UNIVERSITY OF KOTA

SCHEME OF EXAMINATION AND

COURSES OF STUDY

Faculty of Science Bachelor of Science (B.Sc.)
Mathematics-Course Code MAT9600P

Semester- I, II, III, IV

UNIVERSITY OF KOTA
MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005
INDIA

Edition: 2024

B.Sc. (Mathematics) Semester Scheme

Course Code MAT9600P

B.Sc. (Mathematics) I, II, III, IV Semester

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess
I Year I Semester	MAT 101	DCC	Mathematics-1	3 Hrs	4	--	4	30	70	100	12	28
	MAT 102	DCC	Mathematics Practical-1	2 Hrs		2	2	--	50	50	--	25
	Total				04	02	06	30	120	150	--	
I Year II Semester	MAT 201	DCC	Mathematics-2	3 Hrs	4	--	4	30	70	100	12	28
	MAT 202	DCC	Mathematics Practical-2	2 Hrs		2	2	--	50	50	--	25
					04	02	06	30	120	150	--	
First Year Total					08	04	12	60	240	300	--	
II Year III Semester	MAT 301	DCC	Mathematics-3	3 Hrs	4	--	4	30	70	100	12	28
	MAT 302	DCC	Mathematics Practical -3	2 Hrs	--	2	2	--	50	50	--	25
	Total	04	02	06	30	120	150	--				
II Year IV Semester	MAT 401	DCC	Mathematics-4	3 Hrs	4	--	4	30	70	100	12	28
	MAT 402	DCC	Mathematics Practical -4	2 Hrs	--	2	2	--	50	50	--	25
	Total				04	02	06	30	120	150	--	
	Second Year Total				08	04	12	60	240	300	--	

Objectives of the Course:
- Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- Introduction to various courses like group theory, ring theory, field theory, metric spaces, number theory.
- Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- Ability to pursue advanced studies and research in pure and applied mathematical science.

Duration of the Course:
The B.Sc. [Bachelor of Science] program consists of three academic years separated into six semesters. Students who pass the first and second semester examinations have the option of graduating with a science certificate. Additionally, students have the choice to graduate with a diploma in science after completing the examinations for the third and fourth semesters. The student will receive a Bachelor of Science (B.Sc.) degree after successfully completing the three-year curriculum.

Eligibility for Admission:
The basic eligibility for admission to the course is XII with Physics, Chemistry and Mathematics for B.Sc. (Mathematics) with minimum marks as per the Govt. of Rajasthan

Norms. The admission in the course is based on merit of XII class.

Structure of the Program:
The B.Sc. program consists ofCore and applied courses of theory as well as practical papers which are compulsory for all students.

Maximum Marks:
Maximum marks of a theory and practical paper shall be decided on the basis of their contact hours/credit per week. One teaching hour per week shall equal to one credit and carry 25 maximum marks and therefore, four teaching hours per paper per week shall carry 100 maximum marks for each theory paper/course. Each four contact hours per week for laboratory or practical work shall be equal to two credits per week and carry 50 maximummarks.

Scheme of Examinations:
The examination shall be divided into two parts in which first part is internal assessment and second part is semester assessment or external assessment. The schemes for the internal and external examinations shall be as under:

a) The assessment of the student for theory paper shall be divided into two parts in which first part is internal assessment (30% of maximum marks) and second part is semester assessment or external assessment (70% of maximum marks). For practical papers there will be only one external assessment (100% of maximummarks).

b) The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester. There will be twocomponents of internal assessment: one by testhaving2/3weightage(20marks)andanotherbyseminar/assignment/presentation/quiz/group discussion / viva-voce of 1/3 weightage (10 marks), for theory papers in each semester. Internal assessment test shall be of one hour duration for each paper and shall be taken according to academic calendar notified by the University / Departments. There will be no internal examination in the practical paper.

c) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/ improvement fee. A record of such candidates shall be kept in theDepartment.

d) The external assessment shall be of three hours duration for each theory paper and two hours duration for practical paper. The practical examination shall be taken by the panel of at least one external and one internal examiner at the end of eachsemester.

e) Also proposed to include the one hour of practical is equivalent to one hour teaching workload of the faculty member

f) The syllabus for each theory paper is divided into five independent units and each theory question paper will have the format as mentionedbelow:

Section A: Compulsory Part-There will be ten short answer type questions covering all units but not more than two questions from each unit.
Section B:long answer type questions covering all units but not more than two questions from each unit, descriptive type. *Students have to attempt* 5 questions in Section B, taking one from each unit. *Paper setter shall be instructed to design question paper covering from all fiveunits.*

g) The pattern of question paper of internal and external shall be asfollows:

(A) Continuous or Internal Assessment-30% weightage of MaximumMarks
The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester as,

Continuous Assessment Weightage					External Assessment Weightage	Total
Regular Students		Private Student		Tot al	Paper based External Evaluation (End termexamination)	Marks (Total credits)
Mid-Term	Seminar/ project / Presentation/ participation in different activities/ attendance	Report Writing	Viva-voce			
20	10	20	10	30	70	100 (04)

- The 30 marks of continuous assessment for each Mathematics paper will have a mid-term test of 20 marks and remaining 10 marks will be devoted to Seminar/ project / Presentation/ participation in different activities/ attendance. Also, only one chance to improve his/her marks of continuous assessment (mid-term) will also be given to the student in the same semester with a fee of Rs. 250/- per paper, after the approval of the competent authority of Department/College. For private students of B.Sc. program is also divided into two component as report writing (20 marks) and Viva-voce (10 marks) as mentionedabove.

