MAHATHMA GANDHI UNIVERSITY KOTTAYAM

BOARD OF STUDIES IN MATHEMATICS (UG)

CURRICULAM FOR

B.Sc MATHEMATICS MODEL I

UNDER

CHOICE BASED CREDIT SYSTEM (UGCBCS2017)

(Effective from 2017 admission onwards)

AIMS AND OBJECTIVES

The courses for the UG Programme are framed using time tested and internationally popular text books so that the courses are at par with the courses offered by any other reputed universityaround the world.

Only those concepts that can be introduced at the UG level are selected and instead of cramming the course with too many ideas the stress is given in doing the selected conceptsrigorously. The idea is to make learning mathematics meaningful and an enjoyableactivity ratherthan acquiring manipulative skills and reducing the whole thing an exercise in using thumb rules.

As learning Mathematics is doing Mathematics, to this end, some activities are prescribed to increase students' participation in learning.

Every student has to do a project during 6^{th} semester. The topics for the project can be selected as early as the beginning of the 4^{th} semester.

Course Structure:

The U.G. Programme in Mathematics must include (a) Common courses, (b) Core courses, (c) Complementary Courses, (d) Open courses (e) Choice basedcourses (f) Project

Courses:

The number of Courses for the restricted programme should contain 12 core courses, 1 open course, 1 choice based course and 8 complementary courses. There should be 10 common courses, or otherwise specified, which includes the first and second language of study.

Objectives :

The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of Mathematics by providing a more complete and logic frame work in almost all areas of basic Mathematics.

By the end of the second semester, the students should have attained a foundation in basic Mathematics and other relevant subjects to complement the core for their future courses.

By the end of the fourth semester, the students should have been introduced to powerful tools for tackling a wide range of topics in Calculus, Theory of Equations and Geometry. They should have been familiar with additional relevant mathematical techniques and other relevant subjects to complement the core.

By the end of sixth semester, the students should have covered a range of topics in almost all areas of Mathematics, and had experience of independent works such as project, seminar etc.

CURRICULUM FOR B.Sc MATHEMATICS MODEL

I (UGCBCS 2017)

Course Structure

Total Credits:-120 (Eng:22+S.Lang:16+Complementary:28+open:4+Core:51)

Total hours:-150 (Eng:28+S.Lang:18+Complementary:36+open:4+Core:65)

Sl: No	Semester	Papers	Hours	Credits	Internal Marks	External Marks	Total Marks
1	I	English I	**5**	**4**	**20**	**80**	**100**
		English /Common course I	**4**	**3**	**20**	**80**	**100**
		Second Language I	**4**	**4**	**20**	**80**	**100**
		Mathematics Core Course - 1	**4**	**3**	**20**	**80**	**100**
		Complimentary1 Course - 1 (Statistics)	**4**	**3**	**20**	**80**	**100**
		Complimentary 2 Course – 1 (Physics Theory/ Computer)	**2 (T)**	**2**	**10**	**60**	**70**
			2 (P)	**0**			
	Total		**25**	**19**			**570**
2	II	English II	**5**	**4**	**20**	**80**	**100**
		English /Common course II	**4**	**3**	**20**	**80**	**100**
		Second Language II	**4**	**4**	**20**	**80**	**100**
		Mathematics Core Course- 2	**4**	**3**	**20**	**80**	**100**
		Complimentary1 Course –II (Statistics)	**4**	**3**	**20**	**80**	**100**
		Complimentary2 Course-II	**2 (T)**	**2**	**10**	**60**	**70**

		(Physics/ Computer)	**2 (P)**	**2**	**20**	**40**	**60**
	Total		**25**	**21**			**630**

3	**III**	English III	**5**	**4**	**20**	**80**	**100**
		Sec. Lang./Common course I	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 3	**5**	**4**	**20**	**80**	**100**
		Complimentary1 Course – II (Statistics)	**5**	**4**	**20**	**80**	**100**
		Complimentary2 Course –II (Physics Theory/ Computer)	**3 (T)**	**3**	**10**	**60**	**70**
			2 (P)	**0**			
	Total		**25**	**19**			**470**
4	**IV**	English IV	**5**	**4**	**20**	**80**	**100**
		Sec. Lang./Common courseII	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 4	**5**	**4**	**20**	**80**	**100**
		Complimentary1 Course III	**5**	**4**	**20**	**80**	**100**
		Complimentary2 Course III (Physics/ Computer)	**3 (T)**	**3**	**10**	**60**	**70**
			2 (P)	**2**	**20**	**40**	**60**
	Total		**25**	**21**			**530**
5	**V**	Mathematics Core Course – 5	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 6	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 7	**5**	**4**	**20**	**80**	**100**
		Human Rights and Mathematics for Environmental studies	**4**	**4**	**20**	**80**	**100**
		Open Course	**4**	**3**	**20**	**80**	**100**
	Total		**25**	**19**			**500**
6	VI	Mathematics Core Course – 9	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course-10	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course-11	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course-12	**5**	**4**	**20**	**80**	**100**
		Choice Based Course	**4**	**3**	**20**	**80**	**100**
		Project	**0**	**2**	**20**	**80**	**100**
	Total		**25**	**21**			**600**

