SANT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

Master of M.Sc. (Mathematics)

MATHEMATICS

SANT GAHIRA GURU VISHWAVIDYALAYA

Sarguja Ambikapur (C.G.)

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS

M.Sc. MATHEMATICS

SEMESTER SYSTEM
SESSION 2018-19

For Affiliated Colleges of

SANT GAHIRA GURU VISHWAVIDYALAYA

Ambikapur (C.G.) -497001

SANT GAHIRA GURU VISHWAVIDYALAYA
SARGUJA, AMBIKAPUR (C.G.)

SANT GAHIRA GURU ORDINANCE 46:
MASTER DEGREE (P.G.) PROGRAMMES

PROPOSED DRAFT ORDINANCE 46:

O.M.D.1.: This Ordinance shall be called "The Sant Gahira Guru Master Degree (Semester Study) Programme with Choice based Credit System.

O.M.D.2.: This Ordinance shall come into the force from the Academic Semester 2017-18.

Notwithstanding anything in the earlier laws of the Sant Gahira Guru Master Degree Programmes in the different faculties (*Ayurveda, Commerce, Education, Fine Arts, Law Life Sciences, Medicine, Management, Science & Social Sciences)* under the "semester system", the "Semester with Choice based Credit System" shall be regulated and conducted as per the provisions of this ordinance.

O.M.D.3. Definitions:

In this Ordinance, unless the context otherwise requires:

a. "**Academic Council**" means Academic Council of the University.

b. "**Administrative Grade Letter**" means the alphabet indicating the administrative comment in place of Grade Letter to indicate the Credit Withdrawn (W), Unfair Means (U), Absent in SEE (X). The Administrative Grade Letter has zero Grade Point associated with it.

c. **"Board of Studies"** means PG Board of Studies in any subject constituted under the university statutes.

d. **"Core Course"** means the course pertaining to main subject or theme of the master programme.

e. **"Credit"** means the unit by which the academic activity of course work is measured. In these Regulations, One Credit means one hour of Class Room Teaching per week in case of theory papers and 1.5 hours in practical / laboratory work.

f. **"Credit Courses"** means the course classified as Compulsory Core Courses(**CCC**), Elective Core Courses(**ECC**), Seminar **(SEM),**Project Work**(PRJ)**, Field Study**(FST)**, Self Study Course**(SSC)**, Other Supportive Courses**(OSC),** Educational/Study Tour (**EST**) and Research Publications **(RPJ).**

g. **"Credit Monitoring"** means an act to monitor the credit by a Credit Monitoring Committee **(CMC)** consists of the Head (as Chairperson) and three senior most teachers on the Roll of the Department. In case, when the Department does not have the required number of the teachers in the department than the Vice chancellor may constitute the said committee by nominating the number of expert(s) required by the Ordinance from any other university or institute who are not below the post of Professor.

h. **"Credit Points"** means the product of 'credits assigned to the course' and 'the Grade Point secured for the same course by the student'.

I. **"Semester Grade Point Average (SGPA)"** means the Semester Grade Point average computed on the basis of the formula prescribed in the ordinance. It measures the performance of a student in a given Semester. The SGPA is the ratio of the 'total credit points earned by the student in all the credits earned in the concerned semester' and the 'total number of credits earned in that Semester'.

j. **"Cumulative Grade Point Average (CGPA)"** means the Cumulative Grade Point weightage average of SGPA computed on the basis of the formula prescribed for the entire Programme. It measures the overall performance of a student in a Master degree programme. The CGPA is the ratio of the 'total credit points earned by the student in all the credits earned in the Master degree programme' and the 'total number of credits earned in that Master degree programme'.

k. **"Degree"** means Post Graduate Degree in any subject.

l. **"Departmental Staff Council (DSC)"** means a Council of the Department consisting of its whole time faculty which falls in the category of teacher. The DSC will be empowered to consider and decide the academic matters, as specified in Master Degree Ordinances and Regulations.

m. **"Elective Course" means the course, which can be offered as 'optional subject' to the provisions of this Ordinance and the respective syllabus from inter or intra subjects and or disciplines including interdisciplinary or multidisciplinary nature.**

n. **"Fee"** means the fee prescribed by the University for the respective Master Degree Programme from time to time.

o. **"Grade Letter"** means the alphabet indicating the performance of a student in a particular course. It is the transformation of the scaled marks secured by the student in a Course. Grade letters are O, A, B, C, D, E, and F.

p. **"Grade Point"** means the numerical weightage allotted to each stratum of scaled marks corresponding to each 'Grade letter'.
However, the "Administrative Grade Letter" as defined will represent the categories mentioned in the OMD.3 sub clause 'b' of this ordinance.

q. "**Master Degree Programme**" means a Masters Degree Programme in any subject studied at Master degree level under any faculty of the University.

r. **"Semester End Examination (SEE)'** means the examination due to be conducted after the end of the respective semester.

s. **"Semester"** means an academic term constituting 20(twenty) weeks. Each semester shall have at least 15 (fifteen) weeks of direct class room teaching. The Academic Year shall be of bi-semesters. Odd Semesters shall be normally from mid June to mid December and Even Semesters shall be from mid December to mid June.

t. "**Student**" means student admitted to Master Degree Programme in any subject being run under the University Ordinance and Regulations.

O.M.D.4.Course Structure:

1. A Master Degree programme shall consist of the duration of at least two academic years consisting four semesters. A candidate will be required to complete this programme within 4 years from the date of his/her first admission in the semester – I.

   Provided that subject to the approval of the UGC Regulations, when the Master Degree Programme is of one academic year and spreads in the two academic semesters then the study has to be completed within a period of two years from the date of admission in the Semester – I.

2. Subject to the provisions of this Ordinance the programme/study shall be based on (a) Semester System Examination, (b) Continuous Assessment, (c) Choice Based Credit System, and (d) Semester Grade Point Average and Cumulative Grade Point Average Systems.

3. "'Core Course' means a 'course/subject', the knowledge of which is considered essential for a student of the respective programme. This may also include elective courses.

4. 'Elective Course' allow students to acquire knowledge and skills in areas of their choice. Such course(s) may be offered by concerned department and / or other departments within the university. This may be inter or/ and intra department/institution subject to the approval by the university.

5. The Course of respective Master Degree Programme shall have following (i) Course Code(**CC**), (ii)Course Title (**CT**), (iii) Course type such as Compulsory Core Courses(**CCC**), Elective Core Courses(**ECC**), Seminar **(SEM)**,Project Work**(PRJ)**, Field Study**(FST)**, Self Study Course**(SSC)**, Other Supportive Courses**(OSC)**, Educational/Study Tour (**EST**) and Research Publications**(RPJ)** (iv) Credits Assigned, (v) Number of Contact Hours for Lecture(**L**), Tutorial (**T**) and Practical or other (**P**) to be assigned per week.

S No.	Course Code	Course Title	Course Type	Credits	Contact Hours Per week		
					L	T	P

6. Fifteen (15) hours of theory teaching will lead to one credit((which means one hour per week theory teaching in a semester is equivalent to one credit) and in case of practical 45 hours of laboratory work will lead to two credits (Which means 3 hour practical classes per week in a semester is equivalent to two credits). Each semester of Master's course shall offer 30 credits or more. Number of semester of Examinations and minimum credit required to be earned for Master Degree in various post-graduate courses specified as under:

S No.	Course Code	Number of Semesters	Minimum Required Credi
1.	All Two Year Master Degree Programme	Four	120
2.	All One Year Master Degree Programme	Two	60

- ***Note***: The curriculum may be described in the syllabus in form of 'Courses' or 'Papers'. The number of papers, course type and credits with detailed syllabus for each course shall be described in the 'syllabus of the respective course'. Candidate will be required to earn minimum credits prescribed for the respective Master Degree.

- 7. Each course shall be assigned a specific number of credits. A course or paper is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the Department offering the course and the later three alphanumeric characters designate a particular course. In the case of compulsory core courses (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory theory core courses the fifth character is **'0'**, for laboratory core courses it is **'1'** and for project/seminar it is **'2'** and for research publications in journals it is **'3'.**

- The examination shall comprise of the requirement of four (in case of one year course two) semesters and the Subjects for each semester will be as per the schedule of the structure of the Master Degree Programme with the particulars mentioned therein.

- 8. CBCS offers flexibility for effective **teaching learning processes** in terms of number of contact hours for Lecture (**L**), Tutorial (**T**) and Practical or other (**P**) to be assigned per week for a course or paper.

. Type of courses

There shall be following categories of courses in the MASTER DEGREE Regular Programme:

.1. Compulsory Core Course (CCC)

A course, prerequisite for a student to obtain the Degree in the concerned Programme.

9.2. Elective Core Course (ECC)

A course, which is to be chosen by the student from a pool of courses offered by the Department.

9.3. Other Supportive Course (OSC)

Subject to the availability of the course and provisions of niversity rules, a student admitted in a Master Degree Programme shall have option to offer **Other Supportive Courses** ncluding Interdisciplinary **(ID)**/Multidisciplinary **(MD)** course/s ffered by a Department/cluster of Departments. For formation of a luster, two or more Departments shall come together for offering D/MD courses depending on their available expertise and nfrastructure. The Departmental Staff Council (DSC) shall be ompetent to decide the nature and scope and number of such ourses to be offered by the concerned Department in ollaboration with other Department/s.

.4. Self Study courses (SSC)

Since one of the main objectives of the CBCS is to enable the students to learn on their own. The Self Study course(s) shall be offered to realize this objective. A list of Self Study course(s) shall be designed by different faculty of the Department and after the approval of the DSC, the course(s) shall be made available to the students for self study. Such a course(s) shall have advisory academic support of the faculty, who proposed the course, and the same faculty shall evaluate the student at the end of the semester for a Course Report of 50 marks and a viva voce examination of 50 marks. The number of credits that can be earned in a semester in SSC shall be limited to 4.

9.5. Seminar (SEM):

The aim of the seminar is to give students a exposure to recent developments and advance topic o research interests. The seminar preparations can b undertaken only after the prior approval of the CMC of th Department. The CMC will allot Seminar Credits on meri basis out of desiring students. The said preparations will b undertaken under the guidance and supervision of a teacher of the parent department. No teacher will b allowed to guide more than three students at a time in a semester. The guiding teacher will make continuou internal assessment of the seminar. At the end of th 'Semester End Examination' the seminar will be conducte and credits will be awarded by a Board of three examiner consisting of the Head of the Department, guide and on faculty member other than a guide.

9.6. Project Work (PRJ) or Field Study (FST):

The aim of the Project Work or Field Work is t introduce students with the research methodology in the subject and to prepare them for pursuing research i theoretical, experimental or computational areas of the subject. The Project Work or Field Study has to be conducted under the guidance of a teacher of the concerned department or a scientist or any other suitable person with proven research excellence in the concerned field of study. One can conduct the Project Work or Field Work in an outside institution of national or international repute on the prior approval by the CMC of the department concerned.

The CMC will allot the Credits Project Work or Field Study to the desirous depending on their capacity and subject to the availability of the resources on the basis of their merit. The guiding teacher will make continuous

assessment of the Project Work or Field Study of a candidate under his/her supervision. SEE for the said Project Work or Field Study will be held at the unit where the study has been under taken by a Board of three examiners consisting of the concerned Head, Guide/Supervisor and one other senior faculty.

9.7. Education Study Tour (EST):

Subject to the provisions of the syllabus of the concerned Master degree Programme, the concerned Department may arrange educational tour/study tour. It will be compulsory on the part of student to join the same and on completion of tour; he/she will be required to submit its report to the University Department. The time spent for the purpose will be considered for computation of attendances in the respective semester/term. The Department may design & arrange the educational tour considering nature, scope & requirement of the respective subject.

The requirement of the tour has to be incorporated in the respective syllabus.

The university will determine the university contribution for toufor each student and escorting staff by administrative decision approved by the Finance Committee.

9.8. Research Publications in Journals (RPJ):

One research publication as a coauthor in a journal above impact factor 1.0 will be assigned two credits and that in other ISSN bearing journals will be assigned one credits.

10. A Master Degree study is a regular fulltime programme. Therefore, no student admitted in the said programme will be allowed to join any other programme of study during this period. This will be obligatory for the student to ensure that he has not sought admission in any other programme during this period.

O.M.D.5.Admission:

1. A candidate, who has passed Bachelor Degree programme in the concerned subject/discipline from this university or any other university established by law and recognized by the Sant Gahira Guru for the purpose of admission in the Master Degree programme of this university shall be eligible to apply for admission in the respective Master Degree programme of this university.

   Provided further that a candidate, who has passed Bachelor Degree programme from the Faculty of Arts/Social Science shall be eligible to submit his candidature for any subject of the Master degree programme(s) of the said faculties except the Master degree programme in Mathematics run under the same faculties. A candidate can apply for Master Degree in Mathematics only when he has passed Bachelor degree with subject of Mathematics either from Faculty of Social Sciences/ Science.
2. The University may prescribe further stipulation with respect to minimum qualifications subject to the approval of the Academic Authorities of the university.
3. The University may prescribe different qualifications for different courses.
4. The admissions shall be granted strictly on the basis of the merit list.
5. The Department/ University may with the previous permission of the Vice-Chancellor (including the approval of the scheme entrance test/examination), hold entrance test and /or Oral examination for admission in the respective Master degree programme of the department.
6. In case when the Department conducts Entrance Test and/ or Oral Test, the university will give at least "Fifty per cent" weightage to the marks obtained by the candidate at the concerned qualifying examination.

It will be obligatory for the authorities involved in the admission process to strictly observe the reservation policy in admissions formulated time to time by the Union Government or State Government, UGC, Rehabilitation Council and adopted by the University. The data based information in this regard has to be provided to the university within a period of 15 days after the completion of the admissions in the respective degree.

Admitting authority shall have to prepare and publish the merit list in the two fold as mentioned below:-

(i) Candidates, who have passed the qualifying examination indicating category against each of the name in the last column such as General/S.T./S.C./S.E.B.C./Physically Challenged/Women etc.
(ii) Candidates, who have passed the qualifying examination from a foreign university.

