M.Sc. Maths (Sem-I and II) **Prospectus**

GOVT. VIDARBHA INSTITUTE OF SCIENCE AND HUMANITIES, AMRAVATI

(Autonomous Institute)

Accredited with 'A' Grade

(Faculty of Science and Technology)

Curriculum for PG under Choice Based Credit System
GOVERNING THE EXAMINATION LEADING TO DEGREE OF MASTER OF SCIENCE

Issued by:
Director
Government Vidarbha Institute of Science and Humanities, Amravati
(To be implemented from academic year 2021-22)

www.gvishamt.org

Science and Technology

Preamble :

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching- learning process, examination and evaluation systems, besides governance and other matters.

The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system.

While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students.

Government Vidarbha Institute of Science and Humanities offers a two-year post graduate degree course (Masters of Science). This post-graduate degree program has been designed by the Board of Studies (BOS) of Govt. Vidarbha Institute of Science and Humanities, with a substantial component of what is needed for a skilled career of a student. These courses are formulated so as to enhance the comprehensive thinking of the students. The syllabi contain disciplinary, interdisciplinary and skill-based courses and thus aim to bring about overall development of the students. The courses are designed keeping in view the UGC regulations and guidelines (2016).

Programme Outcome:

Master of Science (M.Sc.) is a two-year duration postgraduate degree course offered by G.V.I.S.H, Amravati in various specialized Science fields such as Physics, Chemistry, Mathematics, Botany, Zoology, and Statistics.

A Master of Science degree provides scientific as well as professional entry-level competency to students.The course offers advanced theoretical as well as practical knowledge to students in their chosen specialization. The M.Sc. specialization opted by students is usually the one studied by them during graduation. Thus students can focus on a particular field of study, which helps them to become more competitive in their field.

DIRECTION

Notification No : GVISH/ACD/ST/2021/2011-2016 Date: 29/12/2021
Subject : Examinations leading to the Degree of Master's of Science (Two Year Degree Course-Semester Pattern).

1. PROGRAMME OUTLINE

1.	TITLE OF THE PROGRAMME	:	MASTER OF SCIENCE [M.Sc.]
2.	PROGRAMME CODE	:	GVISH PG-211-216- M.Sc. SCIENCE
3.	DURATION OF THE PROGRAMME	:	A TWO YEAR / FOUR SEMESTER FULL TIME PG DEGREE
4.	PATTERN OF THE PROGRAMME	:	CHOICE BASED CREDIT SYSTEM (CBCS)
5.	MEDIUM	:	ENGLISH
6.	TIME SCHEDULE		

- The programme of M.Sc. shall be conducted in TWO Academic Years.
- An academic year is divided into TWOTERMS.
- Term I shall have odd Semesters I, III, whereas Term II shall have even Semesters II, IV.
- In each semester, courses are offered in 12-15 teaching weeks (minimum of 90 teaching days).
- 4-6 weeks are to be utilized for conduct of examinations and evaluation purposes.
- The detailed Academic Calendar will be published in the Institutes Prospectus every year.

2. ELIGIBILITY FOR ADMISSION :

i) The students should have pursued Minimum Bachelor's Three Years course with the subject opted for M.Sc. after 12^{th} standard approved by Government of Maharashtra.

OR

i) As per guidelines of Government of Maharashtra

3. ADMISSIONS:

i. All admissions to this programme will be strictly on merit basis as per the policies and procedures laid down by the Institute / UGC / University from time to time.

ii. The seats will be filled from among the candidates belonging to Open / SC / ST / VJNT / OBC-SBC / EWS / PWD etc. categories as per the reservation rules stipulated by the Government and as applicable strictly on merit basis.

4. ATTENDANCE:

i. It is mandatory for all students to have minimum 75% attendance in order to be eligible to appear in a Semester End Examination. Students with below 75% attendance in any given semester shall not be allowed to fill the examination form or appear in the

examination.

ii. The Director of the Institute may condone the attendance up to maximum 10% to meet the minimum attendance criterion of 75% only in exceptional cases viz. medical emergencies, deputation of students by institute in official programs / activities like NCC / NSS camps, University level Sports or Extra-curricular activities or any other University / Institute sponsored activities where he / she is convinced that meeting the minimum attendance mark was beyond the control of the student and subject to the condition that the student will make up for attendance in subsequent semester.

5. STRUCTURE OF THE PROGRAMME / COURSES:

i. The syllabus of M.Sc. is designed by the Institute's Boards of Studies and approved by the Institute's Academic Council as per the UGC Guidelines on CBCS (Choice Based Credit System).

ii. CBCS provides to students a cafeteria approach where students can take courses of their own choice, learn at their own pace, undergo additional courses and acquire more than required credits, and adopt an interdisciplinary approach to learning.

iii. Students thus get to study the courses which are both mandatory and optional as following:

A. Core Courses (Compulsory)
B. Skill Enhancement Programme (Compulsory / Elective).
C. Discipline Specific Electives
D. Generic Electives

6. CHOICE BASED CREDIT SYSTEM:

Following is a briefing about CBCS as envisaged by the UGC:

CHOICE BASED CREDIT SYSTEM (CBCS) :

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective / minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Outline of Choice Based Credit System:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline / subject of study or which provides an extended scope or which enables an exposure to some other discipline / subject / domain or nurtures the candidate's proficiency / skill is called an Elective Course.

2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline / subject of study & is referred to as Discipline Specific Elective. The Institute may also offer discipline related Electiv ecourses of interdisciplinary nature (to be offered by main discipline / subject of study).

2.2 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline / subject, with an intention to seek exposure is called a Generic Elective.

P.S.: *A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and viceversa and such electives may also be referred to as Generic Elective.*

3. **Dissertation / Project:** An elective course designed to acquire special / advanced knowledge, such as supplement study / support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher / faculty member is called dissertation / project.

Project work / Dissertation is considered as a special course involving application of knowledge in solving / analyzing / exploring a real-life situation / difficult problem.

A Project / Dissertation work may be given in lieu of a discipline specific elective paper.

