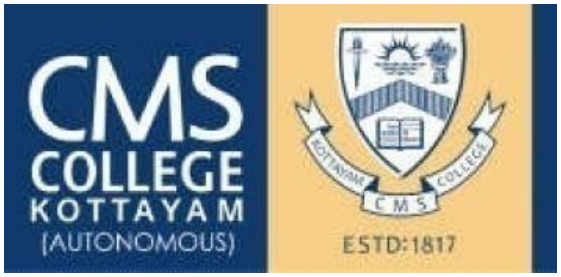

CMS COLLEGE KOTTAYAM

(AUTONOMOUS)

Affiliated to the Mahatma Gandhi University, Kottayam, Kerala

CURRICULUM FOR UNDERGRADUATE PROGRAMME

B.Sc MATHEMATICS MODEL I

UNDER CHOICE BASED CREDIT SYSTEM 2016
(With effect from 2016)

B.Sc. MATHEMATICS MODEL II

COMPLEMENTARY COURSE –OPERATIONS RESEARCH

SYLLABUS

[2017 Admission onwards]

B.Sc.DEGREEPROGRAMME
COMPLEMENTARYCOURSE-OPERATIONSRESEARCH
(For B.ScMathematicsModelII)

FIRSTSEMESTER
LINEARPROGRAMMING

3hrs/week(TotalHrs:54)3Credits

Syllabus

TextBook
K.V.MitalandC.Mohan,OptimizationmethodsinOperationsResearchandsystemAnalysis(NewAgeInternationalpublishers)

ModuleI:MathematicalPreliminaries (15hrs)

Vectorsandvectorspaces(Definition1,2andexamplesonly),LinearDependence(Definition2,4andexamplesonly.Theorem1excluded),Dimensionofavectorspace),basis(Definition5andstatementofTheorem2only;EuclideanSpace(Definition6,7,8andExampleOnly),NormofaVector(Definition9,10andTheorem3withoutproof).LinearAlgebraicEquatons(Generalformonly).OpenandclosedsetsinE$_n$,convexsets(Definition12,13,14,15,16,17andstatementofTheorem7).Convexlinearcombination(Definition18,19,20,21andexamples.Theorem8excluded);Intersectionofconvexsets,ConvexHullofaset(Definition22,statementsofTheorem9and10andexampleonly.Theorem11excluded),Verticesorextremepointsofaconvexset(Definition23andStatementofTheorem13Only);Convexpolyhedron(Definition24andStatementofTheorem14Only.Theorem15excluded),Hyperplanes,halfspacesandpolytopes(Definition25,26,27andstatementsofTheorem17andstatementofCorollaryonly.Theorem16Excluded),SeperatingandSupportingHyperplanes(Definition29,StatementofTheorems18and20Only.Theorem17Excluded);Verticesofaclosedboundedconvexset(StatementsofTheorem21andTheorem22Only**).**

Text1Chapter1(Sections1.1to1.19)
Problems3,4,6,8,and11.AllotherproblemsinProblemsIofChapter1areexcluded.
ProofsofallTheoremsexcluded.

ModuleII: GeneralProblemofMathematicalProgramming (12hours)

QuadraticForms(Definition30,Examples,StatementsofTheorem24,25,26and27only).LocalandGlobalExtrema(Definitions6and7only),Saddlepoint(Definition8only).ConvexFunctions(Definition10,StatementsofTheorem3and4only.Theorems5and6areexcluded),GeneralProblemofMathematical Programming.

Text1Chapter1(Section1.20only)andChapter2(Sections2.5,2.11and2.12only)
AllotherproblemsinProblemsIofChapter1andProblemsIIofChapter2areexcluded.
ProofsofallTheoremsexcluded.

ModuleIII-Linearprogramming (10hours)

Introduction,L.Pintwodimension.GeneralLPproblem,Feasiblesolutions(Definition1andstatement

ofTheorem1),Basicsolutions,Basicfeasiblesolutions(Definition2andStatementsofTheorems2and3 only),Optimalsolutions(StatementsofTheorems4and5only),Summary,LPPusingGraphicalMethod .

Text1Chapter3(Sections3.1to3.8)
Problems1and2ofChapter3.AllotherproblemsinProblemsIIIofChapter3areexcluded.
ProofsofallTheoremsexcluded.

ModuleIV-Linearprogramming(Cont.) (17hours)

Linearprogramming:Simplexmethod,Simplexmethod(NumericalExample),Simplextablefindingt hefirstbasicfeasiblesolution,Artificialvariables,Degeneracy.