Admission granted by the University/Department to any student shall be provisional till the enrolment/registration/enlistment is made by the University. When the admission is granted on the bases of provisional eligibility certificate, the conditions & instructions given by the University should be complied within the time limit fixed by the University or latest by the beginning of next semester otherwise, term kept by such students will be forfeited and no fees on any account will be refunded.

O.M.D.6.Medium of Instruction and Examinations :

1. English or Hindi shall be the medium of instruction & examination.
2. No student shall be allowed to change the medium to appear in the examinations once he/she has opted any medium for particular Semester.
3. No student shall be allowed to opt or write papers with two different medium in one examination.

4. Notwithstanding anything in this ordinance the University may declare English as compulsory medium for instructions and/or examinations for any Master Degree Course keeping academic considerations in mind

O.M.D.7.Mandatory Requirement of Attendance to appear in Examination:

1. The Choice Based Credit System (CBCS) Programme of the University is a comprehensive and continuous evaluation programme .Therefore; no students shall be allowed to appear in the examination unless he has at least 75% (seventy five per cent) attendance separately in all the papers/courses.
2. The respective term/ semester of the student shall be liable for rejection in case the attendance is short in any paper/subject due to the reasons, whatsoever.

   Provided that the Vice chancellor may on the medical ground condone the requirement of attendance not exceeding 10% (ten percent) short to the required minimum attendance on the recommendation of the Head of the concerned Department that the illness was of such a serious nature (recorded by the doctor treating him/her) that it was beyond his or her control to attend the classes during the said period. The production of false certificate in this regard will be a ground for rejection from the Master degree programme and criminal action.

   Provided further that the Vice chancellor may on any other reasonable ground condone 5% (five per cent) attendance lesser than to the required 75% (seventy five per cent) to his satisfaction on the recommendation of the concerned Head of the Department.

3. A student. who represented the university/ institution/ Department/Centre/ State or Nation in Sports, N.C.C., N.S.S. Cultural or other Activities conducted and / or sponsored officially by such institution(s) or agencies shall be entitle to

relaxation of ten percent in the attendance required for the purpose. Such cases should also be recommended by the concerned Head before he/she proceeds for leave and forwarded his application with appropriate documents to prove his participation. Submission of his case without prior permission will not be considered in any case.

xplanation: The University in no case will grant relaxation in attendance to a student, separate or combined on all the heads mentioned in O.M.D. 7 exceeding 15% (fifteen percent). Therefore, no candidate, who does not have 60% (sixty) or more than 60% (sixty per cent) attendance, will not be allowed to appear in the examination for reasons and grounds whatsoever.

.M.D.8. Advisory for Students:

Each Department shall develop 'Advisory Mechanism' to address complex nature of the issues including advice to elect the course(s) from the category of elective courses.

Each Department will appoint Advisors in appropriate number required for the purpose.

3. The Department may Prepare "Student Hand Book" containing the detail of the courses available at the Department. This includes both the 'Core' and 'Elective Course (s)'.

4. A student subject to the availability of the elective courses will be required opt course(s) and submit his 'Option in writing' in triplicate on the prescribed 'Performa' for his registration in the concerned semester to the Head of the Department immediately after the commencement of the respective semester; i.e. on or before the last date notified by the concerned department.

5. The last date for registration and permission for election of subject should not exceed more than two weeks after the commencement of the semester.

6. A student may be permitted to withdraw from his registrati from two weeks from the date of the registration.

7. A student may be permitted to withdraw from/change t elective subject opted by him after the allocation. However, /she will not be allowed to withdraw/ change the same on before the last date fixed for exercising his/her option to opt t same. Provided further that no student will be allowed withdraw or change the option, who has been allowed for la registration/permission or entry.

O.M.D.9. Semester Schedule:

1. A Semester shall consist of the duration of Fifteen weeks (9 working Days)

2. First Semester of each Academic year will commence from Ju 15th of every Academic year.

3. Mid-academic year Semester(s) will commence on th stipulated date notified by the university or within in a period seven days after the completion of the examination of th preceding semester for those students, who fall in this categor can seek provisional admission.
   Their admission will be regularized within a period of seve days after the date of the declaration of the result of the sai semester.

O.M.D.10. Examination Schedule:

1. **Proposed Time of Examinations**: The examinations of th **"Even Semester(s)"** shall commence in the **month of May** i case of "Odd Semester(s)" it may commence in the **month o December.**

Examination Application: A candidate shall be required to apply on the prescribed **'Examination Application Form'** for the 'Semester End Examination' to the Registrar/Dean/ Controller of Examinations through the Head of the concerned Department.

'Examination Application Form' must consist with following particulars and certificates signed by the appropriate authorities:

(a) Candidate has attended minimum number of lectures etc. in respect of all the Courses.

(b) Statement of 'No due Certificate' with regard to all the dues including the fee due on all the heads.

O.M.D.11. Salient Features of the Choice Based Credit System:

1. PG Departments of the different Faculties of the University shall design the Semester based Choice Based Credit System (CBCS) for Master Degree programme. Students will be provided choice to select courses offered by the respective Department of the same faculty or any other Department of the same or any other Faculty, depending on his/her interest, needs and long term goals as well as the feasibility in terms of the available expertise and infrastructure at the Department level.

2. Each PG Department shall design and offer courses after the due consideration and approval of the **Departmental Staff Council (DSC)** and concerned authorities of the University.

3. **Composition of the DSC**: The DSC shall consist of all the regular faculty of concerned Department and the Head of the Department shall chair it. The DSC shall recommend to the Vice chancellor for approval the constitution of "Credit Monitoring Committee **(CMC)**", which consists of the Head of the Department and three senior most teachers of the

department. The Department having the faculty strength of less than three (including HOD) shall co-opt maximum up to two members of the rank of Professor of the same subject from other Universities with the permission of the Vice - Chancellor. The Vice chancellor shall have prerogative to drop, alter or substitute any name suomoto or on the further recommendation of the same. In the absence of the HOD, the DSC/CMC shall be chaired by the next senior faculty member of the concerned Department.

4. Registration of candidates in first and subsequent semesters after the last date will not be permitted. For subsequent semesters, no minimum credit earning criteria will be applicable. Credit registration at least once in all Compulsory Credit Course shall be binding. However, earning all CCC credits for accumulation of the prescribed minimum credits shall not be required.

5. A student shall be evaluated through CCA (Comprehensive Continuous Assessment) and Semester End Examination (SEE). The distribution of marks between the CCA and the Semester end examination shall be in the ratio of 30:70. Each paper/ Course shall consist of 100 marks .However; the Programme governed by the provisions of different Councils in case of inconsistency shall be exempted from this requirement.

6. The candidate will be required to finalize the number of credits at the time of the registration in the semester and no change will be permitted after seven days of the commencement of the semester. The CMC of the concerned Department will forward the credits registration detail of all the students enrolled in the semester. The prior approval of the CMC will be essential and its decision shall be final and binding.

7. Each course shall be assigned a specific number of credits.

8. The marks obtained by a student in a course shall be converted into Grade Points and Credit Points based on scale-normalized marks. The performance of a student in a Semester shall be expressed as Semester Grade Point Average (SGPA) and the combined performance of a student in all the semesters of the Master degree programme shall be expressed as Cumulative Grade Point Average (CGPA).

9. The Department is under obligation to arrange all Compulsory Core Courses and the special number of Elective Core Courses so that the students enrolled for the course can complete/obtain prescribed minimum number of credits. However, it will not be at all obligatory for the department to make provision for all the Elective Core Courses. Department can add, remove or substitute any course and course both in the Core and/ or Elective Course(s).

10. There will be no provision to conduct supplementary, due paper of special examination for any examination. Students with 'F' or "E' Grade will be provided an option to re-register themselves in the said course subject to their desire as 'Self Study Course' or in a 'Regular Course' subject to the feasibility and availability of the resources in the department. The credit earned will not be considered in any case if the candidate has not re-registered and the same has not been approved by the CMC of the department at the time of the registration in the respective semester.

O.M.D.12. Credits: Weightage and Distribution:

1. The term **'Credit'** refers to the weightage given to a course and means the unit by which the academic activity of course work is measured. In these Regulations, One Credit means one hour of Class Room Teaching per week in case of theory papers. For a theory course of 6 credits, 6 'contact hours' per week will be assigned in time-table and thus in a semester 90 contact hours will be assigned to a 5 credit course.

department. The Department having the faculty strength of less than three (including HOD) shall co-opt maximum up to two members of the rank of Professor of the same subject from other Universities with the permission of the Vice - Chancellor. The Vice chancellor shall have prerogative to drop, alter or substitute any name suomoto or on the further recommendation of the same. In the absence of the HOD, the DSC/CMC shall be chaired by the next senior faculty member of the concerned Department.

4. Registration of candidates in first and subsequent semesters after the last date will not be permitted. For subsequent semesters, no minimum credit earning criteria will be applicable. Credit registration at least once in all Compulsory Credit Course shall be binding. However, earning all CCC credits for accumulation of the prescribed minimum credits shall not be required.

5. A student shall be evaluated through CCA (Comprehensive Continuous Assessment) and Semester End Examination (SEE). The distribution of marks between the CCA and the Semester end examination shall be in the ratio of 30:70. Each paper/ Course shall consist of 100 marks .However; the Programme governed by the provisions of different Councils in case of inconsistency shall be exempted from this requirement.

6. The candidate will be required to finalize the number of credits at the time of the registration in the semester and no change will be permitted after seven days of the commencement of the semester. The CMC of the concerned Department will forward the credits registration detail of all the students enrolled in the semester. The prior approval of the CMC will be essential and its decision shall be final and binding.

7. Each course shall be assigned a specific number of credits.

8. The marks obtained by a student in a course shall be converted into Grade Points and Credit Points based on scale-normalized marks. The performance of a student in a Semester shall be expressed as Semester Grade Point Average (SGPA) and the combined performance of a student in all the semesters of the Master degree programme shall be expressed as Cumulative Grade Point Average (CGPA).

9. The Department is under obligation to arrange all Compulsory Core Courses and the special number of Elective Core Courses so that the students enrolled for the course can complete/obtain prescribed minimum number of credits. However, it will not be at all obligatory for the department to make provision for all the Elective Core Courses. Department can add, remove or substitute any course and course both in the Core and/ or Elective Course(s).

10. There will be no provision to conduct supplementary, due paper of special examination for any examination. Students with 'F' or "E' Grade will be provided an option to re-register themselves in the said course subject to their desire as 'Self Study Course' or in a 'Regular Course' subject to the feasibility and availability of the resources in the department. The credit earned will not be considered in any case if the candidate has not re-registered and the same has not been approved by the CMC of the department at the time of the registration in the respective semester.

O.M.D.12. Credits: Weightage and Distribution:

1. The term **'Credit'** refers to the weightage given to a course and means the unit by which the academic activity of course work is measured. In these Regulations, One Credit means one hour of Class Room Teaching per week in case of theory papers. For a theory course of 6 credits, 6 'contact hours' per week will be assigned in time-table and thus in a semester 90 contact hours will be assigned to a 5 credit course.

2. The minimum number of credits to be earned for a degree w be 30 times the number of semesters specified in the syllab for the degree. For example for a two year four semest course the minimum numbers of credit to be earned will be 12 In case where a candidate earned more than the minimu number credits specified, the best credits upto minimu number of credits will be considered for CGPA. However, th total credits for different courses may be different subject to th nature and design of the course concerned and norm formulated by the regulatory authorities.

3. **Distribution of Credits:** Ordinarily, all semester shall have uniform distribution of credits.

4. **Credit Card:** Every department will be under an obligation to maintain academic credit card on the prescribed Performa developed and provided by the University Examination Department for students. The Credit card shall be issued to the students before the commencement of the next semester and a student will be under the obligation to attach the copy of the same with the application for registration as student in the next semester. The department will prepare two copies of the Credit Card one each for the student and for the office record of the department.

O.M.D.13. Assessment and Evaluation:

1. The CBCS is student centric not only in the teaching-learning processes but also in their evaluation process. In CBCS, the evaluation process is divided into two parts. The first part consists of Comprehensive Continuous Assessment (CCA) and the second part consists of the Semester End Examination. The division of marks between the two shall be as per the provisions of this ordinance in ratio 30:70. In the CBCS, the evaluation process shall follow the norm that the faculty, who teaches the course, shall conduct the

Comprehensive Continuous Assessment (CCA) and the Semester End Examination (SEE). The concerned faculty shall be accountable for transparency and reliability of the entire evaluation of the student in the concerned Course.

2. The comprehensive continuous assessment and evaluation (based on the performance of the student) process in CBCS is in continuous model is conducted for the purpose to bring periodically in to the notice of the candidate about his/her progress. The assessment is divided into four discrete components for reporting the scores to the student as earned by him/ her. The CMC shall announce policy for CCA for all the courses in the Department in the beginning of the Semester and the same shall be communicated to the students.

3. The details of the Comprehensive Continuous Assessment and Semester End Examination are summarized in the Table below:

Component	Unit covered in a Course/Paper	Mode of Evaluation	Weightage in Percentage	Marks	Period of Continuous Assessment
CCA-I	First 30%	Assignment/ Field-Project Study/ Tour	10%	10	First part of the Semester. *Completed by the Fifth(5^{th}) Week.
CCA-II	Succeeding 30%	Seminar Presentation	10%	10	Second part of the semester. *Completed by the Tenth(10^{th}) Week.
CCA-III	Remaining 40%	Written/MCQ Test	10%	10	Third part of the Semester. *Completed by the Fifteenth(15^{th}) Week.
CCA-Sub Total			**30%**	**30**	
SEE	100%	**Semester End Examination**	70%	70	To be completed between 18^{th} - 20^{th} week of the Semester.

4. The marks/ grades awarded for the continuous assessment shall be notified to the students within a period of ten days from the date of the completion of the assessment. In case a student fails to secure 12 out of 30 in the CCA (all three components taken). He/she shall not be allowed to appear for the Semester End Examination.

5. Students may seek clarifications within period of a week from the date of the notification of the said result. No clarifications will be entertained after the expiry of the said period.

6. The Department will constitute a committee consists of three members and the Head will be the ex officio chairperson of the Committee to supervise the whole Examination Process.

7. The marks awarded by the teacher(s) are shall be kept confidential unless moderated and approved by the CMC/Dept. Examination committee constituted for the purpose. The Committee shall be under consideration to maintain the standards of the evaluation.