- **Report writing and Viva-voce:** Each private student of B.Sc. program will prepare a report on any topic of each course in minimum 1000 words from the prescribed syllabus of the concerned theory paper/course. The student needs to report the Concerned College at the time prescribed by the College/University to submit the report and the College will arrange a Viva-voce on that report. **It is proposed that the engaged teacher be paid at the rate of per answer book per student charges**.Theexamination section will generate an option of bill when the teacher fills the continuous assessment marks on examination portal (like done for external answer book evaluation). The various components of the report maybe:

- ❖ Name ofCourse/Class:
- ❖ Name ofStudent:
- ❖ Father's/HusbandName:
- ❖ Examination FormNo:
- ❖ Enroll.No:
- ❖ Name of College(Center):
- ❖ Name ofPaper:
- ❖ Title oftopic:
- ❖ No. of Unit of topic (as per prescribedsyllabus):
- ❖ Introduction about thetopic:
- ❖ Details/Analysis about thetopic
- ❖ Conclusion of thetopic:
- ❖ References:
- ❖

(B) Semester or External Assessment-   70% weightage of Max.Marks

   Semester or External Assessment:

   Duration of Examination:3Hours   **Max. Marks: 70**

SECTION-A:10x2=20
(Answer all questions)
(Two question from each unit with no internal choice)

Q. No. 1
(i)………......................…………………………….………… **2Mark**

(ii)……….....................………………………………………………… **2Mark**
(iii)……….....................……………………………………………. **2Mark**
(iv)……….....................…………………………………………… **2Mark**
(v)……….....................………………………………………… **2Mark**
(vi)……….....................…………………………………………… **2Mark**
(vii)……….....................……………………………………………… **2Mark**
(viii)……….....................…………………………………………… **2Mark**
(ix)……….....................………………………………………… **2Mark**
(x)……….....................………………………………………… **2Mark**

SECTION-B: 5x 10 =50
(Answer all questions)
(One question from each unit with internal choice) (Maximum two sub-divisions only)

Q. No. 2. . ………………….......………………………………………
Or
…………............……………………………………………………….

Q. No. 3.…………….......……………………………………………………
Or
……………………….............…………………………………....

Q. No. 4.……………………….............……………………………………
Or
………………………………….............…………………………

Q. No. 5.…………………………………………….............…………………
Or
………………………………………….............………...

Q. No. 6.…………………………………………………….............
Or
………………………………………………………….................

(c) Distribution of Marks for Practical Examinations:

Duration of Exam:02Hours   **Maximum Marks:50**

	Name of Exercise	Marks
1.	Exercise No. 1	30
	Exercise No. 2	
2	Viva-voce	10
3	Practical Record	10
	Total Marks	50

Rules regarding determination of results:
Each semester shall be regarded as a unit for working out the result of the candidates. The result of each semester examination shall be worked out separately (even if he/she has appeared at the paper of the lower semester along with the papers of higher semester) in accordance with the following conditions:

a) The candidate shall be declared as pass in a semester examination, if he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper/project/dissertation with 40% aggregate marks in thatsemester.

b) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

c) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50% of the papers of both semesters of previous academic session. The

candidate who does not fulfill the above condition will remain as an ex-student and will reappear in the due papers along with next odd/even semesterexams.

d) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semesters will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academicsession.

e) If a candidate, who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester, he/she may re-appear only one time in these papers in next odd/even semesterexaminations.

f) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical / dissertation in anycondition.

g) If the number of papers prescribed in a semester examination is an odd number, it shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

h) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing for three years under-graduate program up to five years and soon.

i) The marks secured in the Gen Hindi, Gen English, Elementary Computer applications and Environment studies shall be counted in awarding the division to a candidate. The candidate shall have to clear the compulsory subjects in the additional three chances and non-appearance or absence in the examination of compulsory subjects shall be counted as chance and shall be declared fail in thatexamination.

j) The grace marks scheme shall be applicable as per universitynorms.

Classification of Successful Candidates:

The classification of successful candidates after last semester examination shall be as under:

Description of Marks Obtained	Division / Result
75% and above marks in a paper.	Distinction in thatpaper.
Acandidatewhohassecured aggregate 60% and above marks	First Division
Acandidatewhohassecured aggregate 50% and above but lessthan 60% marks	Second Division
Acandidatewhohassecured aggregate 40% and above but lessthan 50% marks	Pass

Course Outcomes:

Programme outcomes :

PO1: Scientific temper will be developed in Students.