Text1Chapter3(Sections3.9to3.12)Text1Chapter2(Section2.12)andChapter3(Sections3.8to3.14), Problems3,4and5ofChapter3.AllotherproblemsinProblemsIIIofChapter3areexcluded

ReferenceTexts

1. FrankAyresJr,Matrices(Schaum'sOutlineSeries,TMHEdition);
2.LinearAlgebra,SeymourLipschutzandMarkLipson(Schaum'sOutlineSeries,TMHEdition)
3.OperationsResearchTheoryandApplications,.J.K.Sharma(MacmillanIndiaLtd.)

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	7	2	-	9
II	2	3	1	6
III	2	2	1	5
IV	1	2	2	5
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc.DEGREEPROGRAMME COMPLEMENTARYCOURSE-
OPERATIONSRESEARCH –
(For B.ScMathematicsModelII)
SECONDSEMESTER
DUALITY,TRANSPORTATIONANDASSIGNMENTPROBLEM

3hrs/week(TotalHrs:54) 3Credits

Syllabus

TextBook

K.V.Mital&C.Mohan:OptimizationMethodsinOperationsResearchandSystemAnalysis(NewAgeInternationalPublishers)
Chapter3(Sections17to20and22)Chapter4(Sections1to4,6to11,14to16)

ModuleI: LinearProgramming (15hours)
DualityinL.P.Problems,DualityTheorems(statementsonly-ProofsofallTheorems are excluded),Applicationofduality,DualSimplexMethod,ApplicationsofL.P.

ModuleII: TransportationProblems (10hours)
Introduction,TransportationProblems,TransportationArrays,Transportationmatrix,Findingabasisfeasiblesolution.TestingforOptimality.

ModuleIII: LoopingTransportation (15hours)
Theorem2insec8 (statementonly),Arraychangingthebasis,Degeneracy,UnbalancedProblem

ModuleIV:AssignmentProblems (14hours)
AssignmentProblems, Theorem 3 in sec 14(statement only),GeneralizedtransportationproblemSummaryofTransportationAlgorithms.

Reference:

J.K.Sharma:OperationsResearchTheoryandApplications(MacmillanIndianLtd)

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	4	2	1	7
II	4	1	0	5
III	2	3	2	7
IV	2	3	1	6
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc.DEGREEPROGRAMME COMPLEMENTARYCOURSE-OPERATIONSRESEARCH –
(For B.ScMathematicsModelII)
THIRDSEMESTER
QUEUEINGTHEORY

3hrs/week(TotalHrs:54)3Credits

Syllabus

TextBook:

1. **K.V.Mital&C.Mohan:OptimizationMethodsinOperationsResearchandSystemAnalysis(NewAgeInternationalPrivateLimited)**
   Chapter12
2. **J.K.Sharma:OperationsResearchTheoryandApplications(ThirdEdition)(Macmillan)**
   Chapter13(Section1to6)Chapter16(Sections1to6)

ModuleI: TheoryofGames (16hours)

Introduction,Matrixgames,problemofgametheory,Minimaxtheorem(Theorem1,Theorem2,Corollary1andCorollary2withoutproof),SaddlePoint,StrategiesandPayoff.TheoremsofMatrixGames(Theorem3,Theorem4,Theorem5andTheorem6withoutProof),graphicalsolutions,NotionofDominance,RectangulargameasanLPproblem.

Text1:Chapter12, AllTheoremswithoutProof.

ModuleII:ProjectManagementPERT&CPM (10hours)

Introduction,BasicDifferencebetweenPERT&CPM,SignificanceofusingPERT/CPMphasesofProjectManagement,ProjectPlanningPhase,SchedulingPhase,ProjectcontrolPhasePERT/CPM,NetworkComponentsandPrecedenceRelationships,RulesofAOANetworkConstruction,ErrorsandDummiesinNetwork

Text2Chapter13-Sections13.1to13.4

ModuleIII:ProjectManagementPERT&CPM(Cont.) (14hours)

Criticalpathanalysis,ForwardPassMethod,Backwardpassmethod,Float(slack)ofanactivityandEventCriticalPath,ProjectSchedulingwithUncertainActivityTimes,EstimationofProjectCompletionTime.

Text2Chapter13-Sections13.5to13.6
AllQuestionsrelatedtoProbabilityDistributionsareexcluded

ModuleIV:QueuingTheory (14hours)

Introduction,EssentialfeaturesofaQueueingsystem,CallingPopulationsCharacteristics(pdfofPoissonDistributionandExponentialDistributionOnly),QueueingProcess,QueueDiscipline,ServiceProcess,PerformanceMeasuresofaQueueingsystem,Transient – stateandsteady – state,RelationshipsamongperformanceMeasures(FormulaeOnly),ProbabilitydistributionsQueueingsystems,DistributionsofArrivals(ExponentialProcess),DistributionofDeparture(pureDeathProcess),DistributionofServiceTimesClassificationofQueueingModels,SolutionofQueueingModels,SingleservesQueueingModels(DerivationsforDifferentialDifferenceEquations,SystemofSteady-StateEquations,SysytemofDifferenceEquations,ProbabilityDensityFunctionsofWaitingTimeandBusyPeriodDistributionsareexcluded),PerformanceMeasuresforModelI(FormulaeOnly)
ModelI;{(M/M/1):(∞/FCFS)}
ModelII;{(M/M/1): (∞/SIRO)}