O.M.D.14. Semester End Examination:

1. Semester End Examination shall be conducted between 18th - 20th week of the semester.

2. The duration for per course shall be of three hours for theory courses and four hours for practical/laboratory courses, and half hour for seminar, project work or field study presentations.

3. Question papers for Semester End Examination shall be set keeping in mind to examine the candidates' creativity, comprehension, problem solving capacity, application side of the subject, interpretation and awareness capacities. It should not be expected from the students to reproduce the answers by memorizing the answers.

Paper Setting:

4.1.1. The question paper for the end-semester examinations for each course shall be set by the paper setter appointed for the purpose. It shall be the responsibility of the paper setter to ensure that the syllabus for the course is adequately covered in the question paper.

4.1.2. The questions may comprise; objective type, short notes, Descriptive or any other types as per the policy developed and designed by the department and approved by the competent academic authorities of the university and notified in advance. The University may retain the earlier pattern of setting papers which includes the requirement of 10/8 questions and students may be provided with choice to answer respectively 5/4 questions. The maximum marks of SEE shall be 70. All questions shall carry the marks mentioned in the paper.

4.1.3. The answer scripts for End-Semester Examinations shall be evaluated preferably, by the respective paper-setters and or the mechanism developed by the university.

4.2.1. **Appointment of paper-setter/examiner**: The Boards of Studies in each subject shall draw a panel of paper-setters/examiners ordinarily in the month of August every alternate year and forward the same to the Academic Council which shall approve the panel of Paper-Setter/Examiner. While drawing the panel, the Chairman of the Board of Studies shall take into consideration the confidential aspect of the assignment.

The Vice chancellor if present preside the meeting of the Board but will not cast his vote. In his absence the Chairperson of the Board will preside the meeting.

However, the University may constitute group of teachers to set the paper through workshop method.

Provided further that the university may develop question bank with the help of examiners appointed subject to the provisions of this ordinance.

4.2.2. A person to be appointed as a Paper –Setter must be full time teacher of the University/Colleges having least 3 years Post Graduate teaching experience.

4.2.3. However, in exceptional circumstances, the Vice-Chancellor may relax the condition of experience and or alter or remove any paper setter.

4.3.1. **Moderation Board and moderation of Question Papers:** There shall be a Moderation Board for each subject/programme of study and it shall consist of-

a) Dean of the School concerned

b) Head of the concerned Department,

c) Two senior teachers nominated by the Head of the Department/ Departmental committee recommended by the Dean of school and finally approved by the Vice Chancellor.

4.3.2. The functions of the Board shall be:

a) To ensure that the question paper has been set strictly in accordance with the syllabus and instructions given by the University covering broad areas adequately.

b) To delete question(s) set from outside syllabus and to make necessary substitution, if required.

c) To remove ambiguity in the language of question, if any,

d) To moderate the questions properly giving ample opportunity to candidates of both average and exceptional capabilities,

e) To ensure proper distribution and indication of marks for each question or part or parts thereof, time prescribed for the paper and to correct errors, if any, in this regard.

f) To bring to the notice of the Controller of Examinations lapses or omission on the part of the Paper-Setter, if any.

4. Evaluation:

1. The CBCS is student centric scheme, not only in the teaching-learning processes but also in the evaluation process.

2. In CBCS, the evaluation process is divided into two parts. The first part consists of Comprehensive Continuous Assessment (CCA) and the second part consists of the Semester End Examination.

3. The division of marks between the two shall be as per the provisions of this Ordinance i.e. the CCA will have a weightage of 30 and SEE of 70 out of 100.

4. In the CBCS, the evaluation process shall follow the norm that the faculty, who teaches the course, shall conduct the Comprehensive Continuous Assessment (CCA) and the Semester End Examination (SEE) and the concerned faculty shall be accountable for transparency and reliability of the entire evaluation of the student in the concerned Course.

5. In Comprehensive Continuous assessment and Semester End *Examination* evaluation for each course shall be carried out on the basis of performance of students.

6. Continuous Assessment means 'internal assessment tests'or' sessional tests' and end-on semester means theoretical or practical laboratory examinations along with

Project work/Field study/Educational Tour or preparatic dissertation or Term paper.

7. Each course shall carry credits as may be prescribe Board of Studies time to time in the syllabus. weightage assigned to 'Continuous Assessment' 'Semester End Examination' shall be taken into consideration for the purpose of determining the gr obtained by the student in a course,

8. Grade point shall be calculated for each course in 10 p scale system on the basis of total marks obtained in C and SEE.

9. The Vice chancellor on the recommendation of Board studies and approved by the Academic Council sh appoint Paper Setter-cum Examiner or constitute Board Examiners for each course of study subject to t provisions of this Ordinance.

10. The Semester End Practical Examinations shall be jointl conducted by an external and an internal examiner.

O.M.D.15. Result Preparation:

1. The final result of the examination shall be prepared on th basis of 'comprehensive continuous assessment' an 'semester end examination' along with credits earned by th respective student.

The results after computation and tabulation shall be place before the Vice Chancellor for approval after it has beer moderated/scrutinized by a Board consisting of the Head of the concerned Department and not less than two faculty members appointed by the Dean.

2. **Grade Assignments:**

The grades in a course will be assigned on the basis of combined marks obtained in CCA and SEE. The total of maximum marks in CCA and SEE shall be 100 in all courses with a weightage of 30% to CCA. The letter grades and points will be assigned as per table given below.

Total Marks of CAA and SEE	Grade	Grade Definition	Grade Point
90<X<=100	O	Outstanding	10
80<X<=90	A	Excellent	9
70<X<=80	B	Very good	8
60<X<=70	C	Good	7
50<X<=60	D	Fair	6
39<X<=50	E	Average	5
Les than 40	F	Failed	0

3. **Credit Point Assignments:** Credit points earned in a course will be equal to product of Credit assigned to the course in the syllabus and grade point earned by the student on the basis of combined score in CAA and SEE.

4. **Grade Card and /Mark sheet:**

The University will issue the 'Grade Card' and "Mark Sheet" at the end of each semester to each student registered for the respective course from the examination. The Grade Card shall consist of at least the following particulars:

Basic Details: i. Name of the Student. ii. Father's Name. iii. Roll Number. iv. Enrolment / Registration / Unique Number.

Performance Details: For each course i. Course Code. ii. Course Title, iii Course type, iv. Credit of course, v. CAA marks, SEE Marks, Total Marks, Grade Point, Credit Point

Summary Performance Details: i. Total credit points earne the semester, ii. Total credit earned in the semester, iii. SG iv. Credit earned in Previous Semesters and v. CC (calculated till the end of current semester)

5. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) will be calculated on the credit ighted average of the grade points obtained as given below.

$$CGPA=\frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where

C_i: Number of credits earned in the i^{th} course Semester for which SGPA is to be calculated.

P_i: Grade Point Earned in i^{th} course

i: 1, 2, ...n represents the number of courses in which student is registered in the concerned semester.

$$SGPA=\frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where

C_i: Number of credits earned in the i^{th} course of Course till date for which CGPA is to be calculated.

P_i: Grade Point Earned in i^{th} course

i: 1, 2, ...n represents the number of courses in which a student is registered in the concerned semester.

6. The Cumulative Grade Point Average (CGPA) of all the courses after completing the programme or all semesters at the final stage of study shall be awarded in the Final Cumulative Grade Card. The Final Grade of the Master degree programme will be assigned on the basis of Final CGPA as per table given below.

CGPA	Letter Grade	Classification
9.00 to 10.00	O	Outstanding
8.00 to 8.99	A	Excellent
7.00 to 7.99	B	Very good
5.50 to 6.99	C	Good
4.50 to 5.49	D	Fair
3.60 to 4.49	E	Average
O to 3.59	F	Failed

Equivalent Percentage of marks may be computed as ten times of CGPA. The candidates with CGPA equal to or higher than 5.5 (Letter Grade C) will be considered with good academic record and shall be treated as eligible wherever the minimum percentage of 55% is specified.

In case of LLM examination and other cases wherever specified specifically the candidates with CGPA less than 4.8 will be declared failed.

.M.D.16. Promotion Rules:

A candidate is eligible to continue the classes of next semester immediately after the examinations of one semester is over and he/ she can appear the next semester examination with any number of back/arrear papers.

) A candidate shall have to appear in 1st semester examinations to be eligible for promotion to 2nd semester. If and student could not appear or apply for 1st semester examination then he/she must have to take re-admission in 1st semester afresh.

:) A candidate may get chance to clear the all courses double the duration of the course of study .i e. for 2 year course within four years, for 3 year courses within 6 years, for 4 year courses within eight years and for 5 year courses within ten years.

O.M.D.17.: When a candidate at a 'University Semester End Examination' fails to obtain minimum marks for passing in a particular courses he/she will be required to reappear in that

course without keeping term for that semester. The candida have to reappear in the semester end examination by paying examination fee along with an application form. Such cand when obtains minimum or more than minimum marks for pa in the course, his/her actual marks of reappearance will be ca forward for award of class/CGPA.

O.M.D.18. RANKS:

First and Second Ranks will be awarded after completion o course of study at the end of the final semester examination or day of publication of final results.

On the basis of Average percentage of results as declared an this basis of CGPA, Ranks will be awarded to the candidates subject.

O.M.D.19. General Guidelines:

I) There will be no provision for repeat of betterment i.e. scope appearing and paper again for obtaining better result.

ii) If a candidate after admission in first semester could continue the classes or could not obtain eligibility to admission in first semester examination then he/she is to re-admission in first semester again as fresh and he/she not be allowed to continue study in other semester.

iii) Candidates should be registered under Sant Gahira Gur within 3 months of study, if not obtained earlier. The condition for obtaining Registration must be followed as specified in th Application form. Without Registration number of Sant Gahi Guru no students will be allowed to get admission in fir semester examination or 2nd semester course of study.

iv) The dates of commencement and termination of each semeste shall be as fixed by the Academic Council.

will be obligatory for the Head of Department to take ppropriate measures against Ragging & Gender problems rising in the University Department. In case of occurrence of ny such incident, the violator shall be dealt with very seriously nd appropriate stringent action be taken by the Head of epartment by observing principle of natural justice. The Head Department may appoint a committee to inquire in to the matter which will also observe the principle of natural justice. The committee will submit its report to the head of Department who will forward the, same with his comment there upon to the University Registrar, for taking further necessary action in the matter.

Candidates must forward their applications for admission to University examination to the registrar on or before the prescribed date with a certificate of attendance duly signed by the Head of the Department along with the examination fees fixed by the University.

Thirty percent internal evaluation shall be within the exclusive purview of the concerned Head of Department which requires purity, transparency accuracy in the evaluation & assessment of students. The benefits of re-assessment scheme will not be made available to the students as regards the internal assessment.

ii) There will be theory and practical examination if prescribed in the syllabus, at the end of the fourth semester. The viva voce examination will be conducted at the end of the fourth semester.

x) Subject to the provisions of University Act., Statutes, Ordinances, Rules and Regulations, the University will prepare, design and enact syllabus/prospectus for different Master Degree prorgammes under the different faculties time to time.

O.M.D.20.: EMPOWERING CLAUSE: Subject to the provisions of this ordinance, the University shall run Master Degree programme(s) prepared and approved by the Academic authorities of the University including the Board of Studies and Faculty of the respective subject and approved by the Academic Council and the Executive Council.

Semester Structure Table

Appendi

Note: The Department Staff Council may subject to the appro
the Board of Studies of the respective subject, respe
Faculty and the Academy Council of the University, ma
way of addition or deletion introduction of new or additi
subject or amend the given scheme including the increas
the number of papers under the same code number o
inserting additional or new code numbers.

Provided further that the University may design different CB
scheme for the different Master Degree program
depending on their nature, scope & requisites. In s
situation, the scheme will be notified with semester wise de
evaluation scheme and the syllabus of the respect
subject/course.

Thus the actual semester structure table may vary for the different master degree programme. The one given below is fo an example.

ABC: In tables given below ABC shall be replace by Three Letter Subject Code of the degree programme for example PH for M.Sc. Physics.

The table assumes that six cluster A, B, C, D, E, F are available for Elective Core Courses each involving four courses labeled like A01, A02, Ao3, A04.

The Interdisciplinary courses are classified under OSC

First Semester Structure Table

Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
				L	T	P	Thy	P
ABC 101		CCC	6	4	2	0	3	0
ABC 102		CCC	6	4	2	0	3	0
ABC 103		CCC	6	4	2	0	3	0
ABC S01	Other Supportive Course	OSC	6	4	2	0	3	0
ABC A01/B01/ C01/D01/ E01/F01		ECC	6	4	2	0	3	0
			30					

Second Semester Structure Table

No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 201		CCC	6	4	2	0	3	0
2.	ABC 202		CCC	6	4	2	0	3	0
3.	ABC 203		CCC	6	4	2	0	3	0
4.	ABC 221		PRJ/FST/ EST	6	4	2	0	3	0
5.	ABC A02/B02/ C02/D02/ E02/F021		ECC	6	4	2	0	3	0
				30					

Third Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	
1.	ABC 301		CCC	6	4	2	0	3	
2.	ABC 302		CCC	6	4	2	0	3	
3.	ABC 303		CCC	6	4	2	0	3	
4.	ABC S02		OSC	6	4	2	0	3	
5.	ABC A03/B03/ C03/D03/ E03/F03		ECC	6	4	2	0	3	
				30					

Fourth Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 401		CCC	6	4	2	0	3	0
2.	ABC 402		CCC	6	4	2	0	3	0
3.	ABC 403		CCC	6	4	2	0	3	0
4.	ABC 421		PRJ/FST/ EST	6	4	2	0	3	0
5.	ABC A04/B04/ C04/D04/ E04/F04		ECC	6	4	2	0	3	0
				30					

M.Sc. (Mathematics) FIRST SEMESTER

Course Code	Course Type	Course (Paper/ Subjects)	Credits	Contact Hours per Week			EoSE Duration (Hrs.)	
				L	T	P	Thy	P
SM 101	CCC	Advanced Abstract Algebra (I)	6	4	3	0	3	0
SM 102	CCC	Real Analysis (I)	6	4	3	0	3	0
SM 103	CCC	Topology (I)	6	4	3	0	3	0
SM S01	OSC	Research Methodology & Computer Application : Basic						
SM A01	ECC/CB	Advanced Discrete Mathematics (I)	6	4	3	0	3	0
SM A02	ECC/CB	Differential Geometry						
SM A03	ECC/CB	Mathematical Programming	6	4	3	0	3	0
SM A04	ECC/CB	Complex Analysis (I)						
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TOTAL =30					

M.Sc. (MATHEMATICS) I SEMESTE

COURSE CODE:MSM101 COURSE TYPE: CC

COURSE TITLE	
ADVANCED ABSTRACT ALGEBRA - I	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (20+80)	MARKS: THEORY: 80 PRACTICAL :

Unit 1 - 18 hrs.