English:

Semester	Title of the Course	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	English I	5	4	90	3 hrs	20	80
	English /Common course I	4	3	72	3 hrs	20	80
2	English II	5	4	90	3 hrs	20	80
	English /Common course II	4	3	72	3 hrs	20	80
3	English III	5	4	90	3 hrs	20	80
4	English - IV	5	4	90	3 hrs	20	80

Second Language:

Semester	Title of the Course	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Second Language I	4	4	72	3 hrs	20	80
2	Second Language II	4	4	72	3 hrs	20	80
3	Sec. Lang./ Common course I	5	4	90	3 hrs	20	80
4	Sec. Lang./ Common course II	5	4	90	3 hrs	20	80

MATHEMATICS CORE COURSES

Semester	Title of the Course	Number Of hours	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
I	MM1CRT01: Foundation of Mathematics	4	3	72	3 hrs	20	80
II	MM2CRT01: Analytic Geometry, Trigonometry and Differential Calculus	4	3	72	3 hrs	20	80
III	MM3CRT01: Calculus	5	4	90	3 hrs	20	80
IV	MM4CRT01: Vector Calculus, Theory of Numbers and Laplace transforms	5	4	90	3 hrs	20	80
V	MM5CRT01: Mathematical Analysis	6	4	108	3 hrs	20	80
	MM5CRT02: Differential Equations	6	4	108	3 hrs	20	80
	MM5CRT03: Abstract Algebra	5	4	90	3 hrs	20	80
	Human rights and Mathematics for Environmental Studies.	4	4	72	3 hrs	20	80
	Open course	4	3	72	3 hrs	20	80
VI	MM6CRT01 : Real Analysis	5	4	90	3 hrs	20	80
	MM6CRT02: Graph Theory and metric spaces	6	4	108	3 hrs	20	80
	MM6CRT03 : Complex Analysis	5	4	90	3 hrs	20	80
	MM6CRT04 : Linear Algebra	5	4	90	3 hrs	20	80
	Choice Based Course	4	4	72	3 hrs	20	80
	MM6PRT01 : Project	-	2	-	-	20	80

OPEN COURSE DURING THE FIFTH SEMESTER

Title of the Course	No. of contact hrs/week	No. of Credit	Duration of Exam
MM5OPT01: History of Indian Mathematics	**4**	**3**	**3 hrs**
MM5OPT02: Applicable Mathematics	**4**	**3**	**3 hrs**
MM5GET03: Mathematical Economics	**4**	**3**	**3 hrs**

CHOICE BASED COURSE DURING THE SIXTH SEMESTER

Title of the Course	No. of contact hrs/wee	No. of Credit	Duration of Exam
MM6CBT01: Operations Research	**4**	**3**	**3 hrs**
MM6CBT02:Basic Python Programming And Typesetting in LaTeX	**4**	**3**	**3 hrs**
MM6CBT03: Numerical Analysis	**4**	**3**	**3 hrs**

First Semester

MM1CRT01: Foundation of Mathematics

4 hours/week (Total Hours: 72) 3 credits

Brief Description of the Course

This course introduces the concepts of mathematical logic methods of proofs, sets, functions, relations and partial orderings. A brief introduction of theory of Equations is also included. These topics are foundations of most areas of modern mathematics and are applied frequentlyin the succeeding semesters.

Syllabus

Text Books:

1. K.H. Rosen: Discrete Mathematics and its Applications (Sixth edition), Tata McGraw Hill Publishing Company, New Delhi.
2. S. Bernard and J.M Child: Higher Algebra, AITBS Publishers, India,2009

Module 1: Basic Logic (20 hours)

Propositional logic, Propositional equivalences, Predicates and quantifiers, Rules of inference, Introduction to proofs.

Text 1: Chapter – 1excluding sections 1.4 & 1.7

Module 2: Set theory (12 hours)

Sets, set operations, functions

Text 1: Chapter – 2 excluding section 2.4

Module 3: Relations (20hours)

Relations and their properties, representing relations, equivalence relations, partial orderings.

