Hassan University

Hemagangotri,Hassan-573226

Syllabus(Updated)

IandIIsemesterB.Sc.,Mathematics

(According to State Education Policy SEP-2024)

Department of Mathematics
Hassan University
Hemagangotri,Hassan-573226

w.e.f.theAcademicYear

2026-27

BachelorofScience(B.Sc.)

CurriculumStructureforUnderGraduateProgramfor2026-27 I and II semester Syllabus for Mathematics

Sl No	Semester	CourseCode	Titleofthe Paper	Teaching Hours/ Week	Credit Pattern L:T:P	Credit Value	Marks		
							C1	C2	C3
1	I	MATDSCT-01	Algebra-I&Calculus-I	3	3:0:2	3	10	10	80
		MATDSCP-01	Practical-I	4		2	05	05	40
2	II	MATDSCT-02	Algebra-II&Calculus-II	3	3:0:2	3	10	10	80
		MATDSCP-02	Practical-II	4		2	05	05	40

Assessment

WeightagefortheAssessmentin Percentage(Marks)

TypeofCourse	Formative Assessment / IA	Summative Assessment(SA)
Theory	20% (20 Marks)	80% (80 Marks)
Practical	20% (10 Marks)	80% (40 Marks)

AssessmentPatternforTheory.

Formative or Internal Assessment: This should comprise oftwocomponents namely C1 and C2. Each of C1 and C2 should carry 10 marks.

(a) **C1 Component:** A test must be conducted for 10 marks in the eight week ofthe semester.

(b) **C2 Component:** Any of the assessments such as assignment/seminar/quizcanbe conducted for 10 marks in the eight week of the semester.

Summative Assessment: This may be named as C3 component (semester examination of 3-hour duration) and this must be conducted for 80 marks with the following question paper pattern.

QuestionPaperpatternfortheoryexaminationofIandIIsemesters.

Part-A

Answer any TEN questions, each question carries 2 marks *20 Marks*

(A total of 12 questions choosing 4 questions from each unit must be given)

1. a.
   b.
   c.
   d.
   e.
   f.
   g.
   h.
   i.
   j.
   k.
   l.

Part-B

Answer any FOUR questions, each question carries 5 marks. *20 Marks*

(A total of 6 questions must be given from Unit-I)

2. a.
   b.
   c.
   d.
   e.
   f.

Part-C

Answer any FOUR questions, each question carries 5 marks. *20 Marks*

(A total of 6 questions must be given from Unit-II)

3. a.
   b.
   c.
   d.
   e.
   f.

Part-D

Answer any FOUR questions, each question carries 5 marks. *20 Marks*

(A total of 6 questions must be given from Unit-III)

4. a.
   b.
   c.
   d.
   e.
   f.

AssessmentPatternforPractical.

Formative or Internal Assessment: This should comprise oftwocomponents namely C1 and C2. Each of C1 and C2 should carry 05 marks.

(c) **C1 Component:** A test mustbeconductedfor05marksonorbefore15th weekof the semester.

(d) **C2 Component:** Any of the assessments such as assignment/seminar/quizcanbe conducted for 05 marks on or before 15th week of the semester.

Summative Assessment: This may be named as C3 component (semester examination of 3-hour duration) and this must be conducted for 40 marks with the following question paper pattern.

Practical related viva voce must be conducted for 5 marks, practical record must be evaluatedfor5marksandexaminationcomprisingofprogramwritingandexecution/ manual solution must be conducted for 30 marks with following question paper pattern.

Question: Answer any THREE of the following questions, each question carries 10 marks

(Atotal ofFOUR questions, choosingat least ONEfrom each unitmust be given)

Syllabus

Semester-I

TitleofthePaper:Algebra–IandCalculus–I	
TeachingHours:3Hours/Week	**Credits-3**
TotalTeachingHours:48Hours	**Max. Marks: 100** **S.A. – 80 + I.A. – 20**

CourseLearningObjectives.

After completion of this course, the student will be able to:

- Understand the concepts of matrices, systems of linear equations, andapplicationsof the Cayley-Hamilton theorem.
- Acquireknowledgeofpolynomialequations, transformations, reciprocal equations, and methods of solving higher-degree equations.
- Developanalyticalskillsin successivedifferentiation,Leibnitz theorem.
- Applyconceptsofpolarcoordinates,curvature,andradiusofcurvaturetosolve geometrical problems.
- Strengthen mathematical reasoning and problem-solving abilities through theoretical and computational techniques.

CourseLearningOutcomes:

Upon successful completion of the course, the student will be able to:

- Apply matrix operations, determine rank and inverse of matrices, and solve systemsof linear equations using appropriate methods.
- UtilizetheCayley-Hamiltontheoremtofindpowersandinversesofmatricesand analyse homogeneous and non-homogeneous systems.
- Solvepolynomialequationsusingvariousalgebraictechniquesandestablishrelationships between roots and coefficients.
- Computehigher-orderderivatives usingstandardtechniques andLeibnitz theorem.
- Analysecurvesrepresentedinpolarcoordinatesanddeterminetangentproperties, pedal equations, and angles of intersection.
- Calculate curvature, radius of curvature for curvesinCartesian,parametric,andpolar forms.

Unit-I: Matrices 16Hours

Recapitulation of Matrices, Symmetric and Skew –SymmetricMatrices,StandardProperties and Problems, Elementary row operations, Equivalent Matrices, Row reduced echelonform, Rank and Inverse of a Matrix by elementary row operations.

Solution of system of linear equations – Homogeneous system , trivial and non-trivial solutions,criterionforexistenceofnon-trivialsolutions.Non-Homogeneoussystem – Consistency of a non-homogeneous system. Cayley Hamilton theorem (Statement only) - Problems, Inverse of a Matrix and Powers of Matrices by Cayley Hamilton theorem.

Unit-II:Theoryofequations 16Hours

Polynomials: Euclid's algorithm, Polynomials withintegralcoefficients,Remaindertheorem, Factor theorem, Fundamental theorem of algebra (statement only), Irrational and complex roots occurring in conjugate pairs, Relation between roots and coefficients of a polynomial equation, Symmetric functions, Transformation, Reciprocal equations, Descartes' rule of signs, Multiple roots, solving cubic equationsbyCardon'smethod,Solvingquarticequations by Descartes' Method.

Unit-III:Differentialcalculus–I 16Hours

SuccessiveDifferentiation-nth derivativesofStandardfunctions- e^{ax+b}, $(ax+b)^{m}$, $log(ax+b)$, sin(a x + b) , cos(a x + b), e^{ax}sin (b x + c), e^{ax}cos (b x + c), Leibnitz theorem and its applications.