Groups - Normal and subnormal series. composition serie Jordan-Holder theorem. Solvable groups. Nilpotent group Direct product, commutator sub-group of group.

Unit 2 - 18 hrs.

Modules - Cyclic modules. Simple modules. semi-simp modules Schuler's Lemma. Free modules. Quotient modul homomorphism of module.

Unit 3 - 18 hrs.

Linear Transformations - Algebra of linear transformatio characteristic roots, matrices and linear transformations.

Unit 4 - 18 hrs.

Canonical Forms - Similarity of linear transformations. Invariant subspaces. Reduction to triangular forms. Nilpoten transformations.Index of nilpotency. Invariants of a nilpotent transformation. The primary decomposition theorem. Jordan blocks and Jordan forms.

Unit 5 - 18 hrs.

Smith normal form over a principal ideal do-ain and ranl Fundamental structure theorem for finitely generated module over a principal ideal domain and its applications to finitel generated abelian groups.

UGGESTED READINGS

P.B. Bhattacharya , S.K. Jain, and S.R. Nagpaul, Basic Abstract Algebra III Edition) Cambridge University press, 1997. (Indian Edition)

I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd.

D. s. Malik, |.N. Mordeson and M.K.Sen, Fundamental of Abstract Algebra McGraw Hill (International Edition), New york. 1997.

Vivek Sahai and Vikas Bist: Algebra, Narosa publishing House, 1999.

M.Artin, Algebra, Prentice -Hall of India, I991.

M.Sc. (MATHEMATICS) I SEMESTE
COURSE CODE:MSM102 COURSE TYPE: C

COURSE TITLE REAL ANALYSIS - I	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL :
MARKS: THEORY: 100(20+80)	MARKS: THEORY: 80 PRACTICAL

Unit 1 - 23 hrs.

The Riemann-Stieljes Integral: Definition and existence o Riemann-Stieltjes integral, Properties of the Integral. integration and differentiation, the fundamental theorem of Calculus. integration of vector-valued functions. Rectifiable curves.

Unit 2 - 14 hrs.

Sequences and series of functions: pointwise and unifo convergence, Cauchy's criterion for uniform convergence, M teslTn-test, Weiestrass M-test, Abel's and Dirichlet's tests uniform convergence. uniform convergence and continu uniform convergence and Riemann- Stieltjes integrati uniform convergence and differentiation, Weierstra approximation theorem.

Unit 3 - 20 hrs.

Power series: Radius of convergence. series of arbitra terms, convergence divergence & ascillation, uniquene theorem for power series, Abel's and Tauber's theorems. Rearrangements of terms of a series. Riemann's theorem.

Unit 4 - 18 hrs.

Functions of several variables: linear transformatio Derivatives in an open subset of Rn, Chain rule, Part derivatives. directional derivative, derivative as a line transformation, contraction principle- interchange of the ord of differentiation, Derivatives of higher orders, Taylor's theore Inverse function theorem, Implicit function theorem.

it 5 - 15 hrs.

obians extremum problems with constraints, Lagrange's tiplier method Differentiation of integrals. Partitions of unity. erential forms.

GGESTED READINGS

Principle of Mathematical Analysis By Walter Rudin (3rd dition) McGraw-Hill Kogakusha, 1976, International tudent edition.

Real Analysis By H.L.Roydon, Macmillan Pub.Co.Inc.4th Edition, New York.1962.

T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.

Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.

G.de Barra, Measure Theory and Integration, Wiley Eastern Limited, 1981.

E. Hewitt and K. Stromberg. Real and Abstract Analysis, Berlin, Springer, 1969.

P.K. fain and V.P. Gupta, Lebesgue Measure and Integration, New Age International (PJ Limited Published, New Delhi ,1986 Reprint 2000).

Walter Rudin, Real & Complex Analysis, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 1966.

M.Sc. (MATHEMATICS) I SEMEST

COURSE CODE:MSM103 COURSE TYPE: C

COURSE TITLE COURSE TITLE : TOPOLOGY - I	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: THEORY: 90 PRACTICAL :
MARKS: THEORY: 100(20+80)	MARKS: THEORY: 80 PRACTICAL

Unit - 1 25 hrs.

Countable and uncountable sets. Infinite sets and the Axiom choice. Cardinal numbers and its arithmetic. Schroed Bernstein theorem. Cantor's theorem and the continu hypothesis Zorn' s lemma, well-ordering theorem.

Unit - 2 20 hrs.

Definition and examples of topological spaces. Closed sets Closure. Dense subsets. Neighborhoods. Interior, exterior and boundary. Accumulation points and derived sets' Base and sub-bases, Sub spaces and relative topology.

Unit - 3 15 hrs.

Alternate methods of defining a topology in terms of terms Kuratowski Closure Operator and Neighborhood Systems Continuous functions and homeomorphism. First and Seco spaces. Lindelof's theorems. Separable spaces. Second countability and separability.

Unit - 4 15 hrs.

Separation axioms-; Their Characterizations and basic properties' Urysohn's lemma' Tietze extension theorem.

Unit - 5 15 hrs.

Compactness, Continuous functions and compact sets, Bas properties of Compactness. Compactness and finit intersection property. Sequentially and countably compa

. Equivalence of compactness, countable compactness l sequential compactness in metric space. Local mpactness and one point compactification, Stone-Cech mpactification.

GGESTED READINGS.

James R. Munkres, Topology, A First Course, Prentice Hall of India Pvt. Ltd., New Delhi,2000.

K.D.Joshi, Introduction to General Topology, Wiley Eastern Ltd., 1983'

J. Dugundji, Topology, Allyn and Bacon,1966 (reprinted in India by Prentice Hall of India Pvt. Ltd.).

George F. Simmons, Introduction to Topology and modern Analysis, Mc Graw- Hill book Company, 1963.

J. Hocking and G. Young Topology, Addison-WileyReading,L96T.

I.L.Kelley, General Topology, vin Nostrand, Reinhold co., NewYork, 1995.

M.I.Mansfield, Introduction to Topology, D.Van Nostrand Co' Inc' Princeton N. J. 1963

B. Mendelson, Introduction to Topology, Allyn & Bacon' Inc" Boston, 1962.

C. Berge, Topological Spaces, Macmillan Company, NewYork, 1963'

0. S.S. Coirns, Introductory Topology, Ronald Press, New York, 1961.

M.Sc. (MATHEMATICS) **I SEMEST**

COURSE CODE:MSMS01 **COURSE TYPE: C**

COURSE TITLE	
RESEARCH METHODOLOGY & COMPUTER APPLICATION: BAS	
CREDIT: **THEORY: 6 PRACTICAL : 0**	**HOURS: 0** **THEORY: 90 PRACTICAL :**
MARKS: **THEORY: 100(20+80)**	**MARKS:** **THEORY: 80 PRACTICAL**

OBJECTIVE :

Understands the concept and place of research in concern subject.

Gets acquainted with various resources for research.

Becomes familiar with various tools of research

Gets conversant with sampling techniques, methods of research and techniques of analysis of data

Achieves skills in various research writings

- Gets acquainted with computer Fundamentals and Office Software Package.

Unit -1 15 hours

CONCEPT OF RESEARCH : Meaning and characteristics research , Steps in research process , Types of research - Basic, applied and action research (ii) Quantitative and qualitative research , Area of research in concern discipline SELECTION OF PROBLEM FOR RESEARCH :Sources o the selection of the problem ,Criteria or selection of the problem, Drafting a research proposal, Meaning and types variables, Meaning and types of hypotheses.

Unit -2 15 hours

TOOLS OF RESEARCH : Meaning and general informatio about construction procedure of Questionnaire, {ii) Intervie (iii) Psychological test, {iv) observation (v) Rating scale (vi) Attitute srl and (vii) check list , Advantages and disadvantages of above tools

SAMPLING :Meaning of population and sample , importan and characteristics of sample, Sampli' techniques - probability sampling: random sampling, stratified rando

pling, systematic sampling, cluster sampling iii Non- ability -sampling: incidental sampling, purposive sampling, ter sampling.

-3 15 hours

THOD OF RESEARCH: Meaning and conducting edure of following methods of research Historical method , vey method , Case study , Causal comparative method, velopmental methods, Experimental methods.

t -4 15 hours

AETMENT OF DATA: level of measurements of data, Steps treatment of data editing code classification, tabulation, alysis and interpretation of results

RITING RESEARCH REPORT Sections of report: eliminary section , Content section: various chapters, pplementary section: appendices, references' abstract, rmat and style.

it-5 15hours

omputer Fundamentals

omputer System: Features, Basic Application of Computer, eneration.

arts of computer System : Block Diagram of computer ystem; Central Processing unit (CPU) ; Concepts and types of ardware and Software, Input Devices - Mouse, Keyboard, canner, Bar Code Reader, track ball ; Output Devices - lonitor, Printer, Plotter' Speakers.

omputer Memory - primary and secondary memory, magnetic nd optical storage devices.

perating systems - MS windows : Basics of windows os ; omponents of windows -icons, taskbar, activating windows, sing desktop, title bar, running applications, expiorilng omputer, managing files and folders, copying and moving files nd folders ; Control panel :

isplay properties, adding and removing software and ardware, setting date and time, screensaver and appearance , Windows Accessories : Calculator, Notepad' WordPad, Paint rush, Command Prompt, Windows Explorer.

UNIT - 6 15 HRS.

Office Software Package

Word Processing - MS Word :Creating, Saving, Opening, Editing, Formatting' Page Setup and printing Documents ; Using tables, pictures, and charts in Documents ; Using M Merge sending a document to a group of people and creat form, letters and label'

Spreadsheet - MS Excel Opening a Blank or New Workbo entering data'/Function Formula into worksheet cell, Savi Editing, Formatting' Page Setup and printing Workboo presentation Software - MS power point :.creating a enhancing a presentation, modifying a presentation, worki with visual elements, adding Animations & Transitions a delivering presentation.

SUGGESTED READINGS

1. Agrawal, Y.P. (1988) . Better sampling : Concepts, Techniques a Evaluation. New Delhi : sterling Publishers Private Ltd. Best, J. (1993).
2. Research in Education (6th ed.)New Delhi : Prentice-Holl of India P Ltd.
3. Broota, K. D. (1992) Experimental design in Behavioral Research (2 ed.)
4. New Delhi : Wiley Eastern Limited.
5. Dasgupta, A. K. (1968). Methodology o| Economic Researc Bombay: Asia Publishing House. Edwaras.
6. A. L. (1957). Techniques of Attitude scale construction. New York Appleton-contury
7. Goll, M. D., Gall, J.P. and Borg, W.R. (2007). Educational Research An introduction
8. (8th ed.) Coston : Allyn and Bacon.
9. Garrett, H. E. & Woodworth, R.S. (1969). statistics in Psychology an Education 'Bombay :vakils, Fecffer& Simons Pvt. Ltd.
10. Goode, w. J. &Hott, Pout K. (1952). Methods in social Research' Ne York : McGrow-Hill'
11. Gopol, M. H. (1964). An Introduction to research Procedure in soci sciences' Bombay : Asia Publishing House.
12. Hillway, T. (1964) introduction to Research (2nd ed.) Noston Houghton Miffin.
13. Hyman, H. H., et al. (1975). Interviewing in Social Research'
14. Chicago : University of Chicago Press'

Kerlinger, F- N. (1983) Foundation of Behavioural Research. (2'd Indian Reprint)

New York: Hoft, Rinehart and Winston'

Kothari, C. R. (2007) Research Methodology: Methods &Techniques(3rd ed.)

New Delhi Wishwa Prakashan. Fundamentals Of Computers, Dr' P' Mohon' Himalaya Publishing house

Microsoft First Look office 2010, K Murray, Microsoft -Press'

Fundamental Of Research Methodology; and Statistics, Y.K. Singh, New Age

International (P) Limited, Publishers. Practical Research Methods' Dr catherine Dawson'

The Essence Of Research Methodology , Jan Jonker & Bartjan Pennink, springer.

M.Sc. (MATHEMATICS) **I SEMESTER**

COURSE CODE:MSM A01 **COURSE TYPE: ECC/C**

COURSE TITLE ADVANCED DISCRETE MATHEMATICS-I	
CREDIT: **THEORY: 6 PRACTICAL : 0** **MARKS:** **THEORY: 100(20+80)**	**HOURS: 0** **THEORY: 90 PRACTICAL : 0** **MARKS:** **THEORY: 80 PRACTICAL :**

Unit -1 18 hour

Formal Logic-Statements. Symbolic representation ar Tautologies. Quantifiers, Predicates and Validity. Proposition Logic. Semigroup & Monoids-Definitions and Examples Semigroups and monoids (including those pertaining concatenation Operation).

Unit -2 18 hour

Homomorphism of semigroups and monoids. Congruenc relation and Quotient Semigroups. Subsemigroup an submononoids. Directed products. Basic Homomorphisr Theorem.

Unit -3 18 hour

Lattices- Lattices as partially ordered sets. their properties. lattices a Algebraic Systems. Sublattices, Direct products e.g., Complete, Complemented and Distributive Lattices. Boolean Algebra- Boolean Algebra as Lattices. Various Boolean Identities. The Switching Algebra. Subalgebras.

Unit -4 18 hour

Directed Products and Homomorphism. Join-Irreducible elements Atoms and Minterms. Boolean Forms and their Equivalence Minterm Boolean Forms. Sum of Products Canonical Forms. Minimization of Boolean Functions. Application of Boolean Algebra to Switching Theory (using AND, OR & NOT gates). The Karnaugh Map Method.

it -5 18 hour

ammars and Languages- Phrase-structure Grammars. writing rules. Derivations. Sentential Forms. Language nerated by a Grammar. Regular, Context-Free, and Context nsitive Grammars and Languages. Regular sets, Regular xpression and the pumping
mma. Kleene's Theorem. Notions of Syntax Analysis, Polish otations. Conversion of Infix Expression to polish Notations. he Reverse Polish Notation.