PO2: Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science stream.

PO3: Students will become employable; they will be eligible for career opportunities in Industry, or will be able to opt for entrepreneurship.

PO4: Students will possess basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc.

PO5: Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.

Programme specific outcomes

PSO1: A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notation, terminology.

PSO2: A student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.

PSO3 : Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

PSO4: Student should be able to apply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or

techniques in order to process the information and draw the relevant conclusion.
PSO5: Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

MAT101- MATHEMATICS-1

Duration 3 hrs.   **Max. Marks: 70**

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit.
    (Total marks : 10 x 2 = 20)
Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted,
taking one from each unit (Total marks : 10 x 5 = 50)
Lecture- Sixty Lectures including diagnostic and formative assessments during lecture
hours.

Unit I
Binary operation. Addition and multiplication modulo operations. Definition of a group
with examples and simple properties, Permutation group, cycle, transpositions, even
and odd permutations and alternating group. Order of an element of a group and its
properties. Subgroups of a group with its properties, Cyclic groups and their
properties, Cosets. Index of a subgroup, Lagrange's theorem and its applications.
Normal subgroups with properties. Simple groups, Quotient groups.
द्विआधारीसंक्रिया. जोड़ और गुणा मॉड्यूलोऑपरेशन । उदाहरणों और सरल गुणों के साथ समूह की परिभाषा   , क्रमचय
पक्षांतरण समूह, चक्र, स्थानान्तरण, सम और विषम क्रमचयऔर एकांतर समूह। किसी समूह के अवयवों का कोटि और उसके
गुणधर्म। किसी समूह के उपसमूह , उनके गुणों के साथ , चक्रीय समूह और उनके गुण ,सहसमुच्च्य। एक उपसमूह का सूचकांक ,
लैग्रेंज का प्रमेय और उसके अनुप्रयोगागुणों के साथ सामान्य उपसमूह. सरल समूहू विभाग समूह।

Unit-II
Polar coordinates, angle between radius vector and tangent, polar sub tangent and
subnormal. Perpendicular from pole on tangent. Pedal equation of a curve. Derivative
of length of an arc in cartesian and polar coordinates. Curvature, Radius of curvature
and its formula in various forms. Centre of curvature, chord of curvature.
ध्रुवीयनिर्देशांक, ध्रुवंतर रेखा और स्पर्शरेखा के बीच का कोण, ध्रुवीयअधःस्पर्शरेखा और अधोलम्ब, ध्रुव से स्पर्शरेखा पर लंब.
एक वक्र का पदिक समीकरण. कार्तीय और ध्रुवीयनिर्देशांक में चाप की लंबाई का व्युत्पन्न। वक्रता   , वक्रता की त्रिज्या और
विभिन्न रूपों में इसका सूत्र। वक्रता केंद्र, वक्रता जीवा .

Unit-III
Vector differentiation and integration, Problems based on Gradient, divergence and
curl. Vector identities, Line and surface integrals. Theorems of Gauss, Green,
Stokes(without proof) and problems based on these.
सदिशकलन एवं समाकलन , ग्रेडिएंट, डाइवर्जेंस और कर्ल पर आधारित समस्याएं। सदिशसर्वसमिका   , रेखा और सतह
समाकलन, गॉस, ग्रीन, स्टोक्स के प्रमेय (बिना प्रमाण के) और इन पर आधारित समस्याएं

Unit-IV
Ellipse : standard equation, auxiliary circle, eccentric angle, tangent, normal, two
tangents from point, chord of contact, pole, polar, chord whose mid point given,
diameter, conjugate diameters and four normals from a point.
Hyperbola : Standard equation, parametric co-ordinates, asymptotes, equation
referred to asymptotes as axes, conjugate diameters and rectangular hyperbola
दीर्घवृत्त: मानक समीकरण, सहायक वृत्त, उत्केन्द्र कोण, स्पर्श रेखा, अभिलम्ब, बिंदु से दो स्पर्श रेखाएं, स्पर्शजीवा, ध्रुव, ध्रुवी,
जीवा जिसका मध्य बिंदु दिया गया है, व्यास, संयुग्मी व्यास और एक बिंदु से चार अभिलम्ब
अतिपरवलय: मानक समीकरण , प्राचलिकनिर्देशांक, अनंतस्पर्शी, समीकरण जिसके अक्ष अनंतस्पर्शी हों ,संयुग्मी व्यास और
आयताकार अतिपरवलय

Unit-V
Cone : Homogeneous equation in x, y, z, cone with a given vertex and given base,
enveloping cone, condition for the general equation to represent a cone, tangent plane,

reciprocal cone, angle between the two lines, in which a plane cuts a cone, three mutually perpendicular generators and right circular cone.

Cylinder : Right circular cylinder and enveloping cylinder.