Polar coordinates, angle between the radius vector and tangent, angle of intersectionof two curves (polar forms), length of perpendicular from pole to the tangent, pedalequations. Derivative of an arc length in cartesian, parametric and polar forms-problems. Curvature of a plane curve - Radius of curvature in cartesian, parametric and polar forms (derivations and related problems).

SuggestedReferences:

1. TheoryofMatrices,BSVatsa,NewAgeInternationalPublishers.M
2. Matrices,ARVasista,KrishnaPrakashanaMandir.
3. ATextofMatrices-ShantiNarayanandPKMittal,S.ChandandCo.Pvt.Ltd.
4. Theoryofequations,J.V.Uspensky,McGraw-HillInc.,US.
5. University Algebra, N.S. Gopala Krishnan, New Age International (P) Limited.
6. Algebra,Natarajan, Manicavasagam Pillay and Ganapathy.
7. Schaum'sOutlineofCalculus,FrankAyresandElliottMendelson,5thed.USA:Mc. Graw Hill, 2008.
8. DifferentialCalculus,Shantinarayan,S.Chand&Company,New Delhi.
9. Calculus,Shanthinarayanan&T.K.ManicavachogamPillay,S.ViswanathanPvt.Ltd., vol. I & II.
10. DifferentialCalculus-ShantiNarayan,S.Chand&Company,New Delhi.
11. Integral Calculus - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.
12. DifferentialandIntegralCalculus–Schaum'soutline series.
13. DifferentialCalculus– NP Bali,New AgeInternational Publishers.
14. DifferentialCalculus–SBalachandraRao,CKShanthaNewAgeInternational Publishers.
15. ATextofMathematics–GKRanganath,SChandandCompany.

PracticalComponent
Semester - I

TitleofthePaper:Practical-I	
TeachingHours:4Hours/Week	Credits-2
TotalTeachingHours:64Hours	Max. Marks: 50 S.A. – 40 + I.A. – 10

CourseLearningObjectives:

- TofamiliarizestudentswiththeuseofFreeandOpenSourceSoftware (FOSS) tools for mathematical computation.
- TodevelopcomputationalskillsinsolvingmathematicalproblemsusingFOSS tools.
- Toenablestudentstovisualizemathematicalconceptsthroughgraphical representations.
- Topromoteself-learningandproblem-solvingthroughtechnology-enabled mathematics.

CourseLearningOutcomes:

Uponsuccessfulcompletionofthecourse,thestudentwillbeableto:

- UseFOSStoolsforbasicmathematicalcomputations,symbolicmanipulations,and algebraic operations.
- Performmatrixoperations,determinerank,inverse,andsolvesystemsoflinear equations using FOSS tools.
- SolvepolynomialequationsandverifytheoreticalresultsrelatedtoAlgebraand Theory of Equations.
- Computehigher-orderderivatives andverify analyticalresults usingFOSS tools.
- PlotcurvesinCartesianandPolarformsandvisualizegeometricalconceptsrelatedto Differential Calculus.
- Apply computational tools for mathematical modelling and interpretation of results.

SuggestedSoftware: Maxima/Scilab/Python/Maple/Matlab/Mathematica/R.

At least two programs from each unit should be taught.

A total of 10 programs should be taught.

ListofProgramstobetaught:

1. Algebra of matrices.
2. Homogeneous system of linear equations

3. Non-homogeneous system of linear equations
4. Computation of Inverse of a Matrix using Cayley-Hamilton theorem.
5. Tofindtherootsofapolynomial equation.
6. Cardon'smethod.
7. Successive differentiation
8. Leibnitz theorem
9. Finding the angle between the radius vector and tangent.
10. Finding the angle of intersection between two curves.
11. Derivative of arc length.
12. Finding the radius of curvatures of the given curves.

Syllabus

Semester - II

TitleofthePaper:Algebra–IIandCalculus–II	
TeachingHours:3Hours/Week	**Credits-3**
TotalTeachingHours:48Hours	**Max. Marks: 100** **S.A. – 80 + I.A. – 20**

CourseLearningObjectives.

After completion of this course, the student will be able to:

- Acquireknowledgeoflimits,continuity,differentiability,MeanValueTheorems,and series expansions.
- Developanalyticalskillsinfunctionsofseveralvariables,partialdifferentiation, Jacobians, and Euler's theorem.
- Applytechniquesoflineintegrals,doubleintegrals,andtripleintegralsinsolving geometrical and analytical problems.
- Strengthenmathematicalreasoning,computationalskills,andproblem-solving abilities in higher-dimensional calculus.

CourseLearningOutcomes:

Upon successful completion of the course, the student will be able to:

- Analyselimits,continuity,anddifferentiabilityoffunctionsandapplyRolle's, Lagrange's, and Cauchy's Mean Value Theorems.
- ExpandfunctionsusingTaylor'sandMaclaurin'sseriesandevaluateindeterminate forms using L'Hospital's rule.
- Computepartialderivativesoffunctionsofseveralvariablesandapply Euler's theorem, total differentiation, and Jacobians to solve mathematical problems.

- Analyseimplicitandcompositefunctionsandobtainseriesexpansionsforfunctions of two variables.
- Evaluatelineintegrals,doubleintegrals,andtripleintegralsandapplythemto determine areas, volumes, and related geometrical quantities.

Unit-I:DifferentialCalculus-I **16Hours**

Limits – Definition, Concept of Left hand andrighthandlimits,Problems,Algebraoflimits, Continuity of a function - Algebra of continuous functions, Some properties and related problems, Differentiability – Concept of Left hand and right hand derivatives, Intermediate value theorem, Rolle's Theorem, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and problems. Taylor's theorem, Maclaurin's series. Indeterminate forms and evaluation of limits using L'Hospital rule.

Unit-II:PartialDifferentiation **16Hours**

Functions of two or more variables- partial derivatives. Homogeneous functions- Euler's theorem and extension of Euler's theorem.Totalderivatives,Explicit,implicitandcomposite functions, differentiation of implicit and composite functions, Jacobians, properties and problems. Taylor's and Maclaurin's series for functions of two variables, Maxima and Minima of a function of two variables.

Unit-III:IntegralCalculus- II **16Hours**

Line Integrals- Definition and problems on line integrals. Double Integrals- Definition, evaluation ofdoubleintegrals,Evaluationbychangingtheorderofintegrationandevaluation bychangingthevariables.Computationofplanesurfaceareasusingdoubleintegrals. Triple Integrals- Definition and evaluation of triple integrals, Evaluation by changing the variables, volume as triple integral.