In addition to the above, students can also earn extra credits through Value-addition Courses and UGC's 'Swayam' / Massive Online Open Courses (MOOC).

(The details of the Programme Outcomes / Course objectives &Outcomes, Course / Subject-wise scheme and allocation of teaching hours are given in Appendix-I.)

7. The theory examination of all the Semesters shall be conducted by the Institute and shall be held as per the schedule.

Sr. No	Name of the Examination	Main Examination	Supplementary Examination
1	Semester-I, III	Winter	Summer
2	Semester-II, IV	Summer	Winter

8. PATTERN OF ASSESSMENT / EXAMINATIONS:

a. Each Subject / Paper shall be of 100 Marks.

b. There will be an Internal Assessment of 25 Marks as detailed below.

c. There will be an External Assessment of 75 marks through Semester End Examination.

d. There will be Practical Assessment of 100 marks.

e. For consideration of passing marks, the criterion would be minimum 40% marks for theory and 60% for internal assessment and practical for each subject.

f. In addition to academics, students shall also be assessed for their participation and performance in co- & extra-curricular activities as well as in Value-addition courses, and given separate credits.

9 INTERNAL ASSESSMENT :

For Theory :

Sr. No	Evaluation type	Marks (out of 10)	Marks (out of 20)	Marks (out of 25)
1	Student assessment by teacher	2.5	5	10
2	Two Class Tests(Reexam only for genuine reason) (MCQ Type)	2.5+2.5	10	10
3	Attendance in class	2.5	5	5

S.No.	Percentage attendance	Marks (5/2.5)
1	75-80	1/0.5
2	80-85	2/1
3	85-90	3/1.5
4	90-95	4/2
5	95-100	5/2.5

10. EXTERNAL / SEMESTER END ASSESSMENT

- There will be a Semester End Examination at the end of each of all FOUR semesters.
- The Semester End Examination will be conducted by the Institute.
- The examination shall be held at the Institute's premises on such dates as will be notified by the Institute.

11. PATTERN OF SEMESTER ENDEXAMINATION:

g. Each paper of Semester End Examination for all semesters will be of 75 marks each.

h. The questions would be divided into Long Answer Questions (LAQ's) and Short Answer Questions (SAQ's).

i. All questions shall be compulsory with internal choices within the questions.

j. The duration of Semester End examination shall be of 3 hours

k. The Pattern of Question Paper shall be as provided in the APPENDIX-II

12. CREDIT SYSTEM OF EVALUATION:

l. Each Compulsory / Core / Discipline Specific / Generic / Open Elective / Foundation Course / Subject / Paper will have 4 credit points and skill will have 2 credit points.

m. In all thus there shall be 100 credits for complete course.

n. Students can also earn additional 2 credits by successfully completing UGC's on- line 'Swayam' / MOOC Course.

13. CREDIT AND GRADEAWARDS:

In the Credit and Grade Point System, assessment of individual subjects in the concerned examinations will be on the basis of marks only, but the marks shall later be converted into Grades by a mechanism where in the overall performance of learners can be reflected after considering the Credit Points for any given course and the overall evaluation shall be designated in terms of a Grade.

o. CREDIT: Each Course / subject / paper has been given separate credits. A credit is a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical / field work per week.

p. Each semester, thus, has a definite number of credits depending on the number of courses / subjects / papers and the credits given to them.

q. GRADE POINT: Grade Point is a numerical weight allotted to each Letter Grade on a 10-point scale as adopted by the Institute as under:

Seven point rating scale is used for the evaluation of the performance of the students to provide letter grade for each course.

Range of percentage of Marks obtained	**Grade Points**	**Grade**	**Remark (Not to be displayed on the transcripts)**
90-100	10	O	Outstanding
80–89	9	A++	Excellent
70–79	8	A+	Very Good
60–69	7	A	Good
55–59	6	B+	Fair
50 - 54	5	B	Average
40- 49	4	C	Below Average
Below 40	0	F	Fail
Absent	0	AB	Fail

(Note: In case, the marks scored by the student fall in multiple grades, higher grade will be considered in the interest of the student)

- For example 89.4 will be included in the 80-89 range and 89.5 and above will be included in the 90-100 range.

Computation of Semester Grade Point Average (SGPA) for each semester:

$$\text{SGPA} = \frac{\sum \text{Credits in the subject} \times \text{Grade Points obtained}}{\text{Total Credits in the Semester}}$$

Computation of Cumulative Grade Point Average (CGPA) after completion of Program:

Sem-I		Sem-II		Sem-III		Sem-IV	
Credits	SGPA	Credits	SGPA	Credits	SGPA	Credits	SGPA

$$\text{CGPA} = \frac{\sum (\text{Credits} \times \text{SGPA})}{\text{Total Credits in the Programme}}$$

14. FINAL AWARD OF DIVISION

After the award of final Grade on the basis of CGPA, the students will be declared as passed with the following Divisions :

CGPA	Grade	Division
9.0-10	O	Outstanding
8.0 -8.9	A++	Excellent
7.0-7.9	A+	Distinction
6.0 –6.9	A	First
5.5-5.9	B+	Higher Second
5.0-5.4	B	Second
4.0-4.9	C	Pass
00 –3.9	F	Fail

(While calculating the Cumulative Grade score, the value of Grade Point shall be considered Zero (00) in case of students who failed in the concerned course / s i.e. obtained the marks below 40. After calculating the SGPA for an individual semester and the CGPA for entire programme, the value can be matched with the grade in the Grade Point table as per the Seven (07) Points Grading System and expressed as a single designated GRADE such as O, A++, A+,A, B+, B, C, F .

15. CONDONATION OF MARKS /GRACE MARKS FOR PASSING IN A SUBJECT / SUBJECTS :

Ref: 1) Ordinance Number 7-A (AU Ord.edition 1997) of SGBAU , Amravati.

2) Amendment in 2001 ,Ordinance number 20 of 1999 of SGBAU,Amravati.

An examinee failing in one or more subject / Paper/ Pratical /Internal Assessment , a marginal adjustment of marks as grace marks shall be made to the extent of 3% only to meet out such deficiency.