UGGESTED READINGS

. Elements of Discrete Mathematics By C.L.Liu

. J.P Tremblay & R.Manohar, Discrete Mathemmatical Structures with applications to Computer Science, McGraw -Hill Book Co. 1997

. J.L. Gersting, Mathematical structures for computer science, computer science Press, New York

4. Seymour Lepschutz, Finite Mathematics edition, McGraw Hill Book company ,New York

5. S. Wiitala, Discrete Mathematics - A Unified Approach ,McGraw - Hill Book co.

6. J.E. Hopcroft and J.D. ullman, Introduction to Automata Theory, Language & Computation, Narosa Publishing House.

7. C. L. Liu, Elements of Discrete Mathematics, McGraw -Hill Book Co.

8. N.Deo, Graph Theory with application to Engineering and computer science Prentice Hall of India.

M.Sc. (MATHEMATICS)

COURSE CODE:MSM A02 I SEMEST

COURSE TYPE: ECC

COURSE TITLE DIFFERENTIAL GEOMETRY	
CREDIT: THEORY: 6 PRACTICAL : 0 MARKS: THEORY: 100(20+80)	HOURS: THEORY: 90 PRACTICAL : MARKS: THEORY: 80 PRACTICAL

Unit -1 18 hour

SPACE CURVES

Definition of a space curve- Are length - tangent - normal a binormal - curvature and torsion - contact between curves a surfaces - tangent surface involutes and evolutes - Intrinsi equations - Fundamental Existence Theorem for space curv Helies Chapter I: Sections 1 to 9

Unit -2 18 hour

INTRINSIC PROPERTIES OF A SURFACE

Definition of a space curve on a surface of revolution - Helicoi - Metric - Direction coefficients - families of curves - Isomatr correspondence - Intrinsic properties. Chapter II: Sections 1 9

Unit -3 18 hour

GEODESICS

Geodesics - Canonical geodesic equations - nominal property geodesics - Existence Theorems - Geodesic parallels - Geodesic curvature - Gauss- Bonnet Theorem - Gaussian curvature - surface o constant curvature.

Chapter II : Section 10 to18

Unit -4 18 hour

NON INTRINSIC PROPERTIES OF A SURFACE

The second fundamental from - Principal curvature - Lines of curvature- Developable associated with space curves and with curves on surfac - Minimal surfaces - Ruled surfaces.

pter III : Section 1 to 8

it -5 18 hour

FERENTIAL GEOMETRY OF SURFACES

ndamental Equations of Surface Theory- Fundamental Existence eorem for surfaces - Compact surfaces whose points are umblics - lbert's lemma - Compact surface of coustant curvature - Complete rfaces.

apter III : Sections 9 and 10 Chapter IV : Only Section 1 to 5

ecommended Text

J. Willmore, An Introduction to Differential Geometry, oxford niversity Press,(I7th Impression) New Delhi 2002' (Indian rint)

eference Books

1. Struik, D.T. Lectures on classical Differential Geometry, Addison - wesley' Mass. 1950.
2. Kobayashi. S. and Nomizu. K. Foundations of Differential Geometry, Interscience Publishers, 1 963'
3. Wilhelm Klingenberg: A course in Differential Geometry, Graduate Texts in Mathematics, Springer-Verlag 191 8'
4. J.A. Thorpe Elementary topics in Differential Geometry, under - graduate Tex in Mathematics, Springer - Verlag1979'

M.Sc. (MATHEMATICS) I SEMEST

COURSE CODE:MSM A03 COURSE TYPE: ECC

COURSE TITLE MATHEMATICAL PROGRAMMING	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: 0 THEORY: 90 PRACTICAL :
MARKS: THEORY: 100(20+80)	MARKS: THEORY: 80 PRACTICAL

UNIT 1 18 hours

INTEGER LINEAR PROGRAMMING

Types of Integer Linear Programming Problems - Concept of Cutt Plane -Gomory's All Integer Cutting Plane Method - Gomory's mix Integer Cutting Plane method - Branch and Bound Method. - Ze One Integer Programming. Dynamic Programming: Characterist of Dynamic Programming Problem - Developing Optimal Decisi Policy - Dynamic Programming Under Certainty -DP approach solve LPP. Chapter-7:7.1 -7.7. chapter 20:20.1 -20.

UNIT 2 18 hours

CLASSICAL OPTIMIZATION METHODS

Unconstrained Optimization - Constrained Multi-variabl Optimization with Equality Constraints - Constrained Mult vrariable Optimization with inequality Constraints. Non-linea Programming Methods: Examples of NLPP - General NLPP Graphical solution - Quadratic Programming - Wolfe's modifie Simplex Methods - Beale's Method. chapter-23 : 23.1 - 23.4 Chapter-24: 24.1 - 24.4

UNIT 3 18 hours

THEORY OF SIMPLEX METHOD

Canonical and Standard form of LP - Slack, and Surplus Variables - Reduction of any Feasible solution to a Basic Feasible solution - Alternative Optimal solution -Unbounded solution - Optimality conditions - Some complications and their resolutions - Degeneracy and its resolution. Chapter-25: 25.1 - 25.4, 25.6-25.9

UNIT 4 18 hours

VISED SIMPLEX METHOD

ndard forms for Revised simplex Method - Computational edure for Standard form I - comparison of simplex method Revised simplex Method. Bounded Variables LP problem: simplex algorithm. Chapter-26:26.I - 26.4 Chapter-28: 28.1, 2

UNIT 5 18 hours

RAMETRIC LINEAR PROGRAMMING

iation in the coefficients cj , variations in the Right hand le, bi .

al Programming: Difference between LP and GP approach ncept of Goal Programming - Goal Programming Model mulation - Graphical Solution Method of Goal Programming - odified Simplex method of Goal Programming. apter -29:29.1 - 29.3. Chapter -8: 8.1 - 8.4, 8.6 and 8.7.

ecommended Book.

1. J.K.Sharma, Operations Research, Theory and Applications- Third Edition (2007) Macmillan India Ltd.

eference Books

1. Hamdy A. Taha, Operations Research, (seventh edition) Prentice - Hall of India Private Limited, New Delhi,1997.
2. F.S. Hillier & J.Lieberman Introduction to Operation Research (7th Edition) Tata- McGraw Hill company, New Delhi, 2001.
3. Beightler. C, D. Phillips, B. Wilde ,Foundations of Optimization (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979.
4. S.S. Rao - Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi, 1990.

M.Sc. (MATHEMATICS) **I SEMESTER**

COURSE CODE:MSM A04 **COURSE TYPE: ECC/**

COURSE TITLE COMPLEX ANALYSIS I	
CREDIT: **THEORY: 6 PRACTICAL : 0** **MARKS:** **THEORY: 100(20+80)**	**HOURS:** **THEORY: 90 PRACTICAL : 0** **MARKS:** **THEORY: 80 PRACTICAL :**

UNIT 1 18 HOURS

Complex Integration, Contour Integral, Cauchy's Theorem, Cauchy's integral formula, Higher order derivatives, Morera's theorem, Cauchy's inequality and Liouville's Theorem.

UNIT 2 18 HOURS

The Fundamental theorem of Algebra. Taylor's series. Maximu Modulus principle. Schwarz's lemma, Isolated singularity.

UNIT 3 18 HOURS

Bilinear transformation -its properties and classification. conformal mapping, calculus of residues.

UNIT 4 18 HOURS

Spaces of analyic function. Hurwitz's mapping theorem. Montel's theorem. Riemmam mapping theorem.

UNIT 5 18 HOURS

Weierstrass's Factorisation theorem. Gamma Function and its properties. Riemann Zeta Functional equation, Runge's theorem. Mittag Leftler's theorem

SUGGESTED READINGS

Books Recommended :-

1. L.V. Ahlfors, Complex Analysis, Mc Graw-Hill,1979.
2. D. Sarason, Complex Function theory, Hindustan book

Agency

Walter Rudin, Real and complex analysis. McGraw-Hill Book company

S. Punnusamy Foundation of complex Analysis, Narosa Publishing House 1997.

J.B. Conway Function of one complex Variable. Sprinser Verlag.

M.Sc. (Mathematics) SECOND SEMESTE

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours per Week			EoSE Dutatio (Hrs.)	
				L	T	P	Thy	
MSM 201	CCC	Advanced Abstract Algebra (II)	6	4	3	0	3	
MSM 202	CCC	Real Analysis (II)	6	4	3	0	3	
MSM 203	CCC	Topology (II)	6	4	3	0	3	
MSM S02	OSC	Social Outreach And Skill Development	6	0	0	9	0	
MSM B01	ECC/CB	Advanced Discrete Mathematics (II)	6	4	3	0	3	0
MSM B02	ECC/CB	Algebraic Number Theory						
MSM B03	ECC/CB	Complex Analysis (II)						
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TO TAL =30					

.Sc. (MATHEMATICS) II SEMESTER

URSE CODE:MSM201 COURSE TYPE: CCC

COURSE TITLE

ADVANCED ABSTRACT ALGEBRA - II

REDIT: HEORY: 6 PRACTICAL : 0	HOURS: THEORY: 90 PRACTICAL : 0
MARKS: HEORY: 100 (20+80)	MARKS: THEORY: 80 PRACTICAL : 0

Unit 1- 18 Hrs.
Noetherian and Artinian rings and Modules, Rings - Hilbert basis theorem. wedderburn Artin theorem , uniform Modules primary Modules , Noether - Lasker theorem.

Unit 2- 18 Hrs.
Field theory - Extension fields , Algebraic and transcendental extensions , Separable and inseparable extensions.

Unit 3- 18 Hrs.
Normal extensions , Splitting field - perfect fields , Finite field, Primitive Elements, Algebraically closed fields, Automorphisms of extensions.

Unit 4- 18 Hrs.
Galios Field and extensions , Fundamental theorem of Galios theory. Solution of polynomial equations by radicals.

Unit 5- 18 Hrs.
Insolvability of the general equation of degree 5 by radicals , Rational Canonical form, Generalised Jordan form over any field.

SUGGESTED READINGS

1. P.B. Bhattacharya, S.K. Jain. S.R. Nagpaul: Basic Abstract Algebra, Cambridge University press.
2. I.N. Herstein: Topics in Algebra- Wiley Eastern Ltd.

3. Quazi Zameeruddin and Surjeet Singh : Modern Algeb

4. M. Artin : Algebra prentice - Hall of India , 1991

5. PM.Cohn : Algebra, Vol.I.II. III,John Wiley & Sons,

6. N. Jacobson: basic Algebra Vols. I, II, W.H. Freeman

7. S.lang , Algebra , 3'd edition. Addison -Wesley

8. D.S. Malik, J.N. Modeson and M.K.Sen : Fundamentals Abstract Algebra, Mc Graw - Hill .international Edition,1

9. K.B.Datta. : Matrix and linear Algebra, prentice Hall of In pvt. Ltd.,New Delhi,2000

10.S.K.Jain, A.Gunawardena and P.B.Bhattacharya : Basi Linear Algebra with MATLAB, Key college publishing (Springer - verlag) 2001

11.S. Kumaresan : Linear Algebra. A. Geometric Approach, prentice - Hall of India.

12-Vivek Sahai and Vikas Bist: Algebra, Narosa publishing house, 1999.

M.Sc. (MATHEMATICS) II SEMESTER

COURSE CODE:MSM202 COURSE TYPE: CCC

COURSE TITLE	
REAL ANALYSIS - II	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100(20+80)	MARKS: THEORY: 80 PRACTICAL : 0

Unit-1 18 Hrs.

MeasurableSets: Measures and outer measures ,Lebesgue outer measure,Regularity, Lebesgue measurable set, properties of measurable set, Boral sets and their measurability, Non measurable sets.

Unit-2 18 Hrs.

Measurable Functions: Definition and properties, step and characteristics function, continuous function, sets of measure zero sequence of function, Egoroff's theorem, Riesz theorem, Lebesgue bounded and dominated convergence theorem, Beppo-Levies theorem, Fatou's lemma Lusin Theorem.

Unit-3 18 Hrs.

Lebesgue Integral: Lebesgue sum. integral of bounded and unbounded function, Integral of non negative functions. comparision of Riemann and Lebesgue integral, general lebesgue integral.

Unit-4 18 Hrs.

Differentiation And Integration: Absolute continuous function, Dinni derivatives, Differentiation of monotonic function, Lebesgue differentiation theorem, function of bounded variation, differentiation of an integral, integral of the derivatives.

Unit-5 18 Hrs.

Lebesgue Lp- spaces: The classes Lp . Convex functio Jensen's Inequality, Holder and Minkowski inequatities, Cauchy's Schwartz inequality, Lp Banach space, Riesz Fischer theorem

SUGGESTED READINGS

1. Principle of Mathematical Analysis by W. Rudin
2. Real Analysis by H.L.rudin
3. T.M. apostol , Mathematical analysis Narosa publishin House,New Delhi
4. A.J. white,Real Anall-sis -an intrftuction .Addison - we publishing co. Inc .1968.
5. G.De Barra, Measure Theory- and Integration, Wiley Eastern Limited,1981
6. E. Hewitt and K.Stromberg.Real and Abstract Anaiysis ,Berlin,springer.
7. P.K.Jain and V.P. Gupta, Lebesgue Measure and Integration ,New Ale International (P) Limited New-Delh
8. L.P.Natanson,theon-of Functions of a Real Variable ,Vo Fredrick Ungar publishing Co. 1961
9. H. Williamson, Lebesgue Integration, Holt Rinehart and Winston,Inc. New york.
10. K. R. Parthasararhv Inroduction to Probability and Measure , Macmillan Company of India Ltd- Delhi
11. Inder K. Rana - An Introduction to Measure and Integration ,Narosa publishing House. Delhi.