SuggestedReferences:

1. DifferentialCalculus-ShantiNarayan,S.Chand&Company,New Delhi.
2. DifferentialCalculus– SBalachandra Rao,New AgeInternational Publisher.
3. Integral Calculus, Shanthinarayan, New Delhi: S. Chand and Co. Pvt. Ltd.
4. IntegralCalculus,ShanthinarayanandPKMittal,Reprint.NewDelhi:S.ChandandCo. Pvt. Ltd., 2013.
5. TextBookofB.Sc.Mathematics,GKRanganath,SChand&Company.

PracticalComponent
Semester - II

TitleofthePaper:Practical-II	
TeachingHours:4Hours/Week	Credits-2
TotalTeachingHours:64Hours	Max. Marks: 50 S.A. – 40 + I.A. – 10

CourseLearningObjectives:

- TofamiliarizestudentswiththeuseofFreeandOpenSourceSoftware (FOSS) tools for mathematical computation.
- Todevelopcomputationalskillsinsolvingmathematicalproblemsusing FOSS
- To enable students to visualize mathematicalconceptsthrough graphical representations.
- To promote self-learning and problem-solving through technology-enabled mathematics.

CourseLearningOutcomes:

Uponsuccessfulcompletionofthecourse,thestudentwillbeableto:

- Analyselimits,continuity,differentiation,andseriesexpansionsusingcomputational methods.
- Computepartialderivatives,Jacobians,andverifyEuler'stheoremformultivariable functions.
- Evaluate line integrals, double integrals, and triple integrals using FOSS tools.
- Generategraphicalrepresentationsoffunctionsofoneandseveralvariablesforbetter visualization and interpretation.
- EmployFOSStoolseffectivelyformathematicalproblem-solving,verification,and exploration of advanced concepts.

SuggestedSoftware: Maxima/Scilab/Python/Maple/Matlab/Mathematica/R.

At least two programs from each unit should be taught.

A total of 10 programs should be taught.

ListofPrograms tobetaught:

1. Evaluating the Limits of a function.
2. Continuity of a function.
3. Differentiabilityofafunction.
4. ProgramtoverifyRolle'stheorem.
5. ProgramtoverifyLagrange'smeanvalue theorem.
6. ProgramforfindingtheTaylor'sandMaclaurin'sexpansionsofthegivenfunctions.
7. Programtoevaluatethelimitofafunctionby L'Hospital'srule.
8. Program to verify Euler's theorem and its extension.
9. Program to find the Jacobian.
10. Program to evaluate the line integrals with constant and variable limits.
11. Program to evaluate the Double integrals with constant and variable limits.
12. ProgramtoevaluatetheTripleintegralswithconstantandvariable limits.

****

IIISemesterandIVSemester

Sem	Sl. No	Code	TitleofthePaper	Teaching Hours/ Week	Credit Pattern L:T:P	Credit Value	Marks		
							C1	C2	C3
III	1	DSC-MAT-03	Differential Equations – I andNumericalAnalysis-I	3+4	3:0:2	5	10	10	80
	2	DSET-MAT-03A	NumericalAnalysis-II	2	2:0:0	2	5	5	40
	3	DSET-MAT-03B	AdvancedCalculus	2	2:0:0	2	5	5	40
IV	1	DSC-MAT-04	Algebra–IIIand Calculus - III	3+4	3:0:2	5	10	10	80
	2	DSET-MAT-04	RealAnalysis-I	2	2:0:0	2	5	5	40
	3	DSEP-MAT-04	IntroductiontoLaTeX (Compulsory Practical/Skill)	4	0:0:2	2	5	5	40

Assessmentpatternfortheory(DSC)

Assessmentsbroadlycompriseoftwocomponentsnamesformativeandsum-mativewhichshouldbeintheproportion20% : 80%.

1. **Formative or Internal Assessments.**This should comprise of two components namely$C1$ and $C2$. Each of$C1$ and$C2$ should carry equal weights.Assuming that the theory paper is for 100 marks, the splits are as follows:

   (a) $C1$**Component.**Atestmustbeconductedfor10marksinthe eighth week.

(b) *C*2**component.**Any of the assessments such as seminar/assignment/quizcanbeconductedfor 10marksoratestcan be conducted for 10
marks.

2. **Summative assessment.**This may be named as*C*3 component and this should be conducted for 80 marks.The question paper pattern should be as follows:

PART-A

1. **Question 1.**Answering 10 questions out of 12 questions each carrying 2 marks.(Total 20 marks) and four questions from each of the unit shouldbe given.

PART-B

2. **Question2.**(AnsweranytwofromUnit1andcarries10marks)

    1. (5marks)
    2. (5marks)
    3. (5marks)

PART-C

3. **Question3.**(AnsweranytwofromUnit2andcarries10marks)

    1. (5marks)
    2. (5marks)
    3. (5marks)

PART-D

4. **Question4.**(AnsweranytwofromUnit3andcarries10marks)

    1. (5marks)
    2. (5marks)
    3. (5marks)

PART-E

5. **Question 5.**Answering 6 out of 9 questions, each carrying 5 marks (Total 30 marks). Three questions from each of the unit should be given.

AssessmentpatternforPractical

Assessment comprises of two components namely formative and summa- tive which should be in the proportion of 20% : 80%.Assuming it is for 50marks, the split should be as follows:

(1) **Formative or internal Assessments:**This should be for 10 marks and should comprise of two components namely*C*1 and*C*2 and each should carry same weight.

(i) *C*1 **Component.**A test should be conducted for 5 marks in the eighth week.

(ii) Assignment comprising of two programs of his/her own, apart from the programsprescribedinthelabmanual(if any)hastobesub-mittedfor5 marks in the fifteenth week.

(2) **Summative Assessment:**This may be named as*C*3 component and this should be conducted for 40 marks of 3 hours duration.Practical related vivavoceshouldbeconductedfor5marksandrecordshouldbeevaluated for5marks.Atestofwritingandexecutingprogramsshouldbeconducted for 30 marks. The question paper pattern should be as follows:

Question: Answering3outof4questions,eachcarrying10marks(Total30 marks).Programs from each unit should be given.