शंकु: x, y, z में सजातीय समीकरण , एक दिए गए शीर्ष और दिए गए आधार के साथ शंकु   , आवरण शंकु, एक शंकु का प्रतिनिधित्व करने के लिए सामान्य समीकरण की स्थिति , स्पर्श समतल विमान, व्युत्क्रम शंकु, दो रेखाओं के बीच का कोण , जिसमें एक समतल एक शंकु को काटता है, तीन परस्पर लंबवतजनक रेखाएं और लंब वृत्तीय शंकु।

बेलन : लम्बवृतीय बेलन और अन्वालोपबेलन ।

MAT102- MATHEMATICS PRACTICAL

Duration 2 hrs.   **Min. Pass Marks 25**   **Max. Marks 50**

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as: Experiment I- 30, Practical record – 10, Viva Voce – 10.

1. Application of Gauss Theorem.
2. Application of Stokes Theorem
3. Problems related to Pedal Equations
4. Problem related to permutation group.
5. Applications of Lagrange's Theorem
6. Problem related to Normal Subgroups.
7. Problem related to Ellipse.
8. Problem related to Hyperbola.
9. Problem related to Cone.
10. Problem related to Cylinder.

1. गॉसप्रमेयकाअनुप्रयोग.
2. स्टोक्सप्रमेयकाअनुप्रयोग
3. पेडलसमीकरणसेसंबंधितसमस्याएं
4. क्रमचयसमूहसेसंबंधितसमस्या।
5. लैग्रेंजप्रमेयकेअनुप्रयोग
6. सामान्यउपसमूहोंसेसंबंधितसमस्या।
7. दीर्घवृतसेसम्बंधितसमस्या.
8. अतिपरवलयसेसम्बंधितसमस्या.
9. शंकुसेसम्बंधितसमस्या.
10. बेलन सेजुड़ीसमस्या.

Or

I Semester

Question 1 is Compulsory

Introductory knowledge :-matrix formation for real and complex numbers, addition , subtraction, multiplication, division, element wise multiplication ,division of two matrices, element wise division of two matrices, unit matrix , zero matrix, diagonal matrix, rank of matrix, trace of matrix, inverse of matrix, matrix of complex numbers.

Question 2 and 3

Use of .sce file (sci note)
1. Use of if – else statements,
2. Use of for loop, while, do-while loop. .
3. Roots of simultaneous linear equation.
4. Roots of quadratic equation.
5. Roots of polynomial Equations
6. Factorization of algebraic expression
7. Plotting of graph using array
8. Use of Boolean and logic functions

MAT201- MATHEMATICS-2

Duration 3 hrs.   **Max. Marks:70**

Note: The question paper will contain three sections as under –
Section-A :   One compulsory question with 10 parts, having 2 parts from each unit.
    Total marks:20
Section-B :   10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit.   Total marks: 50

Lecture- Sixty Lectures including diagnostic and formative assessments during lecture hours.

Unit I
Group homomorphism with its kernel and properties. Isomorphism, Cayle's theorem, automorphism, Fundamental theorem of homomorphism.
Rings, Zero divisors, integral domains and fields. Characteristic of a ring, Subrings. Ideals and their properties.
Number theory: Division algorithm, Greatest Common divisor (GCD) and its algorithm, Linear diophantine equations of two variables (using Euclid algorithm and Bhaskaracharya'sKuttaka method) Fundamental theorem of arithmetic, congruences, Chinese Remainder Theorem, Euler's Øfunction, primitive roots.

अष्टिऔरगुणोंकेसाथसमूहसमाकारिताातुल्यकारिता,केलीकाप्रमेय, स्वकारिता ,समकारिता की मूल प्रमेय।

वलय, शून्यभाजक, पूर्णांकीय प्रान्त औरक्षेत्रावलयकीविशेषता, उपवलयागुणजावलीऔरउनकेगुण.

संख्यासिद्धांत: विभाजनएल्गोरिथ्म, मात्तमसमापवर्तीपूर्णांक (जीसीडी) औरइसकाएल्गोरिदम, दोचरकैरैखिकडायोफैंटाइनसमीकरण (यूक्लिडएल्गोरिदमऔरभास्कराचार्यकीकुट्टकपद्धतिकाउपयोगकरके) अंकगणितकामूलभूत प्रमेय, सर्वांगसमताएं, चायनीजशेषफलप्रमेय, यूलरकाØफलन,प्रिमिटिवमूल

Unit-II
Partial differential coefficients of a function of two or more variables. Total differential coefficient. Composite function, Euler's theorem on homogeneous functions of two, three and variables. First and second differential coefficients of an implicit function. Taylor's theorem for a function of two variables.
Asymptotes, envelopes. Test for points of inflexion and multiple points. Test for concavity and convexity. Tracing of curves in cartesian and polar coordinates.
दो या दो से अधिक चर वाले फलनके आंशिक अवकलन, पूर्ण अवकलन. समग्र फलन , दो, तीन और चरों के सजातीय फलनों पर यूलर का