Sc. (MATHEMATICS) **II SEMESTER**

URSE CODE:MSM203 **COURSE TYPE: CCC**

COURSE TITLE	
COURSE TITLE : TOPOLOGY - II	
REDIT:0 **HEORY: 6 PRACTICAL : 0**	**HOURS:0** **THEORY: 90 PRACTICAL : 0**
MARKS: **THEORY: 100(20+80)**	**MARKS:** **THEORY: 80 PRACTICAL : 0**

Unit -1 23 Hrs.

onnected spaces , Connectedness on the real line, omponents , Locally connected spaces.

Unit -2 20 Hrs.

roduct Spaces , Tychonoff Product topology in terms of tandard sub base and its characterizations. Projection naps , Connectedness and product Spaces, compactness nd Product Spaces (Tychonoff Theorem). Countability and product spaces.

Unit -3 17 Hrs.

Embedding and Metrization, Embedding Lemma and Tychonoff embedding. The Urysohn's metrization theorem, Metrization theorems and paracompactness_Local Finiteness ,The Nagata -Smimov metrization theorem, Paracompactness, The Smirnov metrization theorem

Unit -4 12 Hrs.

Nets & Filter: topology and Convergence of nets, Hausdorfress and nets, Filters and their convergence, Canonical way of converting nets to filters and vice versa. Ultra filters and compactness.

Unit -5 18 Hrs.

The fundamental group and covering spaces - Homotopy of paths, The fundamental groups' Covering spaces The

fundamental group of the circle and the fundamental theo of Algebra.

SUGGESTED READINGS

1. James R. Munkres. Topology, A First course, Prentic Hall of India Pvt.Ltd.,Neu' Delhi-
2. K.D- Joshi, Introduction to General Topology, wiley Eastern Ltd.
3. J.Dugundgi.Topology- Allyn and Bacon, (reprinted in India by prentice Hall of India Pvt.Ltd.)
4. George F-Simmons - Intoduction to Toporogy. and Modern Analysis, Mcgaw- Hill Book Company)
5. J.Hocking and G-Young - Topology, Addison-wiley Reading
6. J.L.Kelley, General Topology, van Nostrand Reinhold c ,New york
7. L.steen and J.Seebach - Counter examples in Topolog Holt Rinehan and Winston ,New York.
8. W.Thron, Topologically Stmctures Holt, Rineharts and Winston ,New Delhi 9.Topology,by J.N.Sharma & J-P.Cha ,han, Krishna PrakashanMedia (p) Ltd. Meerut.

M.Sc. (MATHEMATICS) **II SEMESTER**

COURSE CODE:MSMB01 **COURSE TYPE: ECC/CB**

COURSE TITLE

ADV. DISCRETE MATHEMATICS (II)

CREDIT: 0	**HOURS: 0**
THEORY: 6 PRACTICAL : 0	**THEORY: 90 PRACTICAL : 0**
MARKS:	**MARKS:**
THEORY: 100(20+80)	**THEORY: 80 PRACTICAL : 0**

UNIT 1 18 HOURS

Graph Theory - Definition of (Undirected) Graphs, Path, Circuits, & Subgraphs, Induced subgraphs ,Degree of a vertex, connectivity ,(planar Graphs and their properties,Trees, Euler's Formula for connected planar Graphs, Complete & Complete Bipartite Graphs .Kurtowski's Theorem (statement only) and its use.

UNIT 2 18 HOURS

Spanning Trees, cut sets. Fundamental cut -sets ,and cycle ,Minimal spanning Trees and Kruskals Algorithm Matrix Representations of Graphs, Euler's Theorem on the Existence of Eulerian Paths and Circuits.

UNIT 3 18 HOURS

Graphs .In Degree and out degree of a vertex, weighted undirected Graphs, Dijkstra's Algorithm, Strong Connectivity & Marshall's Algoritm, Directed Trees ,Search Trees, Tree Traversals

UNIT 4 18 HOURS

Introductory Computability Theory- Finite State Machines and their Transition, Table Diagrams ,Equivalence of Finite State Machines, Reduced Machines, Homomorphism

UNIT 5 18 HOURS

Finite Automata Acceptors- Non - deterministic , Finite Automata and equivalence of its power to that of Deterministi

Deterministic,Moore and Mealy Machines Turning Machine and Partial Recursive Functions

SUGGESTED READINGS

1. Elements of Discrete Mathematics By C.L.Liu
2. Graph Theory and its application By N.Deo
3. Theory of computer science By K.L.P.Mishra and N. chandrashekaran
4. J.P Tremblay & R.Manohar, Discrete Mathemmatical Structures with applications to Computer Science, McGraw -Hill Book Co. 1997
5. J.L. Gersting, Mathematical structures for computer science, computer science Press, New York
6) Seymour Lepschutz, Finite Mathematics edition, McGraw Hill Book company ,New York
7) S. Wiitala, Discrete Mathematics - A Unified Approach ,McGraw - Hill Book co.
8) J.E. Hopcroft and J.D. ullman, Introduction to Automata

M.Sc. (MATHEMATICS) II SEMESTER

COURSE CODE:MSMB02 COURSE TYPE: ECC/CB

COURSE TITLE

ALGEBRAIC NUMBER THEORY

CREDIT:0	HOURS: 0
THEORY: 6 PRACTICAL : 0	THEORY: 90 PRACTICAL : 0
MARKS:	MARKS:
THEORY: 100(20+80)	THEORY: 80 PRACTICAL : 0

Unit 1- 18 Hrs.

ALGEBRAIC BACKGROUND

Rings and Fields -Factorization of Polynomials ,Field Extensions , Symmetric Polynomials, Modules, Free Abelian Groups

Unit 2- 18 Hrs.

ALGEBRAIC NUMBERS

Algebraic numbers , Conjugates and Discriminants, Algebraic Integers, Integral Bases, Norms and Traces .Rings of Integers.

Unit 3- 18 Hrs.

QUADRATIC AND CYCLOTOMIC FIELDS

Quadratic Fields and Cyclotomatic Fields : Factorization into Irreducible .

Trivial Factorization : Factorization into irreducible, Examples of non- unique factorization into irreducible.

Unit 4- 18 Hrs.

Prime Factorization - Euclidean Domains ,Euclidean Quadratic fields ,consequences of unique factorization .The Ramanujan - Nagell theorem

Unit 5- 18 Hrs.

Prime Factorization of Ideals. The norms of an Ideal. Non unique Factorization in Cyclotomic Fields.

SUGGESTED READINGS

Steward and D. Tall, Algebraic Number Theorl- and Fermat's Last Theorem A.K.peters Ltd. Natrick,Mass 2002

M.Sc. (MATHEMATICS) II SEMESTER

COURSE CODE:MSMB03 COURSE TYPE: ECC/CB

COURSE TITLE	
COMPLEX ANALYSIS-II	
CREDIT:	**HOURS:**
THEORY: 6 PRACTICAL : 0	**THEORY: 90 PRACTICAL : 0**
MARKS:	**MARKS:**
THEORY: 100(20+80)	**THEORY: 80 PRACTICAL : 0**

Unit 1- 18 Hrs.

Meromorphic function, The Argument Principal, Rouche's Thorem, Inverse Function Theorem, open mapping theorem, Residues, cauchy's residue theorem ,Evaluation of integrals ,Branches of many valued function with special reference to arg z, Logz and z.

Unit 2- 18 Hrs.

Analytic Continuation, Uniqueness of analytic continuation along a curve, Power series method of analytic continuation - Schwartz Reflection principle.

Unit 3- 18 hrs.

Harmonic function on a disc, Harnack's Inequality and theorem, Canonical product, Jensen's Formula, Poisson - Jenson formula Hadmard's three circle theorem.

Unit 4- 18 Hrs.

Order of an entire function, Exponent of Convergence, Borel's Theorem, Hadmards Factorization Theorem.

Unit 5- 18 Hrs.

The range of an analytic function Bloch's Theorem, The Little Picard theorem, Montel Caratheodary and The Great picard Theorem.

SUGGESTED READINGS

L.V.Ahlfors - Complex Analysis ,Mc Graw Hill ,1979

2) D-Sarason, Complex Function Theory, Hindustan Book Agency, Delhi. walter Rudin, Real and complex analysis, McGraw -Hill Book company 1996

4) E-C-Titchmash.The Theory of Functions ,Oxford University press ,London

5) S. Ponnusamy Foundations of complex Analysis, Narosa publishing House,1997

6) J-B-conway, Function of One complex variable, springer verlag

M.Sc. (Mathematics) THIRD SEMESTER

Course Code	Course Type	Course (Paper/ Subjects)	Credits	Contact Hours per Week			EoSE Duration (Hrs.)	
				L	T	P	Thy	P
MSM 301	CCC	Integration Theory and Functional Analysis (I)	6	4	3	0	3	0
MSM 302	CCC	Partial Differential Equtions & Mechanics (I)	6	4	3	0	3	0
MSM 303	CCC	Operations Research (I)	6	4	3	0	3	0
MSM S03	OSC	Intellectual Property, Human Right Environment : Basics	6	4	3	0	3	0
MSM C01	ECC/CB	Numerical Analysis	6	4	3	0	3	0
MSM C02	ECC/CB	Mathematical Modeling						
MSM C03	ECC/CB	Fluid Dynamics						
MSM C04	ECC/CB	Fuzzy Sets and their Application- I						
MSM C05	ECC/CB	Computer Fundamental and Programming in C						
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TOTAL =30					

M.Sc. (MATHEMATICS) III SEMESTER

COURSE CODE:MSM301 COURSE TYPE: CCC

COURSE TITLE	
Integration Theory and functional Analysis (I)	
CREDIT: THEORY: 6 PRACTICAL : 0	HOURS: THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100(20+80)	MARKS: THEORY: 80 PRACTICAL : 0

Unit-1 18 Hrs.

Measure Theory :
signed measure. Hahn decomposition theorem, mutually singular Measures. Radon-Nikodym theorem. Labesgue decomposition. Riesz representation theorem. Extension theorem fcaratheodory).

Unit-2 18 Hrs.

Lebesgue-Stieltjesintegral,productmeaSureS,
Differentiation and Integration. Decomposition into absolutely continuous and singular parts.

Unit-3 18 Hrs.

Bairesets.BairemeaSure,continuousfunction' Regularity of measures on locally comiract spaces.
Integration of continuous functions with compact support, Riesz Markoff theorem.

Unit-4 18 Hrs.

Functional Analysis
Normed linear spaces. Banach spaces and examples.
euotient space of normed linear spaces and its completeness, equivalent normi.
Riesz Lemma, basic properties of finite dimensional normed linear spaces and compactness.

Unit-5 18 Hrs.

weak convergence and bounded linear transformations,

norrned linear spaces of bounded linear tansformations, dual spaces with examples.

SUGGESTED READINGS

1. P.R. Halmos, Measure Theory, V
2. B.choudhary and S.Nanda, Functional Analysis with Applications wiley Eastern Ltd. 1989.
3. H.L. Royden, Real Analysis, Macmilian Publishing Co. Inc, Newyork,4th Edition, 1993.
4. S.K. Berberian, Measure and integration, chelsea publishing company, New York, t965.
5. G. de Barra, Measure Theory and Integration, wiley Eastern Limited, 1981.
6. P.K. Jain and V.P. Gupta, Lebesgue Meisure and Intlgration, NewAge International [P) Limited, New Delhi ,2000.
7. Richard L. wheeden and Antoni Zygmund, Measure and Integral : An Introduction to Real Analysis, Marcel Dekker rnc. 1977.
8. I.H.williamson, Lebesgue Integration, Holt Rinehart and winston,Inc. New York. 1962.
9. T'G. Hawkins, Lebesgue's Theory of Integration: Its origins and Development, Chelsea, New York, 1979.
10. K.R. Parthasarathy, Introduction to probability and Measure, Macmillan Company of India Ltd., Delhi , 1977.
11. R.G. Bartle, The Elements of Integration, |ohn wiley & sons, Inc. New york, 7966.
12. Serge Lang Analyusis I & II, Addison -Wesley Publishing Company, Inc. 1967.
13. Inder K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, Delhi, 1997.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM302 **COURSE TYPE: CCC**

COURSE TITLE	
Partial Differentiation Equation and Mechanics (I)	
CREDIT: THEORY: 6 PRACTICAL : 0	**HOURS:** THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100(20+80)	**MARKS:** THEORY: 80 PRACTICAL : 0

UNIT -1 18 HOURS

Partial Differential Equtions :
Examples of PDE. Classification, Transport Equation-Initial value Problem. Non-homogeneous Eduation, Laplace's Equation- Fundamental Solution, Mean Value Formulas, Properties of Harmonic Functions, Green's Function, Euler-Langrange equation.

UNIT -2 18 HOURS

Heat equation-Fundamental solution, Mean value Formula, Properties of Solutions, Energy Methods. wave Equation-solution by Spherical Means, Non-homogeneous Equations.

UNIT -3 18 HOURS

Nonlinear First order PDE-complete Integrals, Envelopes, characteristics, Hamiltonjacobi Equations [calculus of Variations, Hamilton's ODE, Legendre Transform, Hopf-Lax Formula, weak Solutions, Uniqueness], conservation Laws [Shocks, Entropy condition, LaxOleinik formula, weak solutions, uniqueness, Riemann's Problem, Long Time Behaviour]

UNIT -4 18 HOURS

Gravitation: Attraction and potential of rod, disc, spherical shells and sphere.

UNIT -5 18 HOURS

Surface integral of normal attraction (application & Gauss'

theorem). Laplace and Poisson equation. Work done by self attracting system. Distribution for a given potential.