Assessmentpatternfortheory(Elective)

Assessments broadly comprise of two components names formative and sum- mativewhichshouldbeintheproportion20%:80%.Assumingitisfor50marks, the split should be as follows:

1. **Formative or Internal Assessments.** This should comprise of two components namely *C*1 and *C*2.Each of *C*1 and *C*2 should carry equal weights.Assumingthatthetheorypaperisfor50marks,thesplitsareas follows:
   (a) *C*1**Component.**A test mustbe conducted for 5marks in the eighth week.
   (b) *C*2**component.**Anyoftheassessmentssuchas

seminar/assignment/quizcanbeconductedfor5 marksoratestcan be conducted for 5
marks.

2. **Summative assessment.**This may be named as *C*3 component and this shouldbeconductedfor40 marks.Thequestionpaperpatternshouldbe as follows:

PART–A

1. **Question 1.**Answering 5 questions out of 6 questions, each carrying 2 marks.(Total10marks)andthree questionsfromeachoftheunitshould be given.

PART-B

2. **Question2.**(AnsweranythreefromUnit1andcarries15marks)
    1. (5marks)
    2. (5marks)
    3. (5marks)
    4. (5marks)
    5. (5marks)

PART-C

3. **Question3.**(AnsweranythreefromUnit2andcarries15marks)
    1. (5marks)
    2. (5marks)
    3. (5marks)
    4. (5marks)
    5. (5Marks)

SYLLABUS

Semester-III:COREPAPER

DSC-MAT-03

Differential Equations - IandNumerical Analysis - I

Unit1-IntroductiontoDifferentialequations 16hours

Differential Equations- Recapitulation of basics of differential equations. **Solutions to differential equations of first order - Classical tech-niques -** Variable separable, reducible to variable separable, Homogeneous, reducible to homogeneous, Exact, reducible to exact (by determining in- tegrating factors), Linear differential equations, Bernouli differential equa- tions;.
Equations of First order and higher degree – Solvable for *p*, Solvable for *x*, Solvable *y*, Clairaut's equations – Singular and General solutions.

Unit2-NumericalMethods&Differentialequationsofhigherorder
16hours

Briefdiscussiononthesignificanceofnumericaltechniques;**Erroranalysis**
- Significant digits, absolute , relative, percentage errors, rounding off and truncation errors, general error formula, error in series approximation, Taylor series approximation.
Numerical techniques for solving differential equations -Euler's method, Euler's modified method, Runge Kutta fourth order method, Pi- card's method.

Ordinary Linear differential equations with constant coefficients- Complementary function-particular integral -inverse differential operators.

Unit3-SecondOrderDifferentialequations 16hours

Cauchy-Euler differential equations -Solutions of ordinarysecond order linear differential equations with variable coefficients - Meth- ods:

1. Whenapartofcomplementaryfunctionisgiven
2. Changingtheindependentvariable
3. Changingthedependentvariable
4. Bythemethodofvariationofparameters
5. ExactMethod

Totaldifferentialequations-Necessaryandsufficientconditionfortheequa-tion *Pdx*+*Qdy*+*Rdz*=0tobeexact(proofonlyforthenecessarypart)– Simultaneousequationsoftheform $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$

References:

1. B.S.Grewal,*HigherEngineeringMathematics*,43rdEdition,Khanna Publishers, New Delhi, 2014.
2. B.S.Grewal,*NumericalMethodsforScientistsandEngineers*,Khanna Publishers, New Delhi, 2012.
3. B. D. Gupta, *Numerical Analysis*, Konark Publishers Pvt.Ltd, New Delhi, 2010.
4. E.IsaacsonandH.B.Keller,*AnalysisofNumericalmethods*,DoverPub-lications, New York, 1994.
5. S.R.K.IyengarandR.K.Jain,*Numericalmethods*,NewAgeInterna-tional Pvt.Ltd., New Delhi, 2009.
6. E.Kreyszig,*AdvancesEngineeringMathematics*,10thedition,JohnWiley &Sons Inc;, 2011.
7. D.A.Murray,*IntroductoryCourseinDifferentialEquations*,Khoslapublications, New Delhi, 1967.
8. M.D.Raisinghania,*Ordinaryandpartialdifferentialequations*,20th Edition, S. Chand Publications, New Delhi, 2013.
9. G.F.Simmons,*Differentialequationswithapplicationsandhistorical notes*,McGrawHillEducation,2ndedition,1991.
10. S. S.Sastry,*IntroductorymethodsofNumericalAnalysis*,5thEdition, PHI Learning Private Limited, 2012.

SemesterIII

PRACTICAL1:DifferentialEquations-IandNumerical Analysis – I

(4hours/Weekperbatchofnotmorethan19students)

MathematicspracticalwithFOSStools forcomputerprograms

Suggestedsoftware:

Maxima/Scilab/Python/Maple/Matlab/Mathematica/R-programming.A

minimum of 10 programs should be taught.

Programs:

1. Programsondifferentialequationssuchas:
   (a) Solvingdifferentialequationsoffirstandhigherorders(withat least three different programs).
   (b) Verifyingexactness(inthecasesapplicable).
   (c) Findingthewronskian.
   (d) Findingpartsofcomplementaryfunctions.
2. Programsonnumericalanalysissuchas:
   (a) Solvingequationsthroughbisection/Newton-Raphson/RegulaFalsi (three different programs)
   (b) Solvingsystemoflinearequations(atleasttwodifferentmethods)
   (c) SolvingdifferentialequationsthroughRunge-Kuttamethod/Picard's method etc.(at least)
   (d) On Newton-Gregory formulas and Numerical differentiation and integration.

ELECTIVES

Elective:DSET-MAT-03A Numerical Analysis - II

Unit1-SolutionstosystemofequationsandPolynomial interpolations 16 hours

Solutions to algebraic and transcendental equations- Bisection method, Regula-Falsi method, iterative method Newton-Raphson method (Brief discussion of the rationale behind techniques and problems on their applications).
Polynomialinterpolations-Finitedifferences-Forward,backwardand central differences and shift operators:definitions, properties and problems; Polynomial interpolation - Newton-Gregoryforwardandbackwardinterpolation formulas, Lagrange interpolation polynomial, Newton's divided differences . (Discussion on setting up the polynomials, differences between them and problems on their applications).

Unit2-Numericaldifferentiationandintegration 16hours

Formula for derivatives (till second order) based on Newton-Gregory forward and backward interpolations (Derivations and problems based on them).Numerical Integration- General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's3/8th rule and Weddell's rule (derivations for onlygeneral quadrature formula, trapezoidal rule and Simpson's 1/3rd rule and problemsontheapplicationsofallformulas).