Text2Chapter16-Sections16.1to16.5ExceptModelIII

AllQuestionsrelatedtoProbabilityDistributionsexceptpdfofPoissonDistributionandExponential Distributionareexcluded

Reference:
OperationsResearch – KantiSwarup – P.K.GuptaandManMohan(SultanChand&Sons)

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	4	2	1	7
II	1	1	-	2
III	3	3	2	8
IV	4	3	1	8
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc.DEGREEPROGRAMME COMPLEMENTARYCOURSE-
OPERATIONSRESEARCH –
(For B.ScMathematicsModelII)
FOURTHSEMESTER
NONLINEARPROGRAMMING

3hrs/week(TotalHrs:54)3Credits

Syllabus

TextBook:

K.V.Mital&C.Mohan:OptimizationMethodsinOperationsResearchandSystemAnalysis,3rdEdition,NewAgeInternationalPrivateLimited

ModuleI -IntegerProgramming (13hours)

Introduction,ILPintwo-dimensionalspace,GeneralILPandMILPproblems,(StatementsofTheorems1,2and3only),Examplesofsection2continued,Cuttingplanes,Examples,RemarksonCuttingplanemethods
Text1Chapter6-Section1to7andallTheoremswithoutProof

ModuleII (14hours)

BranchandBoundMethod – Examples,Branchandboundmethod – GeneralDescription(TwovariablesProblemsOnly)
Text1Chapter6-Section8to 9 Problems8,11,12 ,13, 14,15,16,171nd 18inProblemsVIareexcluded**.**

ModuleIII -Kuhn-TuckerTheoryandNonLinearProgramming (15hours)

Introduction,LagrangianFunction,SaddlePoint,RelationBetweensaddlepointofF(X,Y)andMinimalpointofF(X)(Theorm1,2,3and4StatementOnly),Kuhn-Tuckerconditions(ConditionsOnly-Derivationsexcluded),GraphicalMethodProblems.
Text1Chapter8-Section1to4andallTheoremswithoutProof.

ModuleIV-Kuhn-TuckerTheoryandNonLinearProgramming(Cont.) (12hours)

QuadraticProgramming,Separableprogramming(Definition1and2.Derivationofthismethodisexcluded),ProblemsofQuadraticProgrammingandSeparableprogramming
Text1Chapter8-Section6and7

Reference:

OperationsResearchTheoryandApplications – J.K.Sharma(Macmillan)

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	2	-	-	2
II	2	4	1	7
III	5	3	2	10
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSES)
SYLLABUS
(Effective from 2017 admissions onwards)

COMPLEMENTARY COURSES

MATHEMATICSCOMPLEMENTARYCOURSETO PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCEAND QUALITYCONTROL/ELECTRONICSANDCOMPUTERMAINTENANCE

(ForModelI/ModelII/ModelIII)

Semester	Title of the paper	No. of hours per week	Total Credits	Total hours per semester	University Exam Duration	Marks	
						Internal	External
I	MM1CMT01: PARTIALDIFFERENTIATION ,MATRICES,TRIGONOMETRY ANDNUMERICALMETHODS	4	3	72	3 hours	20	80
II	MM1CMT02:INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS	4	3	72	3 hours	20	80
III	MM3CMT03:VECTOR CALCULUS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA	5	4	90	3 hours	20	80
IV	MM4CMT04 : FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS	5	4	90	3 hours	20	80

B.Sc. DEGREEPROGRAMME(UGCBCS2017)
MATHEMATICSCOMPLEMENTARYCOURSETO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCEAND
QUALITYCONTROL/ELECTRONICSANDCOMPUTERMAINTENANCE
(ForModelI/ModelII/ ModelIII)
FIRSTSEMESTER
MM1CMT01: PARTIALDIFFERENTIATION,MATRICES,TRIGONOMETRY

B. Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE
(For Model I / Model II / Model III)
SECOND SEMESTER
MM2CMT02 : INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

4 hours/week (Total Hrs : 72) 3 Credits

Syllabus

Text Books:-

1. **George B. Thomas, Jr.: Thomas' Calculus 12th Edition,(Pearson).**
2. **A. H. Siddiqi, P. Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)**
3. **Ian Sneddon : Elements of Partial Differential Equations (Tata Mc Graw Hill)**

Module I: Integral Calculus (15 hrs)

Volumes using Cross-Sections, Volumes using Cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text 1: Chapter 6 (Sections 6.1 to 6.4)

Module II: Multiple Integrals (17 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, Area by double integration, Triple integrals in rectangular co-ordinates.