SUGGESTED READING

1. L.C .Evans, partial Differential Equation, Graduate Studies in Mathematics, volume 19, AMS, 1998.
2. F. Gantmacher, Lectures in Analytic Mechanics, MIR Publishers, Moscow, 1975.
3. R.C. Mondal, Classical Mechanics, Prentice Hall of India.
4. S.L. Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi, 1979.
5. Books on Partial differential equation by J.N. Sneddon,F.John, P. Prasad and R.Ravindran, Amarnath etc.
6. A.S. Ramsey, Dynametics Part II, The English Language Book Society and Cambridge University Press, 1972.
7. H. Goldstein, Classical Mechanics (2nd edition), Narosa Publishing House, New Delhi.
8. I.M. Gelfand and S.V. Fomin, Calculus of Variation, Prentice Hall.
9. Narayan Chandra Rana & Pramod Sharad Chandra Joag, classical Mechanics, Tata McGraw Hill, 1991.
10. Louis N. Hand and Janet D. Finch, Analytical Mechanics, Cambridge University Press, 1998.
11. A.S. Ramsey, Newtonian Gravitation, the English Language Book Society and the Cambridge University Press.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM303 **COURSE TYPE: CCC**

COURSE TITLE

OPERATION RESEARCH I

CREDIT:		**HOURS:**	
THEORY: 6	**PRACTICAL : 0**	**THEORY: 90**	**PRACTICAL : 0**

MARKS:	
THEORY: 100(20+80)	**PRACTICAL : 0**

UNIT -1 23 HOURS

Operations Research and its Scope. Problem formulation & Graphical solution of Linear Programming problem, some properties of convex sets, convex and concave functions. Solution of L.P.P. - simplex method, Two phase method,

UNIT -2 20 HOURS

Solution of L.P.P. - Simplex method, Two phase method, Big -M method,

UNIT -3 17 HOURS

Duality in Linear programming -Dual Simplex Method. Sensitivity Analysis.

UNIT 4 12 HOURS

Parametric Linear Programming. Upper Bound Technique. Interior Point Algorithm. Linear Goal programming.

UNIT -5 18 HOURS

Transportation and Assignment problems

SUGGESTED READINGS

1. F.S Hiller and G.J. Lieberman. Introduction to Operation ResBareft [SixthEdition), McGraw Hill International Edition, industrial Engineering Series, 1995.
2. G. Hadley, Linear Programming, Narosa publishing House,1995

3. G. Hadly, Nonlinear and Dynamic programming Addison-wesley, Reading Mass.

4.H.A. Taha, Operations Research -An introduction, Macmillan publishing Co., Inc., New Yark.

5. Kanti Swarup, P.K. Gupta and Man Mohan, operations Research, sultan chand & Sons, New Delhi

6. S.S. Rao, optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.

7. Prem Kumar Gupla and D.S. Hira, Operations Research- An Introduction. S. Cliand & Company Ltd., New Delhi.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM S02 **COURSE TYPE: OSC**

COURSE TITLE: INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT: BASIC

CREDIT:0 **HOURS: 0**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 12 HOURS

Patents :- Introduction & concepts, Historical Overview.
Subject matter of patent.
Kinds of Patents.
Development of Law of Patents through international treaties and conventions including TRIPS Agreement.
Procedure for grant of patents & term of patent.
Surrender, revocation and restoration of patent.
Rights and obligations of patentee
Grant of compulsory licenses
Infringement of Patent and legal remedies
Offences and penalties
Discussion on leading cases.

UNIT -2 24 HOURS

Meaning of Copyright, Historical Evolution.
Subject matter of copyright.
Literary works
Dramatic Works & Musical Works
Computer Programme
Cinematographic films
Registration of Copyrights
Term of Copyright and Ownership of Copyrights
Neighboring Rights
Rights of Performers & Broadcasters
Assignment of Copyright.
Author's Special Righs (Moral Rights)
Infringement of Copyrights and defenses

Remedies against infringement (Jurisdiction of courts and penalties)
International Conventions including TRIPS Agreement WIPO, UCC, Paris Union, Berne Convention-UNESCO.
Discussion on leadirg cases

UNIT -3 12 HOURS

Rights: meaning
Human Rights-Meaning & essentials
Human Rights Kinds.
Rights related to life- Liberty, Equals & Disable.

UNIT -4 24 HOURS

National Human Rights Commission
State Human Rights Commission
High Court
RegionalCourt
Procedure & Functions of High & Regional Court.

UNIT -5 18 HOURS

Right to environment as human right
International humanitarian law and environment
environment and conflict management
nature and origin of international environmental organisation (IEOS)
Introduction to sustainable development and environment
sustainable development and environmental governance

SUGGESTED READINGS

1. G.B.Reddy, Intellectual Property Rights and Law, Gogia Law Agency, Hyderabad.
2. S.R.Myneni, Intellectual property Law, Eastern Law House. Calcutta
3. P Narayanan Intellectual Property Rights and Law (1999), Eastern Law House, Calcutta, India
4. Vikas Vashistha, Law and Practice of Intellectual Property,(1999) Bharat Law House, New Delhi.

5. Comish W.R Intellectual property,3rd ed, (I996), Sweet and Maxwell.

6. P.S. Sangal and Kishor Singh, Indian Patent System and Paris Convention,

7. Comish W.R Intellectual Property, Patents, Copyrights and Allied Rights, (2005)

8. BibeckDebroy, Intellectual Property Rights, (1998), Rajiv Gandhi Foundation

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM C01 **COURSE TYPE: ECC/CB**

COURSE TITLE: NUMERICAL ANALYSIS-I

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

The calculus of Finite Differences: Differences, Fundamental theorem of difference calculus, To express any value of the function in term of and the leading differences of a difference table, The operator E, properties of two operators E and A, Factorial notation, Differences of zero, Recurrence relation.

UNIT -2 18 HOURS

Interpolation with equal intervals: Different interpolation method, method of curve fitting, Use of calculus of finite differences, sub-division of intervals.

UNIT -3 18 HOURS

Interpolation with unequal intervals: Divided differences Newton's formula for unequal intervals, Relation between divided differences and ordinary differences, Sheppard's rule, Lagrange's interpolation formula for unequal intervals, Hermite's interpolation formula.

UNIT -4 18 HOURS

Central difference Interpolation Formlae: Gauss's interpolation formula Sterling formula, Bessel's formula, lallace-Everett formula, Uses of various, interpolation formula.

UNIT 5 18 HOURS

Numerical Differentiation And Integration: The trapezoidal rule, Simpson's one third rule, Simpson's three-eight's rule, weddle's rule, cote's method, The Euler's Maclaurin's formula, integration formula.

SUGGESTED READINGS

1. C. E. Froberg. Introduction to numerical analysis, (Secend Edition), Addison Wesley-1979.

2. James B. Scarbrough- Numerical Mathematical analysis, Oxford and IBH Publishing co., Inc. New York 1982.

3. M. K. Jain- S.R.K- Iyangar- R.K. Jain- Numerical Methods for Scientific and Engineering Computation- New Age International (P) Ltd.. 1999.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM C02 **COURSE TYPE: ECC/CB**

COURSE TITLE: MATHEMATICAL MODELLING

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Mathematical Modelling through Systems of Ordinary differential Equation of the First Order Mathematical modeling in population dynamics, Mathematical modeling of epidemics through systems of ordinary differential equations of first order - Mathematical Models in Medicine, Arms Race, Battles and international Trade in terms of systems of ordinary differential equations - Mathematical modeling in dynamics through systems of ordinary differential equations of first order.

UNIT -2 18 HOURS

Mathematical Modelling through difference equations The needs for Mathematical modelling through difference equations- some simple models - Basic theory of linear difference equations with constant coefficients - Mathematical modelling through difference equations in economics and finance

UNIT -3 18 HOURS

Mathematicat Modelling through difference equation (contd.) Mathematical Modelling through difference equation in population dynamics and genetics.Mathematical Modelling through difference equation in probability theory. miscellaneous examples of Mathematical modelling through difference equations

UNIT -4 18 HOURS

Mathematical modelling through Graphs

Situations that can be modeled through graphs -Mathematical models in terms of directed graphs- Mathematical models in terms of signed graphs- Mathematical models in terms of weighted graphs

UNIT -5 18 HOURS

Mathematical Modelling through calculus of variation and Dynamic Programming Optimization principles and techniques - Mathematical modelling through calculus of variations - Mathematical Modelling through dynamic programming

SUGGESTED READING

1. D.J.G.James and J.J.Macdonald, Case studies in Mathematical Modelling, Stanly Thames, Cheltonham.
2. J.N. Kapur, Mathematical entropy Models.
3. J.M Crossand A.O. Moscrcadini, The art of Mathematical Modelling Ellis Harwood and John Wiley.
4. C. Dyson, Elvery, Principles of Mathematical Modelling Academic Press, New York.
5. D. N. Burghes, Modelling with Difference Equations, Ellis Harwood and John Wiley.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM C03 **COURSE TYPE: ECC/CB**

COURSE TITLE: FLUID DYNAMICS

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Kinematics of fluid in motion. real fluid and Ideal fluids- Velocity of a fluid at a point, Steam line, path lines, steady and unsteady flows- Velocity potential- The vorticity vector- Local and particle rates of charges- Equations of continuity - worked examples- Accelaration of a fluid- Conditions at a rigid boundary.

UNIT -2 18 HOURS

EQUATIONS OF MOTION OF A FLUID

Pressure at a point in a fluid at rest.- pressure at a point in a moving fluid - conditions at a boundry of two inviscid immiscible fluids- Eular's equation of motion- Discussion of the case of steady motion under conservation body forces.

UNIT -3 18 HOURS

Some three dimensional flows, Introduction- Sources, sinks and doublets- Images in a rigid infinite plane- Axis symmetric flows - stokes stream function.

UNIT -4 18 HOURS

SOME TWO DIMENSIONAL FLOWS

Meaning of two dimensional flow- Use of Cylindrical polar coordinate- the steam function- The complex potential for two dimensional, irrotational incompressible flow- Complex velocity potential for standard two dimensional flows- some worked examples- Two dimensional Image system- The Milne Thompson circle Theorem

UNIT -5 18 HOURS

VISCOUS FLOW

Stress components in a real fluid -Relations between Cartesian components of stress-Translation motion of fluid elements- The rate of strain quadric and principal stresses - some further properties of the rate of strain- The coefficient of viscosity and laminar flow - The Navier-Strokes equations of motion of a Viscous fluid.

SUGGESTED READINGS

Books Recommended:

1. R.W.Fox and A.T.McDonald. Introduction to Fluid Mechanics, Wiley, 1985.

References

1. E.Krause, Fluid Mechanics with Problem and Solutions, Springer, 2005.
2. B.S.Massey, J.W.Smith and A.J.W.Smith, Mechanics of Fluid, Taylor and Francis, New York, 2005.
3. P.Orlandi, Fluid.Flow Phewnomena, Kluwer, New York, 2002.
4. T.Petrila, Basis of Fluid Mechanics and Introduction to Computation Fluid Dynamics, Springer, berlin, 2004.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM C04 **COURSE TYPE: ECC/CB**

COURSE TITLE: FUZZY SETS AND THEIR APPLICATIONS-I

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOUR

FUZZY SETS- Basic defination α-level sets. Convex fuzzy sets. Basic operations on fuzzy sets. types of fuzzy sets. cartesian products, Algebraic products. Bounded. sum and difference, t-norms and t-conorms.

UNIT -2 18 HOURS

The Extension Principle- The Zadeh's extension pri inverse image of fuzzy sets. Fuzzy numbers. Elements of fuzzy arithmetic. Arithmetic operations on fuzzy numbers. Lattices of fuzzy numbers, fuzzy equation.

UNIT -3 18 HOURS

Fuzzy Relations: Fuzzy relations on fuzzy sets, fuzzy binary relations and fuzzy equivalence relations. Fuzzy morphism, standard composition, sup i composition, inf-wi composition of fuzzy relation.

UNIT -4 18 HOURS

Fuzzy Relation Equation: Problem partitioning, solution methods, fuzzy relation equations based upon sup I composition and inf-wi composition, approximate solution. Fuzzy graphs, Similarity relation.

UNIT -5 18 HOURS

Possibility Theory-Fuzzy measures. Evidence theory. Necessity measure. Possibility measure. Possibility distribution. Possibility theory and fuzzy sets. Possibility theoryversus probability theory

SUGGESTED READING

Books Recommended:

1. G.J.Klir And B. Yuan: Fuzzy sets and Fuzzy logic, prentice Hall of India New Delhi.

2. H.J.Zimmermann: Fuzzy sets and Fuzzy logic, Prentice Hall of India New Delhi.

M.Sc. (MATHEMATICS) **III SEMESTER**

COURSE CODE:MSM C05 **COURSE TYPE: ECC/CB**

COURSE TITLE: COMPUTER FUNDAMENTAL & PROGRAMMING IN C

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

An overview of programming: Programming language, classification. C Essentials Program Development. Functions. Anatomy of C Function. Variables and Constants. Expressions. Assignment Statements. Formatting Source Files. Continuation Character. The Preprocessor

UNIT -2 18 HOURS

Scalar Data Types-Declarations, Different Types of integers. Different kinds of Integer constants. Floating-point Types. Initialization. Mixing Types. Explicit conversions-casts. Enumeration Types. The void Data Type' Typedefs. Finding the Address of an object. pointer.

UNIT -3 18 HOURS

Control Flow Statement-Conditional Branching. the Switch Statement. Looping. Nested Loops. The break and continue statements. The goto statement. Infinite Loops.

UNIT -4 18 HOURS

Operators and Expressions-Unary Plus and Minus operator. Binary Arithmetic Operator. Arithmetic Assignment operators. Increment and Decrement operators. comma operator. Renational operators. Logical operators. Bit - Manipulation operators. Bitwise Assignment operators.
Size of operators' conditional operator. Memory operators.

UNIT -5 18 HOURS

Arrays -Declaring an Array. Array and Memory. Initializing Array. Array of Pointers declaration, Arrays of string.

SUGGESTED READING

1. Peter A. Darnell and philip E. Margolis, C:A Software Engineering Approach Narosa Publishing House (springer International Student Edition) 1993.

2. Samuel P. Harkison and Gly L. Steele Jr., C : A Reference Manual , 2nd Edition, Prentice Hall, 1984.

3. Brian W Kernighan & Dennis M. Ritchie, The c programme Language, 2nd Edition (ANSI Features), Prentice Hall 1989.

M.Sc. (Mathematics) FOURTH SEMESTER

Course Code	Course Type	Course (Paper/ Subjects)	Credits	Contact Hours per Week			EoSE Duration (Hrs.)	
				L	T	P	Thy	P
MSM401	CCC	Integration Theory and Functional Analysis (II)	6	4	3	0	3	0
MSM402	CCC	Partial Differential Equtions & Mechanics (II)	6	4	3	0	3	0
MSM403	CCC	Operations Research (II)	6	4	3	0	3	0
MSM421	OSC	Dissertation	6	0	0	9	0	4
MSMD01	ECC/CB	Numerical Analysis (II)	6	4	3	0	3	0
MSMD02	ECC/CB	Mathematical Modeling						
MSMD03	ECC/CB	Number Theory and Cryptography						
MSMD04	ECC/CB	Fuzzy Sets and their Application- Ii						
MSMD05	ECC/CB	Computer Fundamental and Programming in C-II						
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TOTAL =30					

M.Sc. (MATHEMATICS) IV SEMESTER

COURSE CODE:MSM 401 COURSE TYPE: CCC

COURSE TITLE:
INTEGRATION THEORY AND FUNCTIONAL ANALYSIS II

CREDIT:
THEORY: 6 PRACTICAL : 0

HOURS:
THEORY: 90 PRACTICAL : 0

MARKS:
THEORY: 100(20+80) PRACTICAL : 0

UNIT -1 18 HOURS

Uniform boundedness theorem and some of its consequences. open mapping and closed graph theorems.