प्रमेय। किसी अंतर्निहित फलन का पहला और दूसरा अवकलन। दो चरों के एक फलन के लिए टेलर का प्रमेय।

अनंत स्पर्शी, अन्वालोप। नति परिवर्तन बिंदुओं और एकाधिक बिंदुओं के लिए परीक्षण। अवतलता और उत्तलता के लिए परीक्षण. कार्तीय और ध्रुवीयनिर्देशांक में वक्रों का अनुरेखण।

Unit-III

Quadrature, Rectification, Volumes and surfaces of solids of revolution. Differentiation under the sign of integration. Beta and Gamma functions. Double integrals and their evaluation by change of order and changing into polar coordinates. Triple integrals, Dirichlet's double and triple integrals with their Liouville's extension.

क्षेत्रकलन, चपकलन, परिक्रमण- ठोसों के आयतन एवं पृष्ठ। समाकलन चिन्ह के अंतर्गत अवकलन। बीटा और गामाफलन   ,द्विसमाकलन और क्रम परिवर्तन के उपरांत हल तथा ध्रुवीयनिर्देशांक में परिवर्तन द्वारा उनका हल। त्रिसमाकल, डिरिचलेट के द्वि और त्रिसमाकल उनके लिओविले विस्तार

Unit-IV

Polar Equation : Standard equation, directrix, tangent, normal, polar and asymptotes.

Sphere : standard equations in various forms, plane section, sphere through the circle of intersection of two spheres, power of a point, tangent plane, polar plane, polar line, angle of intersection of two spheres, length of tangent, radical plane, radical axis, co-axial system of spheres and limiting points.

ध्रुवीय समीकरण: मानक समीकरण, नियता, स्पर्शरेखा, अभिलम्ब,ध्रुवी और अनंतस्पर्शी।

गोला: विभिन्न रूपों में मानक समीकरण , समतल परिच्छेद , दो गोलों के प्रतिच्छेदन वृत्त के माध्यम से गोला , बिंदु की शक्ति, स्पर्श तल, ध्रुवीय तल, ध्रुवीय रेखा, दो गोले के प्रतिच्छेदन का कोण , स्पशरेखा की लंबाई, ध्रुवीयतल, रेडिकल अक्ष, गोले की सम-अक्षीय प्रणाली और सीमान्त बिंदु।

Unit-V

Central Conicoid : Standard equation, tangent plane, condition of tangency, director sphere, polar plane, polar lines, section with a given center, enveloping cone, enveloping cylinder.

Ellipsoid : Normal, six normals from a point, cone through six normals, conjugate diameters and their properties.

केंद्रीय शांकवज: मानक समीकरण, स्पर्शरेखा तल, स्पर्शरेखा की स्थिति, निदेशक क्षेत्र, ध्रुवीय तल, ध्रुवीय रेखाएं, दिए गए केंद्र के साथ परिच्छेद , आवरण शंकु, अन्वालोपबेलन।

दीर्घवृत्ताकार: अभिलम्ब, एक बिंदु से छह अभिलम्ब, छह अभिलम्ब से शंकु, संयुग्म व्यास और उनके गुणधर्म।

MAT202P - MATHEMATICS PRACTICAL

Duration 2 hrs.   **Min. Pass Marks 25**   **Max.Marks 50**

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as:
Experiment I- 30, Practical record – 10, Viva Voce – 10.

1. Application of fundamental theorem of Homomorphism
2. Problem related to Spheres.
3. Problem related to co axial system of spheres.
4. Problem related to Asymptotes.
5. Problem related to differentiations of composite functions.
6. Application of Euler's theorem.
7. Problem related to curve tracing.
8. Applications of Beta and Gamma function.
9. Problems related to Number Theory and its applications.

1. समरूपता के मौलिक प्रमेय का अनुप्रयोग
2. क्षेत्रों से संबंधित समस्या.
3. गोले की सह-अक्षीय प्रणाली से संबंधितसमस्या।

4.अनंतस्पर्शी से सम्बंधित समस्या।

5. समग्र फलनों के विभेदन से संबंधितसमस्या।

6. यूलरप्रमेय का अनुप्रयोग.

7. कर्वट्रेसिंग से जुड़ी समस्या.

8. बीटा और गामाफ़ंक्शन के अनुप्रयोग।

9. संख्यासिद्धांतऔरउसकेअनुप्रयोगोंसेसंबंधितसमस्याएं।

Or

II Semester

Question 1 is Compulsory 1.

Operations on Matrices Revision of Experiments of Semester I , remainder after division of two polynomials.