References:

1. S.Grewal,*NumericalMethodsforScientistsandEngineers*,KhannaPublishers, 2005.
2. B.D.Gupta,*NumericalAnalysis*,KonarkPublishersPvt.Ltd,1995.
3. E.Isaacson and H.B.Keller, *Analysis of Numerical methods*, Dover Publications, 1994.
4. S.R.K.IyengarandR.K. Jain, *Numericalmethods*,NewAgeInterna-tional Pvt.Ltd Elective,2009.
5. M.K.Jain,S.R.K.IyengarandR.K.Jain,*NumericalMethodsforScien- tific and Engineering computation*, New Age International, 4th Edition, 2007.

6. EKreyszig,*AdvancedEngineeringMathematics*,WileyIndiaPvt.Limited, 2011.
7. S.S.Sastry,*IntroductorymethodsofNumericalAnalysis*,PHILearning Private Limited, 5th Edition, 2012.
8. H.C.Saxena,*FiniteDifferenceandNumericalAnalysis*,S.ChandPub-lishers, 2003.

Elective:DSET-MAT-03B Advanced Calculus

Unit1-CurveTracing 16hours

Recalling polar coordinates (relation with cartesian coordinates, formula forthe anglebetweenthecurves&derivativesofarcinpolarandcartesian forms. Simple problems),Pedal equations,curvature of plane curves - radiusof curvature in polar, parametric and cartesian forms, Pedal equations, cen-terofcurvatureand circle of curvature, Envelopes and Evolutes (definitionandmethodsoffinding envelopes).

Unit2-VectorCalculus 16hours

Vectors – Scalars – Vector Field – Scalar field (definition and problems); Vec-tor differentiation–Thevectordifferentialoperator,Gradient–Divergence
– Curl – Standard derivations – vector integration - Green's theorem in plane (definition and problems).

References:

1. K.S.Chandrashekhar,*EngineeringMathematicsII*,SudhaPublica-tions, 2010.
2. H.S.Dhami,*DifferentialCalculus*, NewAgeInternationalPvtLtd Publishers, 2008.
3. ShanthinarayanandJNKapur,*AtextbookofVectorcalculus*,S. Chand Publications, 1989.
4. M.R.Spiegel,*Theoryandproblemsofvectorcalculus*,McGraw-Hill Inc., US, 1959.

Semester-IV:COREPAPER

DSC-MAT-04:Algebra-IIIandCalculus- III

Unit1-IntroductiontoNumbertheoryandGrouptheory16hours

Division algorithm, Divisibility, Prime and composite numbers, GreatestCommondivisor(GCD),co-primes(definition& Properties),Eucledianal-gorithm for finding the GCD, Fundamental theorem of arithmetic, Congru- ences (definition, properties& problems on finding remainders), Euler's Φ function(only definition), Wilson's theorem, Euler's theorem and Fermat's little theorem(only statements, no problems).

IntroductiontoGroupTheory: Definitionandexamplesofgroups;somegeneral properties of groups; Groups of permutations - Cyclic permutations, even-odd permutations;

Unit2-Subgroupsandhomomorphism 16hours

Subgroups; Cyclic subgroups, Properties of cyclic subgroups; Cosets, Index of a group, Lagrange's theorem, consequences, Normal subgroups, Quotient groups; Homomorphisms - Kernel of homomorphism, Isomorphism, Auto- morphism, Fundamentaltheoremofhomomorphism;Cayley'stheorem.

Unit3-LineandMultipleintegrals 16hours

Line integral: Definition of line integral and basic properties, examples on evaluation of line integrals.Double integral: Definition of Double integrals and its conversion to iterated integrals.Evaluation of double integrals by changing the order of integration and change of variables.Computation of plane surface areas using double integrals. Triple integral: Definition of triple integrals and evaluation- change of variables, volume as triple integral.

References:

1. M.Artin, *Algebra*,PHILearningPvt. Ltd.,NewDelhi,India,2nd edition, 2011.
2. RBalakrishanandN.Ramabadran,ATextbookofModernAlgebra, Vikas publishinghousepvt.Ltd,NewDelhi,India,1stedition, 1979.
3. D.MBurton,*ElementaryNumberTheory*,McCrawHill,6thedition, 2006.

4. EmilGrosswald,*TopicsfromtheTheoryofNumbers*,ModernBirhauser, 1984.
5. J.B.Fraleigh,*Afirstcourseinabstractalgebra*,PearsonEducation India; 7th edition, 2003.
6. I.N.Herstein,*TopicsinAlgebra*,Wileypublications,2ndedition,2006.
7. Joseph Gallian, *Contemporary Abstract Algebra*, Narosa Publishing House, New Delhi, Fourth Edition, 2006.
8. I.Niven, H. S.Zuckermanand H. L. Montgomery,*AnIntroductiontothe Theory of Numbers*, John Willey (New York), 1991.
9. Vashista,*AFirstCourseinModernAlgebra*,KrishnaPrakasanMandir,11th edition, 2010.

SemesterIV

PRACTICAL1:Algebra-IIIandCalculus–III

(4hours/Weekperbatchofnotmorethan19students)

MathematicspracticalwithFOSStools forcomputerprograms

Suggestedsoftware: Maxima/Scilab/Python/Maple/Matlab/Mathematica/R-programming.

AMinimumof10programsshouldbetaught.

Programs:

1. Programsinnumbertheory(anythingwithinthescopeofthetheory syllabus-atleastfourprograms).
2. Programsingrouptheorysuchas:
   (a) Verifying the laws such as commutative,associative,closure etc. (at least three programs)
   (b) ConstructingCayley'stable.
   (c) Findingtheidentityelement andinverses.(Twoprograms)
   (d) Findingifasubgroupiscyclic/normalornot.(Twoprograms)
   (e) Constructingthecosetsofagivensubgroup.
   (f) Programsonhomomoprhisms.

ELECTIVE

Elective:DSET-MAT–04 Real

Analysis – I

Unit1-RiemannIntegration 16hours

Definition and examples for partition of an interval, Refinement and common refinement of a partition; Lower and upper Riemann (Darboux) sums- Definition, properties and problems; Riemann integral - Lower and Upper integrals (definition and problems), Darboux's theorem and criterion for integrability, integrability of sum,difference,product,quotientandmodulusof integrablefunctions. Integralasa limit of sum – Problems on integrability, Some integrable functions – Integrability of continuous functions and monotonic functions, bounded function with finitenumber of discontinuity, Fundamental theorem of Calculus, Change of variables, integration by parts, First mean value theorems of calculus.