In case a subject is divided into individual heads of passing, the grace marks shall be awarded to such individual head / s of passing as per assigned marks to that head/s of passing , provided the total allotted grace marks to the individual heads of passing shall not exceed 3% of the total marks prescribed to that particular subject.

16. **INCENTIVE MARKS FOR N.C.C ,N.S.S , GAMES AND SPORTS AND EXTRA-CURRICULAR ACTIVITIES** :

REF : 1) Ordinance Number 1 of 1985 of SGBAU ,Amravati.

2) Ordinance Number 22 of 1999 of SGBAU ,Amravati.

3) Ordinance Number 2 of 2001 of SGBAU ,Amravati.

4) Ordinance Number 12 of 2007 of SGBAU ,Amravati.

A student may be given a maximum of 10 incentive marks, provided that a maximum of 5 incentive marks may be given to the student for one semester.

Participation in NSS,

Maximum 120 hrs whole year : Marks 1

(Maximum 5 marks for whole year)

Incentive marks to be given for paper published by the students :

a) For award winning at National Level : Marks 5
b) For award winning at State Level : Marks 3

17. AWARD OF MARK SHEET / S

a. All Mark Sheets for all semesters shall be awarded by the Institute at the end of each semester.

b. Each Semester End Mark Sheet shall reflect both the actual marks and the Credits of each subject along with the Grade Letter designated for the marks obtained and SGPA.

c. The Mark Sheet shall specifically mark all the pass / exempted / pass with grace and fail subjects.

d. The Final Semester Mark Sheet shall include total marks, CGPA and final designated GRADE such as O, A++, A+,A, B+, B,C, F .

18. AWARD OF DEGREE

a. The degree shall be awarded by the SGBAU , Amravati with the name of the Institute on the degree certificate.

b. The Degree shall be issued at the end of successful completion of the programme i.e. after passing all semester end examinations. It shall be signed by the Director of the institute and shall have the name of the institute (GVISH, Amravati)

APPENDIX - I SYLLABUS FOR

M.Sc. (SEMESTER PATTERN)

(With effect from the academic year 2021-22)

The semester pattern syllabus for M.Sc. Two Year Degree Course comprises off our semesters. Each semester is based on five theory periods and Nine practical periods per week. The examination of each semester shall comprise of one theory papers each of three hours duration and carries 80 marks and a practical of 5 hours duration carries 100 marks. Internal assessment for each semester based on theory papers of 20 marks shall be conducted by departmental teaching staff. Candidates are expected to pass separately in theory and practical examination.

GOVERNMENT VIDARBHA INSTITUTE OF SCIENCE AND HUMANITIES, AMRAVATI (Autonomous Govt. Institute)

General Scheme of C.B.C.S. for Science PG Semester Pattern (FOURSEMESTER)

Semester	Subject	Paper	Credit Theory / Practical	Credit	Total Credits	Mandatory Non-CGPA		
						Compulsory		Elective
						AEC	SEC	Co / Extra CC
I	CORE	4T	4	16	25	2		
		4P	2	08				
II	CORE	4T	4	16	25		2	2 Co CC
		4P	2	08				
III	CORE	2T	4	08	25	2		2
		2P	2	04				
	specializations (DSE)	2T	4	08				
		2P	2	04				Extra CC
IV	CORE (3) + DSE (1)	4T	4	16	25		2	2 MOOC
		3P	2	06				
	DSE	Dissertation	06	06				
TOTAL CREDITS					100	04	04	06

Subject Code : Semester I

Sr. No.	Subject	Subject Code	Course	Year	Sem
1	Botany	P1STBOTC01 P1STBOTC02 P1STBOTC03 P1STBOTC04	M.Sc.	I	I
2	Chemistry	P1STCHEC01 P1STCHEC02 P1STCHEC03 P1STCHEC04	M.Sc.	I	I
3	Maths	P1STMATC01 P1STMATC02 P1STMATC03 P1STMATC04 P1STMATE01 P1STMATE02	M.Sc.	I	I
4	Physics	P1STPHYC01 P1STPHYC02 P1STPHYC03 P1STBOTC04	M.Sc.	I	I
5	Statistics	P1STSTAC01 P1STSTAC02 P1STSTAC03 P1STSTAC04	M.Sc.	I	I
6	Zoology	P1STZOOC01 P1STZOOC02 P1STZOOC03 P1STZOOC04	M.Sc.	I	I

Subject Code : Semester II

Sr. No.	Subject	Subject Code	Course	Year	Sem
1	Botany	P2STBOTC05 P2STBOTC06 P2STBOTC07 P2STBOTC08	M.Sc.	I	II
2	Chemistry	P2STCHEC06 P2STCHEC07 P2STCHEC08 P2STCHEC09	M.Sc.	I	II
3	Maths	P2STMATC05 P2STMATC06 P2STMATC07 P2STMATC08 P2STMATE03 P2STMATE04 P2STMTHG01	M.Sc.	I	II
4	Physics	P2STPHYC05 P2STPHYC06 P2STPHYC07 P2STBOTC08	M.Sc.	I	II
5	Statistics	P2STSTAC05 P2STSTAC06 P2STSTAC07 P2STSTAC08	M.Sc.	I	II
6	Zoology	P2STZOOC05 P2STZOOC06 P2STZOOC07 P2STZOOC08	M.Sc.	I	II

Government Vidarbha Institute of Science and Humanities, Amravati
Department of Mathematics

Learning Objectives :

1. To equip students with knowledge, abilities and insight in mathematics and related fields.
2. Have the ability to pursue interdepartmental research in Universities in India and abroad.
3. To develop the ability to utilize the mathematical problem-solving methods such as analysis, modeling, programming and mathematical software applications in addressing the practical and heuristic issues.
4. To enable them to work as a mathematical professional or qualify for training as scientific researcher.
5. To enable students to recognize the need for society and the ability to engage in life-long learning.