Text 1: Chapter 15 (Sections 15.1, 15.2,15.3, 15.5)

Module III: Ordinary Differential Equations (20 Hrs)

Separable Variables, Exact Differential Equation, Equations reducible to exact form, Linear Equations, Solutions by Substitutions, Homogeneous equations and Bernoulli's Equations.

Text 2 : Chapter 2

Module IV: Partial Differential Equations (20 Hrs)

Surfaces and Curves in three dimensions, Solution of equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method.

Text 3: Chapter 1 (Sections 1 and 3), Chapter 2 (Sections 1, 2 and 4)

Reference Books:

1. Shanti Narayan, P. K. Mittal : Integral Calculus (S. Chand & Company)
2. Differential Equations, E. Rukmangadachari, Pearson.
3. R. K. Ghosh, K. C. Maity – An introduction to Differential Equations, New Central Books.

QUESTION PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total

I	3	2	1	6
II	3	3	1	7
III	3	2	1	6
III	3	2	1	6
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B. Sc. DEGREE PROGRAMME(UGCBCS 2017)
MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONIS AND COMPUTER MAINTENANCE
(For Mode I/ Model II/ Model III)
THIRD SEMESTER
MM3CMT03:VECTOR CALCULUS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

5 hours/week (Total Hrs : 90) **4 credits**

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus Twelfth Edition, Pearson.**
2. **John B Fraleigh – A First course in Abstract Algebra (Seventh Edition)**

Syllabus

Module I: Vector valued Functions (15 hrs)

Curves in space and their tangents, Arc length in space, Curvature and Normal Vectors of a curve, Directional Derivatives and Gradient Vectors**.**

Text 1: Chapter 13 (Sections 13.1, 13.3 and 13.4), Chapter 14 (Section 14.5 only)

Module II: Integration in Vector Fields (25hrs)

Line Integrals, Vector fields and line integrals: Work, Circulation and Flux. Path independence, Conservation Fields and Potential Functions , Green's theorem in Plane (Statement and problems only), Surface area and Surface integral, Stoke's theorem(Statement and Problems only), the Divergence theorem and a Unified theory (Statement and simple problems only).

Text 1: Chapter 16 (Sections 16.1 to 16.8)

Module III: Analytic Geometry (25 hrs)

Polar coordinates, Conic sections, Conics in Polar coordinates.

Text 1: Chapter 11 (Sections 11.3, 11.6 and 11.7)

Module IV: Abstract algebra (25 hrs)

Groups, Subgroups, Cyclic groups, Groups of Permutations, Homomorphism.

Text 2: Chapter 1 Sections 4, 5 and 6 (Proofs of Theorems/ Corollary 5.17, 6.3, 6.7, 6.10, 6.14, 6.16 are excluded)
Chapter 2, Section 8 (Proofs of theorems 8.15 and 8.16 are excluded)

Chapter 3, Sections 13.1, 13.2 and 13.3, 13.11, 13.12 only

Reference Books:

1. Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed.,
2. Universal Book Stall, New Delhi.
3. Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.
4. I.N. Herstein - Topics in Algebra
5. Joseph A Gallian - A Contemporary Abstract Algebra, Narosa Publishing House.

QUESTON PAPER PATTERN

MODULE	PART A(2 Marks Each)	PART B(5 Marks Each)	PART C(15 Marks Each)	TOTAL
I	3	2	1	6
II	3	3	1	7
III	3	2	1	6
IV	3	2	1	7
Total no of questions	12	9	4	25
No. Of Questions to be answered	10	6	2	18
Total	20	30	30	80

B.Sc. DEGREE PROGRAMME(UGCBCS 2017)
MATHEMATICS
COMPLEMENTARY COURSE TO PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE

(For Model I/ Model II/ Model III)

FOURTH SEMESTER

MM4CMT04 : FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

5 hours/ week (Total 90 hours) **4 credits**

Syllabus

Text: Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, Wiley, India.

ModuleI: Fourier Series and Legendre Polynomials (25 hours)

Periodic Functions, Trigonometric Series, Fourier Series, Functions of any period p = 2L, Even and Odd functions, Half range Expansions.

A brief introduction to power series and power series method for solving Differential equations, Legendre equation and Legendre polynomials $P_n(x)$.

(Proofs of all theorems in this module are excluded.)

(Sections 10.1 to 10.4, 4.1 and 4.3)

ModuleII: Laplace Transforms (20 hours)

Laplace Transform, Inverse Laplace transform, Linearity, Shifting, transforms of Derivatives and Integrals, Differential Equations, Differentiation and Integration of Transforms, Laplace transform general Formula(relevant formulae only), Table of Laplace Transforms(relevant part only)

(Proofs of all theorems in this module are excluded.)