Writing script in .sce file to find (any two practical)

1. To find LCM of numbers.
2. To find GCD of number.
3. To find factorial
4. To find permutations
5. To find prime number less than or equal to given number
6. Lower and upper triangular matrix of a matrix
7. Factorization of algebraic expression
8. Plotting of graph by functions
9. Geometric, harmonic, and arithmetic Means
10. Calculate standard deviation

SEMESTER I & II - Suggested Books

1. Shanti Narayan, A text book of Modern Abstract Algebra, S. Chand and Co. New Delhi.
2. A, R, Vasishtha, Modern Algebra, Krishna Prakashan Mandir, Meerut
3. Pundir and Pundir, Theory of numbers , Pragati Prakashan, Meerut.
4. J. N. Sharma & A. R. Vasishtha, Vector Calculus, Krishna Prakashan Mandir, Meerut.
5. S. L. Loney, the elements of coordinate Geometry, Macmillan and Company, London
6. R. J. T. Bell, Elementary Treatise on Coordinate Geometry of Three dimension Macmillan
7. M. Ray & S. S. Seth, Differential calculus, students, friends & Co. Agra
8. M. Ray & S. S. Seth, Integral calculus, students, friends & Co. Agra.
9. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.

MAT301- MATHEMATICS-3

Duration 3 hrs.   **Max.Marks: 70**

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit.
(Total marks : 10 x 2 = 20)
Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit (Total marks : 10 x 5 = 50)
Lecture- Sixty Lectures including diagnostic and formative assessments during lecture hours.

Unit-I

The set of real numbers as a complete ordered field, incompleteness of Q, Archimedean and denseness properties of R, Modulus, Intervals , Equivalent sets. Finite and infinite sets, denumerable sets, Countable and uncountable sets. Interior point of a set, open set, limit point of a set, Bolzano-Weierstrass theorem. Closed set. Dense in itself and perfect sets. Cantor's ternary set

वास्तविकसंख्याओंकासमुच्चय एकपूर्णक्रमितक्षेत्रकेरूपमें। Q कीअपूर्णता।R कीआर्किमिडियनऔरघनत्वगुण।मापांक।अंतराल।तुल्यसमुच्चय ।सीमितऔरअसीमितसमुच्चय ।गणनीयसमुच्चय औरअगणनीयसमुच्चय ।किसीसमुच्चय काआंतरिकबिंदु , विवृतसमुच्चय , सीमाबिंदु, बोल्ज़ानो-वायसट्रासप्रमेय।संवृतसमुच्चय ।स्वयंमेंसघन औरसंपूर्णसमुच्चय ।कैंटरकाटर्नरीसमुच्चय ।

Unit-II

Definition of limit of a function. Continuity of function - Cauchy's and Heine's definitions with their equivalence. Types of discontinuities. Properties of continuous functions defined on closed intervals. Uniform continuity. Differentiability, Rolle's theorem, Lagrange's and Cauchy's mean value theorems and their geometrical interpretations. Taylor's theorem with various forms of remainders. Darboux's intermediate value theorem for derivatives.

किसीफलनकीसीमाकीपरिभाषा।फलनकीसान्तयता – कौशीऔरहाइनीकीपरिभाषाएँऔरउनकीतुल्यता ।असान्तत्यकेप्रकार।संवृतअंतरालपरसान्तत्यफलनोंकेगुण।समान सान्तत्यता।अवकलनीयता।रोलकेप्रमेय , लैग्रेंजऔरकौशीकेमाध्यमानप्रमेयऔरउनकेज्यामितीयअर्थ ।टेलरकाप्रमेयविभिन्नशेषांकोंकेरूपोंकेसाथ।डारबॉकामध्यमानप्रमेयअवकलजोंकेलिए।

Unit-III

Differential equations of first order and first degree, variables separable, homogeneous equations. Linear equations and equations reducible to linear form. Exact differential equations and equations reducible to exact forms.
Differential equations of first order but not of first degree. Solvable for x, y, p Clairaut's form, singular solutions. Geometrical meaning of a differential equation, orthogonal trajectories

प्रथमकोटिऔरप्रथमश्रेणीकेअवकलसमीकरण, चरों का पृथक्करण , समजातीयसमीकरण।रैखिकसमीकरणऔररैखिकरूपमेंसमानीत होने वालेसमीकरण।यथातथअवकलसमीकरणऔरयथातथरूपमेंकियेजासकनेवालेसमीकरण।प्रथमकोटिकेलेकिनप्रथमश्रेणीकेनहींअवकलस मीकरण।x,y,pकेसाधनीयक्लेरेटरूप ,विचित्र हल।अवकलसमीकरणकाज्यामितीयअर्थ, लंबवृत्तीयप्रक्षेपपथ।

Unit- IV

Linear differential equations with constant coefficients, Homogeneous linear differential equations, Total differential equations.
Linear differential equations of second order. Transformation by changing the dependent / independent variable. Method of variation of parameters, Exact differential equations and certain particular forms of equations.