Learning Outcomes :

After the completion of the program, students will able to :

1. Identify, formulate, and analyze the complex problems using the principles of Mathematics.
2. Solve critical problems by applying the Mathematical tools.
3. Apply the Mathematical concepts, in all the fields of learning including higher research, and recognize the need and prepare for lifelong learning.
4. Able to crack competitive examinations, lectureship and fellowship exams approved by UGC like CSIR-NET and SET.
5. Apply ethical principles and commit to professional ethics, responsibilities and norms in the society.
6. Gain the knowledge of software which will be useful in Industry

PROGRAM SPECIFIC OUTCOMES :

1. To understand the basic concepts of advanced mathematics.
2. To develop the problems solving skills and computational skills.
3. To enhance self-learning and improve own performance.
4. To formulate mathematical models.

Government Vidarbha Institute of Science & Humanities, Amravati Department of Mathematics
Syllabus for M.Sc. Mathematics (Semester Pattern) Choice Based Credit System
Academic Session 2021-22

Details of course code and names of Theory paper for M.Sc.-Mathematics Program

M. Sc. Mathematics Semester I													
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Examination Scheme						
		Th	Tutorial	Practical	Total		Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks		
								External Marks	Internal Ass		Th	Practical	
(CORE) P1STMATC01	Modern Algebra	4	7	-	11	4+1	2.5	80	20	100	40	-	
(CORE) P1STMATC02	Real Analysis	4	7	-	11	4+1	2.5	80	20	100	40	-	
(CORE) P1STMATC03	Operations Research	4	7	-	11	4+1	2.5	80	20	100	40	-	
(CORE) P1STMATC04	Ordinary Differential Equations	4	7	-	11	4+1	2.5	80	20	100	40	-	
Students can choose any one DEC from given two DEC. Credits will be counted accordingly.													
(DSE) P1STMATE01	Differential Geometry	4	7	-	11	4+1	2.5	80	20	100	40	-	
(DSE) P1STMATE02	Advanced Discrete Mathematics-I						2.5						
	TOTAL	20	35	-	55	25		400	100	500	200		

M. Sc. Mathematics Semester II												
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Examination Scheme					
		Theory	Tutorial	Practical	Total		Duration in hrs	Max. Marks		Total Marks	Minimum Passing Marks	
								External Marks	Internal Ass		Theory	Practical
(CORE) P2STMATC05	Linear Algebra	4	7	-	11	4+1	2.5	80	20	100	40	-
(CORE) P2STMATC06	Complex Analysis	4	7	-	11	4+1	2.5	80	20	100	40	-
(CORE) P2STMATC07	Topology	4	7	-	11	4+1	2.5	80	20	100	40	-
(CORE) P2STMATC08	Partial Differential Equations	4	7	-	11	4+1	2.5	80	20	100	40	-
Students can choose any one DSE from given two DSE. Credits will be counted accordingly.												
(DSE) P2STMATE03	Riemannian Geometry	4	7	-	11	4+1	2.5	80	20	100	40	-
(DSE) P2STMATE04	Advanced Discrete Mathematics-II						2.5					
	TOTAL	20	35	-	66	25		400	100	500	200	-
(GEC) P2STMATG01	Fundamentals of Mathematics-II (for the students not from Mathematics dept)	4	7	-	11	4+1	2.5	80	20	100	40	-

	M. Sc. Mathematics Semester III											
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Theory	Tutorial	Practical	Total			External Marks	Internal Ass		Th	Pract
(CORE) P3STMATC09	Measure and Integration Theory	4	7		11	4+1	2.5	80	20	100	40	-
(CORE) P3STMATC10	Numerical Analysis	4	7		11	4+1	2.5	80	20	100	40	-
Students can choose any three DSE from given six DSE. Credits will be counted accordingly.												
(DSE) P3STMATE05	General Theory of Relativity	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P3STMATE06	Fluid Dynamics-I	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P3STMATE07	Reaction Diffusion Theory-I	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P3STMATE08	Difference Equations-I	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P3STMATE09	Advanced Modern Algebra	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P3STMATE10	Classical Mechanics	4	7		11	4+1	2.5	80	20	100	40	-
	TOTAL	20	35		55	25		400	100	500	200	
(GEC) P3STMATG02	Fundamentals of Mathematics-II (for the students not from Mathematics dept)	4	7		11	4+1	2.5	80	20	100	40	

	M. Sc. Mathematics Semester IV											
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Theory	Tutorial	Practical	Total			External Marks	Internal Ass		Th	Pract
(CORE) P4STMATC11	Functional Analysis	4	7		11	4+1	2.5	80	20	100	40	-
(CORE) P4STMATC12	Integral Equations	4	7		11	4+1	2.5	80	20	100	40	-
Students can choose any three DEC from given six DEC. Credits will be counted accordingly.												
(DSE) P4STMATE11	Relativistic Cosmology	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P4STMATE12	Fluid Dynamics-II	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P4STMATE13	Reaction Diffusion Theory-II	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P4STMATE14	Difference Equations-II	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P4STMATE15	Coding Theory	4	7		11	4+1	2.5	80	20	100	40	-
(DSE) P4STMATE16	Dynamical Systems	4	7		11	4+1	2.5	80	20	100	40	-
	TOTAL	20	35		55	25		400	100	500	200	
(GEC) P4STMATG03	Graph Theory (for the students not from Mathematics dept)	4	7		11	4+1	2.5	80	20	100	40	

M.Sc.-I Mathematics
Sem-I (Modern Algebra)
Subject Code : P1STMATC01

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

(**Prerequisites :** Introduction to Groups, Definition and Examples, Elementary properties of Groups, Finite Groups and Subgroups, Subgroup Tests, Examples of Subgroups- Questions can be asked).

Cyclic groups, Normal subgroup, Homomorphisms, Dihedral group, Permutation group, Generators of a subgroup, Lagrange's Theorem,

Unit-2 :

Isomorphisms, Cayley's Theorem, Automorphisms and Conjugate elements, Inner automorphisms, Partition of integers.

Unit-3 :

Cauchy theorem, Sylow theorems and Direct products : Sylow p-subgroups, Double coset, finite Abelian groups.