(Sections 5.1, 5.2, 5.4. 5.8 and 5.9)

ModuleIII: Complex Numbers and Functions (25 hours)

Complex Numbers, Complex Plane, Polar form of Complex Numbers, Powers and Roots, Derivative, Analytic Functions, Cauchy-Riemann Equations, Laplace's Equation, Exponential Function, Trigonometric Functions, Hyperbolic Functions, Logarithm, General Power.

(Proofs of all theorems in this module are excluded.)

(Sections 12.1 to 12.4 and 12.6 to 12.8)

ModuleIV: Complex Integration (20 hours)

Line Integral in the Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic functions.

(Proofs of all theorems in this module are excluded.)

(Sections 13.1 to 13.4)

Reference:

1. Michael D.Greenberg Advanced Engineering Mathematics, Pearson Education, 2002.
2. B.S.Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
3. Brown and Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, Edition 8, 2008.

Question paper pattern

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 marks	Total
I	2	2	1	6
II	3	2	1	5
III	4	3	1	8
I*V*	3	2	1	6
Total No. of Questions	12	9	4	25
No. of Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

Mathematics forB.C.A

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semeste	University Exam Duration	Marks	
						Internal	External
1	Discrete Mathematics (I)	4	4	72	3 hrs	20	80
2	Discrete Mathematics (II)	4	4	72	3 hrs	20	80
4	Operations Research	4	4	72	3 hrs	20	80

Mathematics for B.Sc ComputerScience

Semester	Title of the paper	Number of hours	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Discrete Mathematics (I)	4	4	72	3 hrs	20	80
2	Discrete Mathematics (II)	4	4	72	3 hrs	20	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc COMPUTER SCIENCE/ BCA)
FIRST SEMESTER
DISCRETE MATHEMATICS (I)

4 hrs/week (Total Hrs:72) **4Credits**

Syllabus

Text Books

Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6th Edition ;

Tata Mc Graw-Hill Publishing Company Limited

Module 1: Logic **(18 hrs)**

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers and Rules of Inference

Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.5only)

Module II: Basic Structures **(15 hrs)**

Sets, Set Operations, Functions, Sequences and Summations

Chapter 2 (Sections 2.1, 2.2, 2.3 and 2.4)

Module III: Number Theory and Cryptosystem **(20 hrs)**

The Integers and Division, Primes and Greatest Common Divisors, Applications of Number Theory.

Chapter 3 (Sections 3.4, 3.5 and 3.7 Only)

Module IV: Relations **(19 hrs)**

Relations and Their Properties, Representing Relations, Equivalence Relations, Partial Orderings.

Chapter 7 (Sections 7.1, 7.3, 7.5 and 7.6)

References

1. Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd
2. Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt.Ltd
3. Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd
4. Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt.Ltd
5. Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	3	1	7
II	3	2	1	6
III	3	2	1	6
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc COMPUTER SCIENCE/ BCA)
SECOND SEMESTER
DISCRETE MATHEMATICS (II)

4 hrs/week (Total Hrs:72) **4credits**

Syllabus

Text Books

1. **Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6th Edition ; Tata Mc Graw-Hill Publishing Company Limited**
2. **Frank Ayres Jr : Matrices , Schaum's Outline Series , TMH Edition.**

Module I: Graphs **(18 hrs)**

Graphs and Graph Models, Graph Terminology and Special types of Graphs,Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths.

Text 1 Chapter 8 (Sections 8.1, 8.2, 8.3, 8.4 and 8.5 only)

Module II: Trees **(17 hrs)**

Introduction to Trees, Application of Trees, Tree Traversal, and Spanning Trees.

Text 1 Chapter 9 (Sections 9.1, 9.2, 9.3 and 9.4 only)

Module III: Boolean Algebra **(17 hrs)**

Boolean Function, Representing Boolean Functions and Logic Gates

Text 1 Chapter 10 (Sections 10.1, 10.2 and 10.3 only)

Module IV: Matrices **(20 hrs)**

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-hermitian matrices. Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation, Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.

Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV are Excluded)

References

1. Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd

2. Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt.Ltd

3. Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd

4. Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt.Ltd

5. Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	3	1	7
II	3	2	1	6
III	3	2	1	6
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO BCA) FOURTH SEMESTER

OPERATIONS RESEARCH

4hrs/week **4credits**

Syllabus

Text Book:

Belly E Gillet – Introduction to Operations Research (A Computer Oriented Arithmetic Approach) (Tata Mc. GrawHill)

MODULE I: Basics of O.R. **(10hrs)**

The nature and uses of O.R- math concepts and approaches of O.R- models in O.R.