अचर गुणांकवालेरैखिकअवकलसमीकरण।समघातरैखिकअवकलसमीकरण।सम्पूर्ण अवकलसमीकरण।

द्वितीयश्रेणीकेरैखिकअवकलसमीकरण।स्वतंत्र/परतंत्र चरकोबदलकररूपांतरण।प्राचल वितरण विधि यथार्थ अवकलसमीकरणऔरकुछविशेषरूप।

Unit- V

Analytical Conditions of equilibrium of a rigid body under coplanar forces. Friction. Centre of Gravity, Common Catenary

समतलबलोंकेतहतहतपिंड की साम्यवस्था,कीविश्लेषणात्मकशर्तें।घर्षण।गुरुत्वकेंद्र।साधारणकेटेनरी

MAT302P - MATHEMATICS PRACTICAL

Duration 2 hrs.   **Min. Pass Marks 25**   **Max.Marks 50**

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as:

Experiment I- 30, Practical record – 10, Viva Voce – 10.

List of Practical:
1. Solution of differential equations using Picard's method and comparison with exact solution.
2. Solution of differential equations using Euler's method and comparison with exact solution.
3. Formation of the ordinary differential equation.
4. Singular solution of differential equations.
5. Solution of differential equations using variation of parameters method
6. Application of differential equations to solve LCR-circuits and harmonic motions.
7. Solution of differential equation using series solution
8. Applications of Rolles Mean Value Theorem
9. Applications of Cauchy's Mean Value Theorem
10. Applications of Centre of Gravity

1. पिकार्ड की विधि से अवकल समीकरण का हल और यथार्थ हल से तुलना
2. यूलर की विधि से अवकल समीकरण का हल और यथार्थ हल से तुलना
3. सामान्य अवकल समीकरण का गठन।
4. विशेष अवकल समीकरण का हल।
5. चर मान पद्धति का उपयोग करके अवकल समीकरण का हल।
6. अवकल समीकरणों का उपयोग करके LCR-सर्किट और हार्मोनिक गति को हल करना।
7. श्रेणी हल का उपयोग करके अवकल समीकरण का हल ।
8. रोल्स के माध्य मान प्रमेय का अनुप्रयोग
9. कॉशी के माध्य मान प्रमेय का अनुप्रयोग
10. गुरुत्व केंद्र का अनुप्रयोग

Or

III Semester

Revision of practical of Semester I and II
1. Open and closing a file in SCILAB
2. Formatted output.
3. Writing, appending data into file
4. Formatted output.
5. Numerical solution of linear differential equations using initial values.
6. Numerical solution of differential equations of second order using initial values.

7. Numerical solution of simultaneous differential equations of first degree and first order using initial values.
8. 3D graphs.

MAT402- MATHEMATICS-4

Duration 3 hrs.   **Max. Marks: 70**

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit.
     (Total marks : 10 x 2 = 20)
Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit (Total marks : 10 x 5 = 50)
Lecture- Sixty Lectures including diagnostic and formative assessments during lecture hours.

Unit-I
Definition of a sequence, Theorems on limit of sequence,bounded and monotonic sequences, nested interval theorem, Cauchy's sequence, Cauchy's convergence criterion.
Convergence of series of non-negative terms, their various tests (Comparison; D'Alembert's ratio, Cauchy's n^{th}root, Raabe's, Gauss, Logarithmic, De-morgan and Bertand's, Cauchy's condensation, proof of tests not required) for convergence, Alternating series, Leibnitz's test, Series of arbitrary terms, absolute and conditional convergence.

अनुक्रमकीपरिभाषा।अनुक्रमकीसीमापरप्रमेय।परिबद्धऔरएकदिष्टअनुक्रम।नीडितअंतरालप्रमेय।कौशीअनुक्रम।कौ शीकाअभिसरणसिध्धांत।

अऋणात्मकपदोंकेश्रेणियोंकाअभिसरण।अभिसरणकेलिएविभिन्नपरीक्षण (तुलना; डी'अलेम्बर्टकाअनुपात,

कौशीकाn^{th}मूलराबे, गॉस, लघुगणकीयडी-मॉर्गनऔरबर्ट्रेंडका,

कौशीकासंघनन,{परीक्षणकाप्रमाणआवश्यकनहीं}) एकांतर

श्रेणी।लेबनीजकापरीक्षण।याद्रक्षिकपदोंकीश्रेणियां।निरपेक्ष औरसप्रतिबन्धअभिसरण।

Unit-II
Darboux sums and their properties. Riemann integral, Integrability of continuous and monotonic functions. Mean value theorems of integral calculus, The fundamental theorem of integral calculus. Improper integrals and their convergence comparison tests. Abel's and Dirichlet's tests.method.

डारबॉयोगफलऔरउनकेगुण।रीमानसमाकल।सांतत्यऔरएकदिष्टफलनोंकीसमाकलनीयता।समाकलगणितकेमध्यमा नप्रमेय।समाकलगणितकामूलभूत प्रमेय।
अनंत समाकलऔरउनकाअभिसरणपरीक्षण।एबेल एवं डिर्चलिट्परीक्षण विधि

Unit-III
Partial differential equations of first order, Lagrange's solution. Charpit's general method of solution. Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method.