Unit2-ImproperIntegrals 16hours

Improper Integrals (definition only) – Gamma and Beta functions and results following the definitions – Connection between Beta and gamma functions – applicationsofevaluationofintegrals–Duplicationformula.

References:

1. AjitKumarandS.Kumaresan,*AbasicCourseinRealAnalysis*,Taylor and Francis Group, 2014.

1. T. Apostol,*MathematicalAnalysis*,NarosaPublishingHouse(India),2002.

2. R.R.Goldberg,*MethodsofRealAnalysis*,OxfordandIBHPublishing, 1976.

3. S.C.MalikandS.Arora,*MathematicalAnalysis*,India:NewAgeIn-ternational(India)Pvt.Ltd,5thEdition, 2017.

4. S. C. Malik, *Principles of Real Analysis*, New Age Internation (India), Pvt. Limited, 4th Edition, 1992.

5. W.Rudin,*Principles of MathematicalAnalysis*,McGrawHillEduca-tion, 3rd Edition, 1976.

CompulsoryPractical/Skill:DSEP-MAT–04
IntroductiontoLaTeX

ForLatextypesetting: Overallfocusshouldbeon-

1. AbriefintroductiontoLaTeXlanguageanddifferencebetweenLaTeX and word.
2. InstallationofMikeTex
3. InstallationofplatformsTeXStudio/TeXmaker/WinEdt
4. UsesoflearningLaTeX.

Followingtypesettingskillsshouldbemainlyfocused:

1. Writingpreambleandtheknowledgeofpackages&documentclasses required.
2. Basicsoftypesetting-Basicalignment/paragraphwriting/linespac-ing/word spacing/margin/font coloring/font size/font style
3. Mathematical Typesetting - Mathematical Typesetting - Basic sym-bols/commands for mathematical typesetting - packages required; Type-settingofvarioussymbols,matrices,vectorsetc.
4. Environments - Various environments - center, equation, align, mult-line, labelling equations.
5. Tables-Creationoftable(variouskinds),namingthetables,align-ments.
6. Boxes-Creationoftextbox,colortextbox,minipage,Insertingimage
7. Sectioning - Creation of sections,subsectionsand naming the equations, definitionsetc.asperthesection.
8. Imageinsertion.
9. Introductiontobeamerclass(preparationofpresentations).
10. Introductiontooverleaf.

LaTeXlearningplatforms:

1. www.overleaf.com
   (www.oberleaf.com/learn/latex/LearnLaTeXin30minutes)
2. *TheveryshortguidetotypesettingwithLaTeX*
   (bu.edu/math/files/2013/08/ShortTex3.pdf)
3. *LaTeXTutorials-APrimer*
   (tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf)
4. StefanKottwitz,*LaTeXBeginner'sGuide*
   (static.latexstudio.net/wp-content/uploads/2015/03/LaTeXBeginnersGuide.pdf)

VSemesterandVISemester

Sem	Sl. No	Code	TitleofthePaper	Teaching Hours/ Week	Credit Pattern L:T:P	Credit	Marks		
							C1	C2	C3
V	1	DSC-MAT-05A	Algebra - IV and AppliedMathematics	3	3:0:0	3	10	10	80
	2	DSC-MAT-05B	ComplexAnalysis	3	3:0:0	3	10	10	80
	3	DSCP-MAT-05	Complex Analysis, Algebra- IV and AppliedMathematics	4	0:0:2	2	5	5	40
VI	1	DSC-MAT-06A	LinearAlgebraand Graph Theory	3	3:0:0	3	10	10	80
	2	DSC-MAT-06B	RealAnalysis-IIand PartialDifferential Equations	2	2:0:0	2	5	5	40
	3	DSCP-MAT-06	LinearAlgebraand Graph Theory, RealAnalysis-IIand PartialDifferential Equations	4	0:0:2	2	5	5	40

Assessment pattern fortheory(DSC-MAT-05A,05B,06A)

Assessmentsbroadlycompriseoftwocomponentsnamesformativeandsummativewhichshouldbeintheproportion20% : 80%.

1. **Formative or Internal Assessments.**This should comprise of two components namely*C*1 and *C*2. Each of*C*1 and*C*2 should carry equal weights.Assuming that the theory paper is for 100 marks, the splits are as follows:
   (a) *C*1**Component.**Atestmustbeconductedfor10marksinthe eighth week.
   (b) *C*2**component.**Any of the assessments such as seminar/assignment/quizcanbeconductedfor 10marksoratestcan be conducted for 10
   marks.

2. **Summative assessment.**This may be named as*C*3 component and this should be conducted for 80 marks.The question paper pattern should be as follows:

PART–A

1. **Question 1.**Answering 10 questions out of 12 questions each carrying 2 marks.(Total 20 marks) and four questions from each of the unit shouldbe given.

PART-B

2. **Question2.**(AnsweranytwofromUnit1andcarries10marks)
   1. (5marks)
   2. (5marks)
   3. (5marks)

PART-C

3. **Question3.**(AnsweranytwofromUnit2andcarries10marks)
   1. (5marks)
   2. (5marks)
   3. (5marks)

PART-D

4. **Question4.**(AnsweranytwofromUnit3andcarries10marks)
    1. (5marks)
    2. (5marks)
    3. (5marks)

PART–E

5. **Question 5.**Answering 6 out of 9 questions, each carrying 5 marks (Total 30 marks). Three questions from each of the unit should be given.

Assessment patternfortheory(DSC-MAT-06B)

Assessments broadlycompriseoftwocomponentsnamesformativeandsummativewhichshouldbeintheproportion20% : 80%. Assuming it is for 50 marks, the split should be as follows:

1. **Formative or Internal Assessments.**This should comprise of two components namely*C*1 and *C*2. Each of*C*1 and*C*2 should carry equal weights.Assuming that the theory paper is for 50 marks, the splits are as follows:
    (a) *C*1**Component.**Atestmustbeconductedfor5marksinthe eighth week.
    (b) *C*2**component.**Any of the assessments such as seminar/assignment/quiz can be conducted for 5 marks or a test can be conducted for 5 marks.
2. **Summative assessment.**This may be named as*C*3 component and this should be conducted for 40 marks.The question paper pattern should be as follows:

PART-A

1. **Question 1.**Answering 5 questions out of 6 questions, each carrying 2 marks.(Total 10 marks) and three questions from each of the unit should be given.