MODULE II: Linear programming problems **(25 hrs)**

Mathematical formulation of a L.P.P., General linear programming problems, solution of a L.P.P, graphical method for solving a L.P.P.

Simplex Method: Stack and surplus variables- reduction of any feasible solution to a basic feasible solution. Unbounded solution. Optimality conditions- artificial variable techniques- Big M method.

MODULE III: Transportation & assignment Problems **(20 hrs)**

Transportation model- solution by simplex method- north west corner rule, lowest cost entry method, vogel method, MODI method, degeneracy, assignment problems.

MODULE IV: Game Theory **(17 hrs)**

Two persons zero sum games, pure and mixed strategy with saddle point, solution of pure strategy games, solution of mixed strategy problems by arithmetic method. Principle of dominance.

Reference Books:

1. V.K Kapoor – OperationsResearch
2. Kanti Swarup , P.K Gupta and Man Mohan – Operations Research, Sultan Chand &Sons
3. K.V Mital and C. Mohan – Optimization Methods in Operations Research and SystemAnalysis

4. J. K Sharma – Operations Research Theory and Applications , Macmillan

5. B. N. Mishra, B. K. Mishra – OptimizationLinear Programming Ane Books

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	3	1	7
II	3	2	1	6
III	3	2	1	6
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

Mathematics for B.A Economics

Semesters	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Graphing functions, Equations and Differential Calculus	6	4	108	3 hrs	20	80
2	Matrix, Exponential- Logarithmic Functions And Integral Calculus	6	4	108	3 hrs	20	80

B.A DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.A. ECONOMICS)
FIRST SEMESTER
GRAPHING FUNCTIONS, EQUATIONS AND DIFFERENTIAL CALCULUS

6 hrs/week (TotalHrs:108) 4Credits

Syllabus

Text Book

Edward T Dowling : Theory and Problems of Mathematical Methods for Business and Economics, Schaum's Outline Series ,McGraw Hill (1993)

Module I: Equations and Graphs Equations (20 hrs)

Review - (Exponents, polynomials, factoring, fractions, radicals, order of mathematical operations.) Cartesian Co-ordinate system, linear equations and graphs slopes intercepts. The slope intercept form. Determining the equation of a straight line. Applications of line equations in business and economics.

Module II: Functions Concepts (23 hrs)

Functions Concepts and definitions- graphing functions. The algebra of functions. Applications of linear functions for business and economics. Solving quadratic equations Facilitating non linear graphing. Application of non linear functions in business and economics. System of equations Introduction, graphical solutions. Supply-demand analysis. Break-even analysis. Elimination andsubstitution methods. IS-LM analysis. Economic and mathematical modeling. Implicit functions and inverse functions.

Module III: Differential calculus (40 hrs)

Limits and continuity. Evaluation of limit of a function. Algebraic limit. The derivative and the rules of differentiation: The slope of curvilinear function. Derivative notation. Rules of differentiation. Higher order derivatives. Derivative of Implicit functions. Applications of derivatives. Increasing and decreasing functions. Concavity and convexity. Relative extrema.

Inflection points. Curve sketching. Optimisation of functions. The successive derivative test. Marginal concepts in economics. Optimising economic functions of business. Relation among total, marginal and average functions.

Module IV: Exponential and logarithmic functions (25 hrs)

Exponential functions. Logarithmic functions properties of exponents and logarithms. Natural exponential and logarithmic functions. Solving natural exponential and logarithmic functions. Logarithmic transformation of non linear functions. Derivatives of natural exponential and logarithmic functions. Interest compounding. Estimating growth rates from data points.

Reference Book :

1. Taro Yaman : Mathematical Economics

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	2	1	6
II	3	2	1	6
III	3	3	1	7
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.A DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.A. ECONOMICS)
SECOND SEMESTER
MATRIX, EXPONENTIAL-LOGARITHMIC FUNCTIONS AND INTEGRAL CALCULUS

6 hrs/week (TotalHrs:108) 4Credits

Syllabus

Text Book

Edward T Dowling : Theory and Problems of Mathematical Methods for Business and Economics, Schaum's Outline Series ,McGraw Hill (1993)

Module I: Matrix Algebra (30 hrs)

Introduction. Definition and terms. Addition and subtraction of matrices. Scalar multiplication. Vector multiplication. Multiplication of matrices. Matrix expression of a system of linear equations. Augmented matrix. Row operation. Gaussian method of solving linear equations. Solving linear equations with. Matrix algebra Determinants and linear independence. Third order determinants. Cramer's rule for solving linear equations. Inverse matrices. Gaussian method of finding an inverse matrix. Solving linear equations with an inverse matrix. Business and Economic applications. Special determinants.