Unit-4 :

Ring, Examples and Properties, characteristic of a ring, fields, Ideals, Maximal ideals, prime ideals.

Unit- : 5

Quotient rings, Ring homomorphisms, polynomial rings, Euclidean domains, prime and irreducible elements, Unique factorization domains.

References :

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4. V. K. Khanna and S. K. Bhambri, A Course in Abstract Algebra, 3rd Edition, Vikas Publishing House Pvt. Ltd.
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6. J. B. Fraleigh, Abstract Algebra, 5th Edition.
7. I. S. Luthar, I. B. S. Passi, Algebra, Vol. 1, Groups, Narosa Publishing House.
8. P. B. Bhattacharyya, S. K. Jain and S. R. Nagpaul, Basic Abstract Algebra (2e), Cambridge Univ. Press, Indian Edition, 1997.

M.Sc.-I Mathematics
Sem-I (Real Analysis)
Subject code : P1STMATC02

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

The real number system, Completeness property of set of real numbers, Countable and uncountable set, equivalence and cardinality, The Cantor set, Metric space, Limit in metric space, open set, closed set,

Unit-2 :

Sequence and series of real numbers : Convergence, divergence, Cauchy sequence, Limit superior and Limit inferior, Convergence and divergence of an infinite series, Alternating series, absolute convergence and conditional convergence, Test for absolute convergence.

Sequence and series of functions : Point-wise convergence and Uniform convergence.

Unit-3 :

Bounded functions, Monotone functions, Continuous function, uniformly continuous function, Differentiable functions and its application, Function of Bounded variations.

Unit-4 :

Riemann Integral : Definition, Existence of Riemann integral, Properties of Riemann integral, Improper integral.

Unit-5 :

The space of continuous functions, connected sets, Completeness, Totally Bounded sets, Complete Metric spaces, Fixed points, Compactness, Compact metric space, The Baire category theorem.

References :

1. W. Rudin, “Principles of Mathematical Analysis”, Mc Graw Hill.
2. D. Somasundaram and B. Choudhary, A first Course in Mathematical Analysis, Narosa Publishing House.
3. N. L. Carothers, “Real Analysis”, Cambridge university press.
4. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons Inc., U.K.
5. Sudhir R. Ghorpade and Balmohan V. Limaye, “A Course in Calculus and Real Analysis”, Springer Publications.
6. T. M. Apostol, “Mathematical Analysis”, Narosa Publishing House.
7. G. F. Simmons, “Introduction to Topology and Modern Analysis”, Mc Graw Hill.
8. S. Kumaresan, “Topology of Metric Spaces”, Narosa Publishing House.

M.Sc.-I Mathematics
Sem-I (Operations Research)
Subject code : P1STMATC03

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Operation Research & its scope, linear programming, Mathematical formulation, Graphical solution, General linear programming (LP), Simplex method, Use of Artificial variable, (Big-M method), Duality in LP., Economic Interpretation, dual simplex method.

Unit-2 :

Integer Programming, Branch and Bound technique, Fractional cut plane method, Goal programming, Advanced techniques in LP (upper bound technique)

Unit-3 :

Parametric linear programming, Transportation problem and assignment problems.

Unit-4 :

Queing system, basic properties of queuing system, Element of Queing system, Poisson and Non- Poisson Queing system.

Unit-5 :

Game and strategies, two person, zero sum games, the maximum / minimum principle, games without saddle point, mixed strategies, graphics solution of 2 x n and m x 2 games, dominance properties, general solution of m x n rectangular games.

References :

1. G. Hadley, Linear Programming, Narosa publishing House, 1995.
2. G. Hadley, Nonlinear and Dynamic Programming, Addison-Wesley. Reading Mass.
3. Mokhtar S. Bazaraa, Hohn J. Jarvis and Hanif D. Sherali, G. Hadley, Linear Programming and Network flows, John Wiley and Sons. New York, 1990.
4. H. A. Taha, Operation Research- an Introduction, Macmillan Publishing Company, Inc, New York.
5. S. S. Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
6. Prem Kumar Gupta and D. S. Hira, Operation Research- an Introduction, Chand & Company Ltd., New Delhi.
7. N. S. Kambo, Mathematical programming Techniques. Affiliated East-West Press Pvt. Ltd., New Delhi, Madras.
8. F. S. Hillier and G. J. Liebermann, Introduction to Operations Research (6th Ed.) McGraw Hill International Edition, Industrial Engineering Series, 1995.
9. Kantiswaroop, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi-2007.

M.Sc.-I Mathematics
Sem-I (Ordinary Differential Equations)
Subject code : P1STMATC04

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Linear equations with constant coefficients : Second order homogeneous equation, Initial value problems, Linear dependence and independence, Wronskian, The homogeneous equation of order n, The non-homogeneous equation of order n., Equations with real coefficients.

Unit-2 :

Linear equations with variable coefficients : Initial value problems for the homogeneous equation, Solutions of the homogeneous equations, Wronskian and linear independence, Reduction of the order of homogeneous equation, Legendre equation, Euler equation, second order equation with regular singular points, Bessel equation.

Unit-3 :

Equations with variables separated, Exact equations, Lipschitz condition, The method of successive approximations, Existence and uniqueness theorem and examples, Picard's iterative method.

Unit-4 :

Orthogonality, Orthogonal set of functions, weight function, Gram-Schmidth process of orthonormalization.

Strum-Liouville Problem : Eigen functions and Eigen value, orthogonality of Eigen functions.

Unit-5 :

Applications of differential equations : Applications of first order differential equations, Applications of second order linear differential equations-Newton's second law and Hook's law, Free-undamped motion, Free-damped motion, Electric circuit problems.