PART-B

2. **Question2.**(AnsweranythreefromUnit1andcarries15marks)

    1. (5marks)
    2. (5marks)
    3. (5marks)
    4. (5marks)
    5. (5marks)

PART-C

3. **Question3.**(AnsweranythreefromUnit2andcarries15marks)

    1. (5marks)
    2. (5marks)
    3. (5marks)
    4. (5marks)
    5. (5marks)

AssessmentpatternforPractical

Assessment comprises of two components namely formative and summa- tive whichshouldbeintheproportionof20%-80%.Assumingitisfor50marks,thesplit should be as follows:

(1) **Formative or internal Assessments:**This should be for 10 marks and should comprise of two components namely*C*1 and*C*2 and each should carry same weight.

(i) *C*1 **Component.**A test should be conducted for 5 marks in the eighth week.

(ii) Assignment comprising of two programs of his/her own, apart from the programsprescribedinthelabmanual(if any)hastobesub-mittedfor5 marks in the fifteenth week.

(2) **Summative Assessment:**This may be named as*C*3 component and this should be conducted for 40 marks of 3 hours duration.Practical related vivavoceshouldbeconductedfor5marksandrecordshouldbeevaluated for5marks.Atestofwritingandexecutingprogramsshouldbeconducted for 30 marks. The question paper pattern should be as follows:

Question: Answering3outof4questions,eachcarrying10marks(Total30 marks).Programs from each unit should be given.

SYLLABUS

SemesterV

Core Paper : DSC-MAT-05A

Algebra–IVandAppliedMathematics

Unit1:Ringsand Fields 16hours

Rings – properties, integral domains, Fields-theorems and problems, Subrings - Criterion for sub rings, theorems and problems, Ideals – Algebra of Ideals, Principal ideals – properties, prime ideal, maximal ideals (definition and examples), units and associates.
Quotient rings, Homomorphism - examples and properties, Kernel of a homomorphism, Isomorphism, Automorphism of a ring, Fundamental Theorem of Homomorphism.

Unit2: **LaplaceTransforms** 16hours

Definition and basic properties – Laplace transforms of e^t, cos(kt), sin(kt), a^t, t^n, cosh(kt) and sinh(kt) – Laplace transform of $e^{at}F(t)$, $t^nF(t)$, F(t)/t – problems – Laplace transform of derivatives of functions – Laplace transforms of integrals of functions – Laplacetransforms of α-functions – Inverse Laplace transforms – problems.
Convolution theorem – Simple initial value problems – Solution of first and second order differential equations with constant coefficients by Laplace transform method.

Unit3: Fourier series 16hours

Introduction – Periodic functions – Fourier series and Euler formulae (statement only) – Even and odd functions – Half range series – Change of interval.

References

UNIT1:RingsandFields

1. I.N.Herstein,*TopicsinAlgebra*,2ndEdition,WileyEasternLtd.,NewDelhi,1990.
2. A.Joseph,Gallian , *Contemporary Abstract Algebra*, 10th ed, Taylor and Francis Group, 2021.
3. MichaelArtin, *Algebra*,2nded.,Pearson,2015.
4. VijayKKhannaandS.K.Bhambri,*ACourseinAbstractAlgebra*,Vikas Publications, 1998.

UNIT2andUNIT3:LaplaceTransformsandFourierSeries

1. E.Kreyszig-AdvancedEngineeringMathematics,WileyIndiaPvt.Ltd,2011.
2. M.D.Raisinghania,LaplaceandFourierTransforms,S.Chandpublications,2005.

CorePaper:DSC-MAT-05B
Complex Analysis

Unit 1: Functions of a Complex Variable 16 hours

Equationto acircleand astraight line in complexform, Limit of afunction, Continuityand differentiability,Analyticfunctions–Singularpoints–Cauchy-RiemannequationsinCartesian and polar forms – Necessary and sufficient condition for function to be analytic, Harmonicfunctions–RealandImaginarypartsofananalyticfunctionareharmonic– Constructionofanalyticfunctioni)MilneThomsonMethod,ii)usingtheconceptof Harmonic function.

Unit2:Transformations 16hours

Definition – Jacobian of a transformation, Identity transformation , Reflection , Translation, Rotation, Stretching, Inversion, Linear transformation – Definitions – The Bilinear transformations – cross Ratio of four points – cross ratio preserving property – Preservationofthefamilyofstraightlinesandcircles, conformalmappings–Discussionof the transformationsw = z^2, w = sin z, w = e^z,w = ½ (z + 1/z).

Unit3:ComplexIntegration 16hours

The complex line integral – Examples and Properties, Proof of Cauchy's Integral theoremusingGreen'sTheorem, Direct consequencesof Cauchy'stheorem, TheCauchy's integral formula for the function and the derivatives – Applications to the evaluations of simple line integrals , Cauchy's Inequality, Liouville's theorem, Fundamental theorem of Algebra.

References

1. L.V.Ahlfors,*ComplexAnalysis*,3rdEdition,McGrawHillEducation,1979.
2. BruceP.Palka,*IntroductiontotheTheoryofFunctionofaComplexVariable*, Springer, 1991.
3. R.V.Churchill&J.W.Brown,*ComplexVariablesandApplications*,5thed, McGraw Hill Companies, 1990.
4. S. Ponnuswamy, *Foundations of Complex Analysis*, 2nd Edition, Alpha Science International Limited. 2013.
5. SergeLang.*ComplexAnalysis*,Springer,1999.
6. Shanthinarayan,*TheoryofFunctionsofaComplexVariable*,S.Chand Publishers, 1980.

PRACTICAL1:ComplexAnalysis,Algebra–IVandAppliedMathematics

(4 hours /Week per batch of not more than 19 students)

MathematicspracticalwithFOSStoolsforcomputerprograms
Suggestedsoftware:Maxima/Scilab/Python/Maple/Matlab/Mathematica/R-Programming.

AMinimum of 10 programs should be taught.

PROGRAMS:

1. (i)Toverifythegivenringiscommutativeornot.
   (ii)Tocheckthepresence oftheunityelementinthe ring.
2. Toverifythegivenringisafield/integraldomain or not.
3. (i)Tofindthelaplacetransformandinverselaplacetransformofthe functions.
   (ii)Tofindlaplacetransformofintegrals.
4. Tosolveordinarylineardifferentialequationusing Laplacetransforms.

5. Tofindthefullrangetrigonometric Fourierseriesoffunctionwithperiod 2π and 2l in the interval (-l, l).
6. Tofindhalfrangesineandcosine series.