Module II: Linear programming (20 hrs)

Linear programming problem (LPP), Mathematical Formulation of LPP. Basic solution, Feasible solution and Region of feasible solution of an LPP. The extreme point theorem. Solving Maximisation and Minimisation problems using graphical method.

Module III: Integral calculus (35 hrs)

Integration rules for indefinite integrals. Integration by substitution. Integration by parts. The definite integral. The fundamental theorems of calculus. Properties of definite integrals. Area under a curve. Area between curves. Present value of cash flow consumers and producers surplus.

Module IV: Calculus of Multivariable functions (23 hrs)

Functions of several independent variables. Partial derivatives. Rules of partial differentiation. Second – order partial derivatives. Optimization of multivariable functions. Constrained

optimization with Lagrange Multipliers. Income determination Multipliers. Optimization of multivariable functions inbusiness and economics constrained optimization of multivariable economic functions. Constrained optimization of Cobb Douglas production functions.

Reference Book

Taro Yaman : Mathematical Economics

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	3	1	7
II	3	2	1	6
III	3	2	1	6
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

Mathematics for B.Sc Statistics

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Differential Calculus, Logic And Boolean algebra	4	3	72	3 hrs	20	80
2	Integral Calculus And Trignometry	4	3	72	3 hrs	20	80
3	Vector Calculus, Differential equations And Laplace Transform	5	4	90	3 hrs	20	80
4	Abstract algebra, Linear Algebra, Theory of Equations, Special functions	5	4	90	3 hrs	20	80

B.Sc. DEGREE PROGRAMME (UGCBCSS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
FIRST SEMESTER
DIFFERENTIAL CALCULUS, LOGIC AND BOOLEAN ALGEBRA

4 hrs/week (Total Hrs : 72) **3 credits**

Syllabus

Text Books

1. George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.
2. Schaum's outline series - Discrete mathematics, second edition

Module I:Differential Calculus **(22 hrs)**

Rates of change and limits, calculating limits using the limit laws, the precise definition of a limit, one sided limits and limits at infinity, derivative of a function, differentiation rules, the derivative as a rate of change, derivatives of trigonometric functions, the chain rule and parametric equations, implicit differentiation.

Text 1 Sections 2.1 – 2.4, 3.1 – 3.6

Module II: Application of derivatives **(15 hrs)**

Extreme values of functions, The Mean Value Theorem, Monotonic functions and the first derivative test.

Text 1 Sections 4.1 - 4.3

Module III: Partial Derivatives **(15 hrs)**

Functions of several variables (Definition only), Partial derivatives, The Chain Rule.

Text 1 Sections 14.3 - 14.4

Module 1V: Logic and Boolean Algebra **(20 hrs)**

Proposition, compound propositions, basic logical operations, Propositions and truth tables, Logical equivalence, Algebra of propositions, Conditional and biconditional, Arguments, Propositional functions, Quantifiers.

Text 2 sections 4.1 to 4.12
Boolean Algebra: Definitions, theorems, duality, switching circuit
Text 2 sections 15.1, 15.2, 15.3, 15.4, 15.10

Reference Books :

1. Shanty Narayan : Differential Calculus (S Chan)

2.George B. Thomas Jr. and Ross L. Finney: Calculus, LPE, Ninth edition, Pearson Education.

3.Robert.R.Stoll-Set theory And Logic (Eurasia Publishers,N.Delhi)

4.B.S.Vatssa-Discrete Mathematics-Third edition

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5Marks	Part C 15Marks	Total
I	3	3	1	7
II	3	2	1	6
III	3	2	1	6
IV	3	2	1	6
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
SECOND SEMESTER
INTEGRAL CALCULUS AND TRIGONOMETRY

4 hrs/week (Total Hrs : 72) 3 credits

Syllabus

Text Books

1. **George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.**
2. **S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.**

Module I: Integral Calculus (20 hrs)

Sigma notation and limit of finite sums,The Definite integral. The fundamental theorem of Calculus Indefinite integration and substitution rules. Substitution and area between curves.

Text -1 Section5.2, 5.3 , 5.4 5.5 and 5.6

Module II: Application of Integrals (15hrs)

, Volumes by slicing and rotation about an axis (disc method only), Lengths of plane curves, Areas of surfaces of revolution (the theorem of Pappus excluded).

Text – 1 Section, 6.1, 6.3, 6.5

Module III: Techniques of Integration (17 hrs)

Basic integration formulas,Integration by parts,Integration of rational functions by partial fractions,Trignometric integrals, and Trigonometric substitutions.

Text – 1 Sections.8.1,8.2,8.3,8.4, and8.5,

Module IV: Trigonometry (20hrs)

Complex quantities,Demoiver's theorem(without proof) Circular and hyperbolic functions, inverse circular and hyperbolic function. Separation into real and imaginary parts. Summation of infinite series based on C + iS method. (Geometric, Binomial, Exponential, Logarithmic and Trigonometric series).