प्रथमकोटिकेआंशिकअवकलसमीकरण।लैग्रेंजकाहल ।चारपिटकीव्यापक विधि।

द्वितीयऔरउच्चतरश्रेणियोंकेआंशिकअवकलसमीकरण।द्वितीयश्रेणीकेरैखिकआंशिकअवकलसमीकरणोंकावर्गीकरण।अचर गुणांकवालेसमघातऔरविषम घात समीकरण।अचर गुणांकवालेसमीकरणोंमेंसमानीतआंशिकअवकलसमीकरण।मॉन्गेकीविधि।

Unit- IV

Simple harmonic motion. Motion under repulsion varying as the distance from a point, motion under inverse square law. Motion under earth's attraction. Hooke's Law, Horizontal and vertical elastic strings rectilinear motion in a resisting medium.

Velocity and acceleration along radial and transverse directions and along tangential and normal directions.

सरलआवर्तगति।बिंदुसेदूरीकेरूपमेंविभिन्नप्रतिकारकगतियाँ।प्रतिलोमवर्गनियमकेतहतगति।पृथ्वीकेआकर्षणकेतहत गति।हुक कानियम।क्षैतिजऔरऊर्ध्वाधरप्रत्यास्थ डोरी,प्रतिरोधकमाध्यममेंसरल रेखीयगति।

ध्रुवान्तरऔरअनुप्रस्थ दिशाओंमेंवेगऔरत्वरण।स्पर्शरेखाऔरअभिलम्बदिशामेंगति।

Unit- V

Projectiles: Motion on horizontal and inclined planes. Direct and oblique impact. Constrained Motion- Circular and Cycloidal

प्रक्षेप्य: क्षैतिजऔरनत तल परगति।समक्ष एवं तिर्यकसंघट्ट, प्रतिबंधित गति- वर्तुल एवं चक्रीय

MAT402P - MATHEMATICS PRACTICAL II

Duration 2 hrs.   **Min. Pass Marks 25**   **Max.Marks 50**

Note-Total number of experiments to be performed by the students during the session. Two experiments must be performed in the semester examination. Marks distribution will be as:

Experiment I- 30, Practical record – 10, Viva Voce – 10.

List of Practical:
1. Applications of Charpit methods
2. Applications of Monges Methods
3. Problems on Damped Simple Harmonic Motion
4. Motion of a particle under resisting medium (Rectilinear motion in resistance varies as velocity and square of velocity)
5. Problems on Projectiles: Motion on horizontal and inclined planes
6. Solve heat equation by separation of variable method (one dimensional)
7. Solve wave equation by separation of variable method (one dimensional)
8. Find convexity and concavity of the plane curve
9. Applications of D'Almbert's Ratio
10. Applications of Abel's and Dirichlet's tests

1. चारपिटविधियोंकेअनुप्रयोग।
2. मॉन्गे की विधियोंकेअनुप्रयोग।
3. मंदितसरलआवर्तगतिपरसमस्याएँ।
4. प्रतिरोधकमाध्यममेंकणकीगति (वेगऔरवेगकेवर्गकेसमानुपातीप्रतिरोधितएकरेखीयगति)।
5. प्रक्षेप्यपरसमस्याएँ: क्षैतिजऔरनत तल परगति।
6. विभाजनचरपद्धतिद्वाराऊष्मासमीकरणकोहलकरना (एक-आयामी)।
7. विभाजनचरपद्धतिद्वारातरंगसमीकरणकोहलकरना (एक-आयामी)।

8. समतलवक्रकीउत्तलताऔरअवतलताज्ञात करना

9. डालम्बर्ट के अनुपात का अनुप्रयोग

10. एबेलऔरडिर्चलिट्परीक्षणोंकाअनुप्रयोग

Or

IV Semester

Revision of practicals of Semester III

1. Introduction of XCOS applications in Physics viz. LCR circuit's projectiles etc., solutions of ordinary differential equations up to II order different types of outputs (scopes).
2. Numerical solution of Partial differential equations (first degree and first order) Using XCOS
3. Generate**Fibonacci numbers by XCOS**
4. Generate an event signal with a specified time step by XCOS
5. Solve Simple Maths operations by XCOS
6. Solve Logic and Bit Operations by XCOS

SEMESTER III & IV - Suggested Books

1. Shanti Narayan: Elements Of Real Analysis, S. Chand & Company Ltd., New Delhi.

2. S.C. Malik: Mathematical Analysis, Wiley Estern Ltd. New Delhi.
3. M. Ray,J.C. Chaturvedi And H.S. Sharma: A Text Book Of Differential Equations, Students Friends & Company, Agra.
4. M.D. Raisinghania: Ordinary And Partial Differential Equations, S. Chand And Company Ltd., New Delhi
5. M. Ray And P.T. Chandi: Statics, Premier Publishing Company, Delhi.
6. M.Ray: A Text Book On Dynamics, Premier Publishing Company, Delhi.
7. J.N. Sharma, A.R.Vashishth: Mathematical Analysis, Krishna PrakashanMandir, Meerat.