7. (i)Toverifythegivenfunctionisanalyticornot.
   (ii) Constructionofananalyticfunctionby Milne-Thomsonmethod.
8. To checkwhether realandimaginarypartsofthegivenfunctionare harmonic or not.
9. Cauchy'sintegralformula.
10. GeneralisedCauchy'sintegralformula.
11. Crossratiounderbilineartransformation.
12. Fixedpoints.

SemesterVI
Core Paper : DSC-MAT-06A
LinearAlgebraandGraphTheory

UNIT1:Vector Spaces 16hours

Vector Spaces – Definition – Examples, Vector subspaces – Criterion for a subset to be a subspace – Algebra of Subspaces – Linear Combination – Linear Span – Lineardependence and linear Independence of vectors – Theorems on linear dependence and linear independence, Basis of a vector space – Dimension of a vector space –– Some properties, Quotient spaces – Homomorphism of vector spaces – Isomorphism of vector spaces – Direct Sums.

UNIT2:Linear Transformations 16hours

Linear transformation – Linear maps as matrices – Change of basis and effect ofassociated matrices, Kernel and image of a linear transformation, Rank and nullity theorem,Eigen values and Eigen vectors of a linear transformation.

Unit3: GraphTheory 16hours

Properties of graphs, subgraphs, induced subgraphs, spanning subgraphs, walk, path,trail, circuit, cycle, isomorphism, complement of graph, operations on graph - union, join, product, corona. Matrices-adjacency and incidence.

References

UNIT1andUNIT2:VectorSpacesandLinearTransformations

1. Gilbert.Strang,*LinearAlgebraanditsapplications*,(2ndEdition),Elsevier, 2015.
2. I.N.Herstein,*TopicsinAlgebra*,2ndEdition,Wiley, 1990.
3. KennethHoffman&RayKunze,*LinearAlgebra*,PrinticeHall India Leaning Private Limited, 2nd Edition, 2015.
4. S.Kumaresan,*LinearAlgebra*,PrenticeHallIndiaLearningPrivateLimited, 2000.
5. T.K.ManicavasagamPillaiandKSNarayanan,*ModernAlgebra*,Volume2, 2004.
6. S.SergeLang,*IntroductiontoLinearAlgebra*,Springer,2nd Edition,2005.
7. StephenH.Friedberg.ArnoldJ.Insel&LawrenceE.Spence,*LinearAlgebra*, Printice-Hall of India Pvt. Ltd., 4th Edition 2003.
8. F.M.Stewart,IntroductiontoLinearAlgebra,DoverPublications,1995.
9. VivekSahai&VikasBist ,LinearAlgebra,2nd Edition,NarosaPublishing,2013.

UNIT3:Graph Theory

1. J.A.BondyandUSRMurthy,*Graphtheorywithapplications*,Elsevier,1976.
2. N.Deo,*GraphtheorywithapplicationstoEngineeringandComputerScience,* Prentice Hall of India, 1987.
3. FHarary,*Graphtheory,*AddisonWesley,ReadingMass,1969.
4. C.L.Liu,*ElementsofDiscretemathematics*,McGraw-Hill,1986.
5. K.R.Parthasarathy,*BasicGraphtheory*,TataMcGraw-Hill,NewDelhi,1994.
6. D.B.West,*IntroductiontoGraphtheory*,PearsonEducationinc.,2001,2nded.

CorePaper:DSC-MAT-06B
RealAnalysis-IIandPartialDifferentialEquations

Unit1: Sequencesand Series 16hours

Sequenceof realnumbers,bounded andunbounded sequences,Infimumandsupremum, Limit of a sequence – Algebra of limits. Convergent, divergent and oscillatory sequences, Monotonic sequences, Cauchy's general principle of convergence.

Infinite series of real numbers, Convergence and Divergence, Oscillation of series – Properties of converging series, Series of positive terms, Geometric series, p –series, Comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test.

Unit2:PartialDifferential Equations 16hours

Introduction, Formation of a partial differential equations by elimination of arbitrary constants and functions, solution of partial differential equations –Lagrange's linear equations of the form Pp + Qq = R, Charpit's method, Homogenous linear equations with constant coefficient – Rules for finding the complementary function and particular integral.

References

UNIT1:Sequencesand Series

1. S.S.Bali,*RealAnalysis,2004*.
2. LeadershipPproject, *Textbookofmathematicalanalysis,*Bombayuniversity.
3. S.C.Malik, *RealAnalysis, 1992*..
4. RichardRGoldberg,*MethodsofRealAnalysis*,Indianed,1976.

UNIT2:PartialDifferential Equations

1. F.Ayres,*DifferentialEquations*(SchaumSeries),1972.
2. B.S.Grewal,*HigherEngineeringMathematics,2014*.

3. E.Kreyszig, *AdvancedEngineeringMathematics*,WileyIndiaPvt.Ltd,2011.
4. D.A.Murray,*IntroductoryCourseinDifferentialEquations,1924*.
5. M. D. Raisinghania, *Advanced Differential Equations*, S Chand and Co. Pvt.Lid., 2013.
6. G.P.Simmons,*DifferentialEquations, 1972.*
7. G.Stephonson,*AnintroductiontoPartialDifferentialEquations,1996*.

PRACTICAL6:LinearAlgebraandGraphTheory,RealAnalysis–IIand Partial Differential Equations

(4 hours /Week per batch of not more than 19 students)
MathematicspracticalwithFOSStoolsforcomputerprograms
Suggestedsoftware:Maxima/Scilab/Python/Maple/Matlab/Mathematica/RProgramming.

AMinimumof10programsshouldbetaught. PROGRAMS:

1. Toexpressthevectorasalinearcombinationofthegiven vector.
2. Lineardependenceandindependenceofavector.
3. Toverifywhetheragiventransformationislinearor not.
4. Rankandnullity.
5. (i)Obtainsomestandardgraphs.
   (ii) Tocheckwhetherthe given graphsare isomorphicornot.
6. (i)ObtainHamiltoniancycle.
   (ii) Obtainadjacencymatrixofthegraph.
7. Totesttheconvergenceofthesequence.
8. To verifywhetherthegivensequenceismonotonicallyincreasingor decreasing.
9. Tolisttheconvergenceof theseries.
10. TolisttheconvergenceoftheseriesbyD'Alembert'sratiotest.
11. To solve first order nonlinear Partial Differential Equations containing p and q only.
12. Tosolvefirstordernonlinear PartialDifferential Equationsoftheform $f_1(x,p)=f_2(y,q)$.