References :

1. E. A. Coddington, "An Introduction to Ordinary Differential Equation", Prentice-Hall of India Pvt. Ltd. New Delhi.
2. G. F. Simmons, "Differential Equations with Applications and Historical Notes",
3. (2nd edition) Mc Graw Hill Book Co.
4. W. E. Williams, "Partial Differential Equations", Claredon Press Oxford.
5. M. D. Raisinghania, "Ordinary and Partial Differential Equations", S. Chand and Company Ltd.
6. G. Birkhoff and G.C.Rota : "Ordinary Differential Equations", John Wiley and Sons.
7. E. T. Copson, "Partial Differential Equations", Cambridge University Press.
8. I. N. Sneddon, "Elements of Partial Differential Equation", Mc Graw Hill Book Co.
9. "Theory of Ordinary Differential Equations" by A. B. Jadhav and K. L. Bondar, P. U. Chopade, BUUKS (2019)

M.Sc.-I Mathematics
Sem-I (Differential Geometry)
Subject code :P1STMATE01

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Local Intrinsic properties of a surface, Definition of surface, curves on a surface, surfaces of Revolution, Helicoids, Metric, Direction Coefficients.

Unit-2 :

Families of curves, Isometric correspondence, Intrinsic properties, Geodesics, Canonical Geodesic Equation, Normal Properties, Geodesic Existance theorems, Geodesic parallels.

Unit-3 :

Geodesic curvature, Gauss-Bonnet Theorem, Gaussian Curvature, Surface of constant curvature, conformal mapping, Geodesic mapping.

Unit-4 :

Review of tensor calculus, Vector spaces, the dual space, Tensor product of vector spaces, Transformation formulae, contraction special tensors, Inner product. Associated tensors Exterior Algebra.

Unit-5 :

Differential manifolds, Tangent vectors, Af fine Tensors and Tensorial forms, Connexions, covariant differentiation, Absolute derivation of Tensorial forms, Tensor connexions.

References :

1. J.A. Thorpe : Elementary Topics in Differential Geometry (Springer Verlag)
2. W.Klingenberg (Springer), A course in Differential Geometry
3. Weatherburn, C. Riemannian Geometry and Tensor Calculus
4. T. M. Karade, G.S. Khadekar, Maya S. Bendre, Lectures on General relativity, Sonu-Nilu publication.
5. “An Introduction to Differential Geometry”, By T. J. Wilmore, Oxford University Press (1959)
6. D. Somasundaram, Differential Geometry a first course, Narosa Publishing House, 2008

M.Sc.-I Mathematics
Sem-I (Advanced Discrete Mathematics-I)
Subject code : P1STMATE02

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Formal Logic : Statements, symbolic representation and Tautologies. Quantifiers, Predicates and validity. Propositional logic.

Unit-2 :

Semigroups and Monoids : Definitions and examples of semigroups and monoids (including those pertaining to concatenation operation). Homomorphism of semigroups and monoids. Congruence relation and Quotient semigroups. Subsemigroups and submonoids. Direct products. Basic Homomorphism theorem.

Unit-3 :

Lattice Theory : Lattices are partial ordered sets. Their properties. Lattices as algebraic systems. Sublattices. Direct products and Homomorphisms. Some special lattices, e.g. complete, complemented and distributive lattices.

Unit-4 :

Boolean Algebras : Boolean algebra as a lattice. Various Boolean identities. The switching algebra examples. Subalgebras. Direct products and Homomorphisms. Joint irreducible elements.

Unit-5 :

Boolean Algebras (Continue) : Atoms and minterms. Boolean forms and their equivalence. Minterm Boolean forms. Sum of products. Canonical forms.Minimization of Boolean functions. Applications of Boolean algebra of switching theory. (Using AND, OR and NOT gates). The Karnaugh map method.

References :

1. J. P. Tremblay and R.Manohar, Discrete Mathematical Structure with Application to Computer Science, McGraw Hill Book Co. 1997.
2. Seymour Lipschutz, Finite Mathematics (International Edition 1983). McGraw Hill Book Company.
3. S. Wiitala, Discrete Mathematics - A Unified Approach, McGraw Hill Book Co.
4. J. L. Gersting : Mathematical Structure for Computer Science (3rd Edition), Computer Science Press, New York.
5. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill Book Co.

M.Sc.-I Mathematics
Sem-II (Linear Algebra)
Subject code : P2STMATC05

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

(Prerequisites : Matrices and it's types, determinant, matrix polynomials, Cayley–Hamilton theorem).

Unit-1 :

Eigen values and Eigen vectors, Properties of Eigen values, Characteristic subspaces of matrix, Rank-Multiplicity theorem, Minimal polynomial and minimal equation of a matrix, Similarity of matrices.

Unit-2 :

Characteristic polynomial, Cayley –Hamilton theorem, Diagonalizable matrix, Diagonalizing real symmetric matrices, Canonical forms : Jordan Canonical form, Rational Canonical form.

Unit-3 :

Quadratic forms, Linear transformation of a real quadratic form, Congruence of matrices, reduction of a real quadratic form, canonical or normal form of a real quadratic form, Signature and index of a real quadratic form, Sylvester's law of inertia, Definite, semi-definite and indefinite real quadratic forms.

Unit-4 :

Vector space definition and examples, sub-spaces, linear span, Linear dependence and linear independence of vectors, Basis and dimension of subspaces, System of linear equations.

Unit-5 :

Linear transformation : Kernel and Range of linear transformation, Singular and nonsingular linear transformation.

Inner product spaces, Examples of inner product spaces, Cauchy-Schwarz inequality, Orthogonality, Gram-Schmidt orthogonalization process.

References :

1. S.H.Friedberg, A.J.Insel, L.E.Spence : Linear Algebra, Prentice-Hall International, Inc., 3rd Edition.
2. Vivek Sahai, Vikas Bist : Linear Algebra, Narosa Publishing House, 2nd Edition.
3. K.Hoffman, R.Kunze : Linear Algebra. Prentice Hall of India.
4. I. N. Herstein, "Topics in Algebra", Macmillan, Indian Edition.
5. S.Lang : Introduction to Linear algebra, Springer International Edition, 2nd Edition.
6. J.H.Kwak, S.Hong : Linear Algebra, Birkhäuser Verlag, 2nd Edition.
7. Harvey E.Rose : LinearAlgebra.A pure Mathematical Approach, Birkhäuser Verlag.
8. A. R. Vasishtha and A. K. Vasishtha, Matrices, Krishna Prakashan Media (P) Ltd.