UNIT -2 18 HOURS

Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces. Reflexive spaces. weak sequential compactness. Compact operators. Solvability of linear equations in Banach spices. The closed Range Theorem.

UNIT -3 18 HOURS

Inner product spaces. Hilbert spaces. Orthonormal sets. Bessel's inequality. Complete orthonormal sets and parseval's identitv.

UNIT -4 18 HOURS

Structure of Hilebert spaces. Projection theorem. Riesz representation theorem. adjoint of an operator on a Hielbert spaces. Reflexivity of Hielbert spaces.

UNIT -5 18 HOURS

Self-adjoint operators, Positive, projection, normal and unitary operators. Abstract variational boundry-value problem. the generalized lax-Milgram theorem.

SUGGESTED READINGS

1. B.Choudhary and S.Nanda, Functional Analysis with Applications. Wiley Eastern Ltd. 1989.
2. H.L. Royden, Real Analysis, Macmillan Publishing Co. Inc., New york, 4th Edition , 1993.
3. Serge Lang, Analysis I & II, Addison-wesley Publishing company, Inc.1967.
4- Walter Rudin, Real & complex Analysis, Tata McGraw-Hiil Publishing.
5. Edwin Hewitt and Korl Stromberg, Real and Abstract Analysis, Springer-Verlag, New York
6- Edwin Hewitt and Kenneth A. Ross, Abstract Harmonic Analysis, vol. 1, Springer-Verlag 1993.
7. B.-V- Limaye, Functional Analysis, Wiley Eastern ltd.
8. L.A. Lustenik and V.J. Sobolev, Elements of Functional Analysis, Hindustan publishing Corporation, New Delhl I971
9. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company, NewYork 1963.
10. AE Taylor Introduction to Functional Analysis John Wiley and Sons, New york, 1958.
11. K.Yosidia, Functional Analysis, 3" edition Springer-verlag, New York 1971
12. J.B.Conway, A Course in Functional Analysis, Springer-verlag, New york, 1990.
13. Walter Rudin, Functional Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi 1973.

M.Sc. (MATHEMATICS) **IV SEMESTER**

COURSE CODE:MSM 402 **COURSE TYPE: CCC**

COURSE TITLE:
PARTIAL DIFFERENTIAL EQUATION AND MECHANICS (II)

CREDIT:
THEORY: 6 PRACTICAL : 0

HOURS:
THEORY: 90 PRACTICAL : 0

MARKS:
THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 25 HOURS

Representation of Solutions- Seperation of Variable, Similarity Solution (plane and travelling waves, solitons, similary under scaling), Fourier and Laplace Transform, Hopf-cole Transform, hodograph and Legendre Transforms, Potential Functions.

UNIT -2 20 HOURS

Analytical Dynamics: Generalized coordinates. Holonomic and Non-holonomic systems. scleronomic and Rheonomic sytems. Generalized potential. Lagrange's equations of first kind. Lagrange's equations of second kind. Uniqueness of solution. Energy equation for conservative fields. Hamilton's variables. Donkin's theorem. Hamilton canonical equations. Cyclic coordinates.
Routh's equations

UNIT -3 15 HOURS

Analytical Dynamics: Hamilton's Principle of least action Motivating problems of calculus of variations, Shortest distance. Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic. Fundamental lemma of calculus of variations. Euler's equation for one dependent function and its generalization to (1) 'n' dependent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

UNIT -4 15 HOURS

Analytical Dynamics: Poisson's Bracket. Poisson' identity.

Jacobi-poision Theorem. Lagrange Brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, invariance of Lagrange brackets and Poisson brackets under canonical transformations.

UNIT -5 15 HOURS

Classical Mechanics: Genneralized coordinates, Langrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimentional motion of rigid bodies, Euler's dynamical equation for the motion of a rigid body about an axis, theory of small oscillations.

SUGGESTED READING

1. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Volume 19,AMS,1998.
2. F. Gantmacher, Lectures in Analytic Mechanics, MIR publishers, Moscow , 1975.
3. RC.Mondal, Classical Mechanics, prentice Hall of India
4. Books on Partial differential equation by 1.N. Sneddon, F. John, P. Prasad and R. Ravindran, Amarnath etc
5. A.S. Ramsey, Dynamics Part II, The English Language Book Society and Cambridge University Press 1972.
6- H. Goldstein, Classical Mechanics (2nd edition), Narosa Publishing House, New Delhi.
7. I.M. Gelfand and S.V. Fomin, Calculus of Variations, Prentice Hall.

B. Narayan Chandra Rana & Pramod Sharad Chandra Joag Classical Mechanics, Tata McGraw Hill,1991.

9. Louis N. Hand and Janet D. Finch, Analytical Mechanics, Cambridge University Press, 1998

M.Sc. (MATHEMATICS) **IV SEMESTER**

COURSE CODE:MSM 403 **COURSE TYPE: CCC**

COURSE TITLE:
OPERATION RESEARCH (II)

CREDIT:
THEORY: 6 PRACTICAL : 0

HOURS:
THEORY: 90 PRACTICAL : 0

MARKS:
THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Network Analysis-Shortest path problem. Minimum Spanning Tree Problem. Maximum Flow I Problem. Minimum cost Flow Problem, Network Simplex Method. Project Planning and Control I with PERT-Cpm.

UNIT -2 12 HOURS

Dynamic Programming-Deterministic and Probalistic Dynamic Programming

UNIT -3 17 HOURS

Game Theory-Two-person, Zero-sum Games. Games with Mixed Strategies. Graphical Solution. Solution by linear Programming.

UNIT -4 23 HOURS

Integer Programming-Branch and Bound Technique, Gomory,s method of solving I.P.P.

UNIT -5 20 HOURS

Nonlinear Programming-one/and Multi-variable Unconstrained Optimization-Lagrangian method, Kuhn-Tucker Conditions for Constrained Optimization, wolf's method, Beal's method Quadratic Programming. Seperable Programming. Convex Programming. Non convex Programming.

SUGGESTED READINGS

1.F.S. Hillier and G.J. Liebrman. Introduction to Operations

ResBareft (sixth Edition), McGraw Hill International Edition, Industrial Engineering series, 1995.

(this book comes with a CD containing tutorial software).

2. G.Hadley, linear programming, Narosa Publishing House, 1995.

55.G. Hadly, nonlinear and programming, Addision-Wesley,Reading Mass.

3. H.A. Taha, Operations Research An introduction, Macmillan Publishing Co., Inc., New York.

4. Kanti Swarup, P.K.Gupta and Man Mohan, Operation Research, Sultan Chand & Sons, New Delhi

5. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley & sons, New York, 1990.

6. S.S.Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.

7. Prem Kumer Gupta and D.S.Hira, Operations Research- An Introduction. S.Cliand & Company Ltd., New Delhi.

M.Sc. (MATHEMATICS) **IV SEMESTER**

COURSE CODE:MSM D02 **COURSE TYPE: ECC/CB**

COURSE TITLE:
NUMERICAL ANALYSIS-II

CREDIT:
THEORY: 6 PRACTICAL : 0

HOURS:
THEORY: 90 PRACTICAL : 0

MARKS:
THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Difference Equations-I: homogeneous linear difference equations, Homogeneous linear difference equation with constant coefficients, existence and uniqueness theorem, Different methods for finding for particular solution in case of non-homogeneous linear equation.

UNIT -2 18 HOURS

Difference Equation-II: methods of variation of parameters, method of generating function, non-homogeneous linear difference equations with variable coefficients, Solution of some special types of difference equations, solution of homogeneous difference equations (degree two), simultaneous difference i equations, Differential-difference equations.

UNIT -3 18 HOURS

Numerical Solution of Ordinary Differential Equation of F'rrst Order: Picards's method of successive approximations, Euler's method, Improved Euler's method, Modified Euler's method, Taylor's series method, Milne's method, Runge.:, method, Runge's kutta method

UNIT -4 18 HOURS

Solution of Algebraic and Transcendental Equation: Bisection method, method for finding initial approximate value of root Newton's iterative formula for obtaining square root, Rate of convergence of Newton's method.

Simultaneous Linear Algebraic Equations: The elimination method by Gauss Jorddan's, method, Crout's method, Method of .factorization, Jacoibi iterative method, Gauss Seidel iterative method, Relxation method due to Southwell.

SUGGESTED READINGS

1. C. E. Froberg, Introduction to Numerical analysis-(Second Edition). Addison-Wesley,1979.
2. James B. Scarbrough, Numerical Mathematical analysis-Oxford and IBH Publishing co., Inc. New York,1992.
3. M. K. Jain, S.R.K.Iyangar, R.K. Jain. Numerical Methods for scientific and Engineering Computation, New Age International (p) Ltd- 1999.

M.Sc. (MATHEMATICS) **IV SEMESTER**

COURSE CODE:MSM D03 **COURSE TYPE: ECC/CB**

COURSE TITLE:
NUMBER THEORY AND CRYPTOGRAPHY

CREDIT:
THEORY: 6 PRACTICAL : 0

HOURS:
THEORY: 90 PRACTICAL : 0

MARKS:
THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Elementary Number Theory

Time Estimates for doing arithmetic - Divisibility and Euclidean algorithm - Congruences - Applications to factoring. Chapter-I

UNIT -2 18 HOURS

Cryptography

some simple crypto systems - Enciphering matrices. chapter-III

UNIT -3 18 HOURS

Fintte Fields and quadratic Residues. Finite fields - Quadratic residues and Reciprocity. Chapter- II

UNIT -4 18 HOURS

Public Key Cryptography

The idea of public key cryptography- RSA - Discrete log - Knapsa.Chapter-IV: Sections IV.1 to IV.4 [omit sec.5]

UNIT -5 18 HOURS

Primality and Factoring

Pseudoprimes - The rho method - Fermat factorization and factor based- The continued fraction method - The quadratic sieve method-Chapter-V

SUGGESTER READINGS

Recommended Text

Neal Koblitz, A course in Number Theory and cryptography, Springer-Verlag New York, 2002, Second Edition.

Reference Books

1. Niven and Zuckermann, An Introduction to Theory of [Edn. 3], Wiley Eastern Ltd., New Delhi, 1976.
2. David M.Burton, Elementary Number Theory, Wm C.Brown Publisher Dubuque,Iowa, 1989.
3. K.Ireland and M.Rosen, A classical Introduction to Modern Number Theory,Springer Verlag 1972.

M.Sc. (MATHEMATICS) **I/ SEMESTER**

COURSE CODE:MSM D01 **COURSE TYPE: ECC/CB**

COURSE TITLE:
FUZZY SETS AND ITS APPLICATION-II

CREDIT: **HOURS:**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Fuzzy Logic-An overview of classical Logic, Multivalued logics, Fuzzy propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions, the compositional rule of inference.

UNIT -2 18 HOURS

Approximate Reasoning-An overview of Fuzzy expert system. Fuzzy implications and their selection. Multiconditional approximate reasoning. The role of fuzzy relation equation.

UNIT -3 18 HOURS

An introduction to Fuzzy Control: Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification.

UNIT -4 18 HOURS

Defuzzification and the various defuzzification methods (the centre of area, the centre of maxima, and the mean of maxima methods)

UNIT -5 18 HOURS

Decision Making in Fuzzy Environment- Individual decision making. Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods. Fuzzy linear programming.

SUGGESTED READINGS

1. H.J. Zmmemann, Fuzzy set theory and its Applications, Allied Publishers Ltd. New Delhi,1991.
2. G.J. Klir and B. Yuan- Fuzzy sets and fuzzy logic, Prentice-Hall ol India, New Delhi, 1995.

M.Sc. (MATHEMATICS) **IV SEMESTER**

COURSE CODE:MSM C04 **COURSE TYPE: ECC/CB**

COURSE TITLE: FUNDAMENTALS OF COMPUTER SCIENCE & PROGRAMMING IN C-II

CREDIT:0 **HOURS: 0**

THEORY: 6 PRACTICAL : 0 **THEORY: 90 PRACTICAL : 0**

MARKS:

THEORY: 100(20+80) **PRACTICAL : 0**

UNIT -1 18 HOURS

Oriented Programming-Classes and Scope, nested classes, pointer class members; Class initialization, Overload functions, Operator overloading, constructor, Destructor

UNIT -2 18 HOURS

Data Structures-Analysis of algorithms, Link list, Doubly linked list; sequential and linked representations, Lists, stacks, and queues.

UNIT -3 18 HOURS

TREE: Binary Tree- search tree implementation, B-tree (concept only)

UNIT -4 18 HOURS

Shorting: Insertion sort, shell sort, quick sort, heap sort and their analysis; Hashing-open and closed.

UNIT -5 18 HOURS

Database system: Role of Database system, Database system Architecture, Introduction to relational algebra and relational circuits. SQL- Basic features, including views, Integrity constrains; Database design- normalization up to BCNF.

SUGGESTED READINGS

1. S.B. Lipman, J. Lajoi: C++ Primer, Addison Wesley.
2. B. Stroustrup; The C++ programming Language, Addison Wesley.
3. C.J. Date : Introduction to Database systems, Addison wesley.
4. C. Ritehie: operating systems-Incorporating UNIX and windows, BPB Publications.
5. M.A. weiss, Data Structures and Algorithm Analysis in c++, Addison Weslev

प्रस्तावित संत गहिरा गुरू विश्वविद्यालय भवन एवं परिसर स्थल-ग्राम भकुरा