16	VI	MATCO601	Community Outreach-IV	0	0	0	2

Table 7: (Project/ Dissertation) (Basket V)

1	VII	MATD701	Dissertation on Major-I	0	0	0	6
2	VII	MATD702	Dissertation on Minor-I	0	0	0	6
3	VII	MATAP703/ MATEP704	Academic Project-I/Entrepreneurship-I	0	0	0	6
4	VIII	MATD801	Dissertation on Major-II	0	0	0	6
5	VIII	MATSD802	Dissertation on Minor-II	0	0	0	6
6	VIII	MATAP803/ MATEP804	Academic Project-II/Entrepreneurship-II	0	0	0	6

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

UG Mathematics

Department of Mathematics

Details of Generic Elective (GE) Courses:
Generic Elective courses provide multidisciplinary or interdisciplinary education to students.

Table 8: Various GE courses offered by the Mathematics Department are listed below (Basket VI)

	Generic Elective (GE) Courses (4 Credits each)			Contact Hours			credit
S. No	Semester	Course Code	Name of The Course	L	T	P	C
1.	I	MATGE101	Basic Applied Mathematics	3	1	0	4
2.	I	MATGE201	Applied Calculus	3	1	0	4
3.	I	MATGE301	Numerical Methods	3	1	0	4
4.	II	MATGE401	Graph Theory	3	1	0	4
5	II	MATGE501	Probability & Statistics	3	1	0	4
6	II	MATGE601	Linear Programming	3	1	0	4
7	III	MATGE701	Advanced Numerical Analysis	3	1	0	4
8	III	MATGE801	Advanced Linear Programming	3	1	0	4

In addition to the above proposed courses, students may select courses from the **Swayam.org as MOOCs courses** up to the permissible limit.

Table 9: Ability Enhancement Course (Basket VII)

Semester	Course Type	Course Code	Course Title	L	T	P	C
I	AEC	AEC-104	Environment Science-I	2	0	0	2
II		AEC-204	Environment Science-II	2	0	0	2
III		AEC-304	English Communication-I	2	0	0	2
IV		AEC-404	English Communication-II	2	0	0	2