M.Sc.-I Mathematics
Sem-II (Complex Analysis)
Subject code : P2STMATC06

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Topology of complex plane, Stereographic projection, Complex valued functions, Concept of limit and continuity, Analytic functions and power series, Cauchy Riemann equations, Exponential, trigonometric and logarithmic functions.

Unit 2 :

Complex Integration, Curves in the complex plane, Properties of complex line integrals, Cauchy-Goursat theorem, Simple connectivity, Cauchy Integral Formula, Morera's Theorem, Existence of Harmonic conjugate, Zeros of an analytic function, Laurent series.

Unit-3 :

Classifications of singularities : Isolated and non-isolated singularities, Removable Singularities, Poles, isolated singularities at infinity, Meromorphic functions, Rational functions, Essential singularities and Picard's theorem,

Calculus of residues : Residue at a finite point, Residue at infinity, Residue theorem, Number of zeros and poles, Rouche's theorem.

Unit-4 :

Conformal Mappings, Principle of conformal mapping, Basic properties of Möbius map, Fixed points and Möbius maps, Triples to Triples under Möbius map (cross ratio and its invariance properties).

Unit-5 :

Maximum modulus principle, Hadamard's three circles / Lines theorem, Schwarz Lemma and its consequences, Liouville's theorem, Doubly periodic entire functions, Fundamental theorem of Algebra, Zero's of certain polynomials.

References :

1. S. Ponnusamy, "Foundation of Complex Analysis", Narosa Publication, Second Edition.
2. John B. Convey, "Functions of one Complex Variable", Narosa Publishing House.
3. H. S. Kasana, "Complex Variables Theory and Applications", PHI Learning Pvt. Ltd.
4. L. V. Ahlfors, "Complex Analysis", Mc Graw Hill.
5. Ruel V. Churchil, J.W. Brown, "Complex Variables and Applications", Mc Graw Hill.
6. H. Silverman, "Functions of Complex Variables".
7. T. W. Gamelin, Complex Analysis, Springer Publications.

M.Sc.-I Mathematics
Sem-II (Topology)
Subject code : P2STMATC07

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Topological Spaces : Topological spaces, Interior points, Open sets; Limit points, closure of set, Closed sets; exterior of a set, operators ($\boldsymbol{d} - derived$, $\boldsymbol{c} - closure$, $\boldsymbol{i} - interior$, $\boldsymbol{e} - exterior$, $\boldsymbol{b} - boundary$) and neighbourhoods; Basis for Topolgy, Relative Topologies, sub- basis.

Unit-2 :

Topological Spaces (Continued) : Order Topology, product topology, subspace topology, metric topology, Quotient topology, Continuous functions, Homeomorphisms, topological and hereditary properties, T0, T1& T2 spaces and sequences.

Unit-3 :

Connectedness : Connected sets and components, Connected spaces, Connected subspaces on real line, Arcwise connectivity.

Unit-4 :

Compactness : Compact spaces, Countably compact spaces, Lindelof space, Compact subspaces on the real line, limit point compactness, local compactness, one point compactification.

Unit-5 :

Countability andSeperation Axioms : First and Second axiom of countability, Separation Axiom, Regular spaces, T_3-space, Completely regular spaces, T3½-space, Normal spaces, T_4- space, Completely normal spaces, T_5-space, the Urysohn's lemma, the UrysohnMetrization Theorem (statement only), the Tietze Extension theorem (statement only), the Tychonoff theorem.

References :

1. J. R. Munkres, Topology : A First Course, Publisher : Prentice Hall of India.
2. William J. Pervin, Foundations of General Topology, Publisher : Academic Press
3. K. D. Joshi, Introduction to General Topology, Publisher : Wiley Eastern Ltd.
4. Sidney A. Morris, Topology Without Tears, Publisher : www.topologywithouttears.net
5. Dugundji, J., Topology, Allyn and Bacon Series in Advanced Mathematics, Allyn & Bacon.
6. J. N. Sharma, General and Algebric Topology, Krishna prakashan
7. Steen, Lynn Arthur; Seebach, J. Arthur Jr., Counter Examples in Topology, Publisher : Springer Verlag, Berlin, New York.
8. Simmons, George F. Topology and modern analysis. Vol. 3. New York : McGraw-Hill, 1963.
9. R.S.Aggarwal, A Text Book on Topology, Publisher : S.Chand& Company.
10. Stephen Willard, "General Topology", Addison-Wesley Publishing Company, 1970.
11. Sheldon W. Davis, Topology (The Walter Rudin Student Series in Advanced Mathematics), TATA McGraw-Hill.2006.

M.Sc.-I Mathematics
Sem-II (Partial Differential Equations)
Subject code : P2STMATC08

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Curves and Surfaces, Genesis of first order P.D.E., Classification of intergals, Linear Equations of the first order, Pfaffian differential Equations, Compatible systems, Charpit'sMethod, Jacobi's Method, Integral Surfaces through a given curve.

Unit-2 :

Quasi-Linear equations, Non-linear first order P.D.E., genesis of second order P.D.E., Classification of second order P.D.E.

Unit-3 :

One dimensional Wave equation, Vibrations of an infinite string, Vibrations of a Semi-infinite string, Riemann's Method, Vibrations of a string of finite Length.

Unit-4 :

Laplace's Equation, Boundary value problems, Maximum and Minimum Principles, The Cauchy problem, The Dirichlet Problem for the upper half plane, The Neumann problem for the upper half plane, The Dirichlet problem for a circle, The Dirichlet Exterior problem for a circle, The Neumann problem for a circle, The Dirichlet problem for a Rectangle, Harnack's Theorem, Laplace's equation- Green function, The Dirichlet problem for a half plane, The Dirichlet problem for a circle.

Unit-5 :

Heat conduction problem : Heat conduction- Infinite rod case, Heat conduction-finite rod case, Duhamel's principle : Wave equation, Heat conduction equation. Classification in the case of n –variables, Families of equipotential surfaces, Kelvin's inversion theorem.