Text 2 Relevant Sections in Chapter 2 , 5 and Chapter 8

Reference Books :

1. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education
2. Shanti Narayan , P .K . Mittal :Integral Calculus (S. Chand & Company).

3. S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	2	1	6
II	2	2	1	5
III	3	3	1	6
IV	4	2	1	8
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
THIRD SEMESTER
VECTOR CALCULUS, DIFFERENTIAL EQUATIONS LAPLACE TRANSFORM

5 hrs/week (Total Hrs : 90) 4 credits

Syllabus

Text Books

1. **Erwin Kreyszig- Advanced Engineering Mathematics, Eighth Edition, Wiley, India.**
2. **A text book of engineering mathematics-N.P.Bali,Dr.N.Ch.Narayana Iyengar.Laxmi publications(p)ltd.**

Module I: Vector Differential Calculus (25hrs)

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3. Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, , Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

Text 1: Sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.9, 8.10, 8.11.

Module II: Ordinary differential equations of first order (30 Hrs)

Introduction to Differential Equations , solutions of First order differential equations, variable separable,homogeneous equations,Equations reducible to homogeneous,Linear differential equations, Bernoulli's equations Exact equations(theorem 11.11 statement only),equations reducible to Exact form,

Text 2: Chapter 11- Sections 11.1,11.4, 11.5,11.6,11.7,11.8,11.9, 11.10,11.11,11.12.

Module III: Partial differential equations (20 Hrs)

Introduction ,Formation of partial differential equations,Linear partial differential equations of the first order,Lagrange's equation, and its working method.

Text 2: Chapter 16- Sections 16.1,16.2,16.5,16.6 and 16.7

Module IV: Laplace Transform (15 Hrs)

Introduction,Definition ,Linearity Property,Laplace transform of some elementary functions, Shifting

Theorems and The Inverse Laplace Transform.

Text 2 Chapter 18 – Section 18.1,18.2, 18.3,18.4,18.5 and 18.6

Reference Books:

1. Shanti Narayan , P .K . Mittal :Vector Calculus (S. Chand & Company)
2. Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.
3. Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.
4. Murray : Differential Equations (Macmillan)

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15 Marks	Total
I	4	3	1	8
II	4	3	1	8
III	2	2	1	5
IV	2	1	1	4
Total No. of Questions	12	9	4	25
No. Questions to be answered	10	6	2	18
Total Marks	20	30	30	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)
MATHEMATICS
(COMPLEMENTARY COURSE B.Sc TO STATISTICS)

FOURTH SEMESTER
LINEAR ALGEBRA, THEORY OF EQUATIONS, NUMERICAL METHODS AND SPECIAL FUNCTIONS

5 hrs/week (Total Hrs : 90) 4 credits

Syllabus

Text Books

1. **Erwin Kreyszig - Advanced Engineering Mathematics, 8th Edition, Wiley, India**
2. **N.P.Bali, Dr.N.Ch.Narayana Iyengar.-Text book on Engineering mathematics,Laxmi publications**
3. **3. S.S.Sastry-Introductory Methods of Numerical Analysis,Fourth Edition,PHI**

Module I: Linear Algebra (35 hrs)

A quick review of the fundamental concepts of matrices, Matrix Multiplication(excluding by linear transformation) Linear system of equations, Rank of a Matrix, Linear dependence and independence of vectors (exluding vector space, dimension and basis),Solution of linear systems, Determinants, Cramer's rule, Characteristic roots and characteristic vectors. Cayley-Hamilton theorem (statement only), Symmetric ,Skew symmetric and orthogonal matrices, Complex matrices, Hermitian,Skew- Hermitian and unitary matrices,(definitions and examples only)

Text 1 Sections 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 7.1, 7.3, 7.4

Module II: Theory of Equations (20 hrs)

Statement of Fundamental theorem of Algebra, Relation between roots and coefficients, Transformation of equations, Reciprocal equations, Descarte's rule of signs and Cardon's method.

Text 2, chapter 2 sections-2.1 to 2.14,2.17 and 2.18

Module III: Numerical methods (20 hours)

Introduction, Bisection Method, Method of False position, Iteration Method, Newton - Raphson Method.

Text 3, Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5)

Module IV: Special functions (15 hrs)

Beta and Gamma functions, Reduction formula for gamma. Relation between beta and gamma functions.

Text 2, Chapter 15 sections 15.1,15.2,15.3,15.4,15.5 and 15.6

Reference Books:

1. Kenneth Hoffman, Ray Kunze-Linear Algebra (second edition) prentice-Hall India
2. Thunter – An elementary treatise on the Theory of Equations with examples