References :

1. T. Amaranath : An elementary course in Partial Differential Equations, 2nd Ed. Narosa Publishing House, New Delhi.
2. I. N. Sneddon : Elements of Partial Differential Equation, Mc Graw Hill, International Edition, New York.
3. Phoolan Prasad, Renuka Ravindram : Partial Differential equations, New Age and International Publishers.
4. Lawrence C. Evans : Partial Differential Equations, Vol. 19, AMS, 1998.
2. R. J. Leveque, Finite difference methods for ordinary and partial differential equations, July- 2007.
3. M. D. Raisinghania, "Ordinary and Partial Differential Equations", S. Chand and Company Ltd.

M.Sc.-I Mathematics
Sem-II (Riemannian Geometry)
Subjectb code : P2STMATE03

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Riemannian metric, metric tensor, Christoffel symbol, christoffel symbol of first kind, second kind, properties of Christoffel symbols. Computations of Christoffel's symbols for static and non- static spherically symmetric and R-W spacetimes, transformation of Christoffel symbols, derivatives of tensor, absolute derivative. Covariant derivatives, divergence, gradient, Laplacian.

Unit-2 :

Parallel Vector Fields : Parallel vector field of constant magnitude, parallel displacement of covariant vector field, parallelism of a vector field of variable magnitude Geodesic : Differential equations of a geodesic, special co-ordinate system : Local cartesians, Riemannian co-ordinates, Normal co-ordinates, Geodesic normal co-ordinates.

Unit-3 :

Curvature Tensor : Covariant curvature tensor of Riemann tensor, curvature tensor in Riemannian co-ordinates, properties of curvature tensors, on a cyclic property, number of independent components of R.

Unit-4 :

Ricci tensor, curvature invariant, Einstein tensor, Computations of Einstein's tensor for static and non-static spherically symmetric and R-W space times, the Bianchi identity. Geodesic deviation : Equations of Geodesic deviation.

Unit-5 :

Riemannian curvature, space of constant curvature, flat space, tensor derivatives, dual tensors, intrinsic symmetries and killing vectors.

References :

1. T. M. Karade, G.S. Khadekar and Maya S.Bendre, Lectures on General Relativity SonuNilu Publication.
2. T. J. Willmore.An Introduction in Differential Geometry
3. J. L. Synge, Tensor Calculus – Schild.
4. C. E. Weatherburn, An introduction to Riemannian geometry and tensor calculus, Cambridge university press, (1963).
5. L. P. Eisenhard, Riemannian geometry, University press Princeton (1926)
6. J. A. Schouten, Ricci Calculus, Springer Verlag, Berlin
7. T.Y. Thomas, Concepts from tensor analysis and differential geometry, Academic press, New York
8. W. Boothby, Introduction to differentiable manifold and Riemannian geometry, Academic press, 1975.
9. S. Kobayashi and K. Nomizu, Foundations of differential geometry, Vol. I and II Wiley Interscience publisher 1963 (Vol.I), 1969 (Vol. II)

M.Sc.-I Mathematics

Sem-II (Advanced Discrete Mathematics-II)

Subjectb code : P2STMATE04

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**

Theory internal marks : 20

Unit-1 :

Graph Theory : Definition of (undirected) graphs, paths, circuits, cycles and subgraphs. Induced subgraphs. Degree of a vertex. Connectivity planar graphs and their properties.

Trees, Euler formula for connected planar graphs. Complete and complete bipartite graphs. Kuratowski' s theorem (statement only) and its use.

Unit-2 :

Graph Theory (Continue) : Spanning trees, cut sets, fundamental cut sets, and cycles. Minimal spanning trees and Kruskal's algorithm. Matrix representations of graphs. Euler 's theorem on the existence of Eulerian paths and circuits. Directed graphs. Indegree and outdegree of a vertex. Weighted undirected graphs. Dijkstra' s algorithm. Strong connectivity and Warshall's algorithm. Directed trees. Search trees. Tree traversals.

Unit-3 :

Introductory Computability Theory : Finite state machines and their transition table diagrams. Equivalence of finite state machines. Reduced machines. Homomorphism. Finite automata acceptors. Non-deterministic finite automata and equivalence of its power to that of deterministic finite automata. Moore and Mealy machines.

Unit-4 :

Grammers and Languages : Phrase structure grammars. Rewriting rules, Derivations, sentential forms. Language generated by a grammer.Regular, context free and context sensitive grammers and languages. Regular sets, regular expressions and the pumping lemma. Kleen' s theorem.

Unit-5 :

Turing machine and partial recursive functions. notation. Notions of syntax analysis, polish notations. Conversion of infix expressions to polish notations. The reverse polish

References :

1. N. Deo, Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India.
2. J. R. Tremblay and R. Manohar, Discrete Mathematical Structure with Application to Computer Science, McGraw Hill Book Co., 1997.
3. J. E. Hopcroft and J.D.Ullman, Introduction to Automata Theory, Language and Computation, Narosa Publishing House.
4. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill Books co.
5. F. H. Harary - Graph Theory, Narosa Publishers, New Delhi (1989)
6. K. R.Parthasarthy, Basic Graph Theory (TMH)

M.Sc.-I Mathematics
Sem-II (Fundamentals of Mathematics-I)
Subject Code : P2STMATG01

Theory : 4 Periods / Wk (Credits 4 +1) **Theory marks : 80**
Theory internal marks : 20

Unit-1 :

Number System, H.C.F. and L.C.M. of Numbers, Decimal Fractions, Simplification.

Unit-2 :

Square Roots and Cube Roots, Average, Problems on Numbers, Problems on Ages.

Unit-3 :

Surds and Indices, Logarithms, Percentage, Profit and Loss.

Unit-4 :

Ratio and Proportion, Partnership, Chain Rule, Pipes and Cisterns.

Unit-5 :

Time and Work, Time and Distance, Boats and Streams, Problems on Trains.

References :

1. R. S. Aggarwal, Quantitative Aptitude for competitive examinations, S. Chand Publication
2. Arun Sharma, How to prepare for Quantitative Aptitude for CAT, McGrawHill publication