(Text 1: Chapter 7 excluding Sections 7.2 & 7.4)

Module 4: Theory of Equations (20 hours)

Roots of Equations, Relation Connecting the roots and coefficients of an equation, Transformation of equations, Special Cases, The Cubic equation, The Biquadratic Equation, Character and Position of the Roots of an Equation, Some General Theorems, Descartes's Rule of Signs, Corollaries, Reciprocal Equations

Text 2: Chapter VI Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, Chapter XI Section 1

References:

1. Lipschutz: Set Theory and related topics (Second Edition), Schaum Outline Series, Tata McGraw-Hill Publishing Company, New Delhi. (Reprint 2009).
2. P.R. Halmos : Naive Set Theory, Springer.
3. Ian Chiswell&Wifrid Hodges: Mathematical Logic, Oxford university press

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

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

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

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

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

9. Lipschutz:Set Theory And Related Topics (2nd Edition), SchaumOutlineSeries, Tata McGraw-Hill Publishing Company, New Delhi

10. H.S.Hall, S.R. Knight: Higher Algebra, Surjit Publications, Delhi.

Question Paper Pattern

Module	Part A (2 marks)	Part B (5 marks)	Part C (15 marks)	Total
I	3	2 or 3	1	7 or 6
II	3	2	0.5	5.5
III	3	2	1.5	6.5
IV	3	2 or 3	1	6 or 7
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 MATHEMATICS (UGCBCS2017)
SECOND SEMESTER

MM2CRT01: ANALYTIC GEOMETRY, TRIGONOMETRY ANDDIFFERENTIAL CALCULUS

4 hours/week (Total Hours : 72) **3 credits**

Text books:

1. **Manicavachagom Pillay, Natarajan : Analytic Geometry (Part I Two Dimensions)**
2. S.L.Loney : Plane Trigonometry Part II , S.Chand and Company Ltd
3. **Shanti Narayan , P.K.Mittal : Differential Calculus , S.Chand and Company**

MODULE I: Conic Sections (22 hrs)

Tangent and Normals of a Conic (Cartesian and Parametric form), Orthoptic Locus, Chords in terms of given points, Pole and Polar and Conjugate diameters of Ellipse.

Relevant Sections of Text 1

MODULE II: Polar Co-ordinates (15 hrs)

Polar Co-ordinates, Polar Equation of a line , Polar Equation of Circle, Polar Equation of Conic , Polar Equations of tangents and Normals , Chords of Conic Sections.

Relevant Sections of Text 1

MODULE III:Trigonometry (17 hrs)

Circular and Hyperbolic functions of complex variables, Separation of functions of complex variables into real and imaginary parts, Factorization of $x^n - 1, x^n + 1$, $x^{2n} - 2x^n a^n \cos n\theta + a^{2n}$ and Summation of infinite Series by $C + iS$ method

Relevant Sections of Text 2 Cha ter – V, VI, VIII, IX.

Module IV: Differential Calculus (18 hrs)

Successive Differentiation and Indeterminate forms

Text 3: Chapter 5 and Chapter 10

References:

1. S. K. Stein : Calculus And Analytic Geometry, McGraw Hill

2. P. K. Jain , Khalil Ahmad : Analytic Geometry of Two Dimensions ,(2ndEdition) New AgeInternational (P) Limited Publishers

3. Thomas and Finney : Calculus and Analytic Geometry , Addison Wesley

QUESTON PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	4	2	1	7
II	2	1	1	4
III	3	3	1	7
IV	3	3	1	7
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 MATHEMATICS (UGCBCS 2017)

THIRD SEMESTER

MM3CRT01: CALCULUS

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

Syllabus

TextBooks:

1. Shanti Narayan, P.K.Mittal: Differential Calculus , SChand and Company
2. **George B Thomas Jr: Thomas' Calculus (12thEdition), Pearson.**

Module I: Differential Calculus (27 hrs)

Expansion of functions using Maclaurin's theorem and Taylor's theorem, Concavity and points of inflexion. Curvature and Evolutes. Length of arc as a function derivatives of arc, radius of curvature - Cartesian equations only. (Parametric, Polar, Pedal equation and Newtonian Method are excluded) Centre of curvature, Evolutes and Involutes, properties of evolutes. Asymptotes and Envelopes.

Text 1: Chapter 6, Chapter 13, Chapter 14 , Chapter 15 (Section 15.1 to 15.4 only), Chapter 18 (Section 18.1 to 18.8 only).

Module II: Partial Differentiation (18 hrs)

Partial derivatives, The Chain rule, Extreme values and saddle points, Lagrange multipliers.

Text 2 Chapter 14 (Sections 14.3, 14.4, 14.7 and 14.8 only) All other sections are excluded

Module III: Integral Calculus (20 hrs)

Volumes using Cross-sections, Volumes using cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text 2: Chapter 6 (Section 6.1 to 6.4 only (Pappus Theorem excluded)

Module IV: Multiple Integrals (25 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, Area by double integration, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals.

Text 2: Chapter 15 (Sections 15.4 and 15.6 are excluded)

References

1. T.M Apostol- Calculus Volume I & II(Wiley India)
2. Widder-Advanced Calculus, 2nd edition
3. K.C. Maity& R.K Ghosh- Differential Calculus(New Central Books Agency)
4. K.C. Maity& R.K Ghosh- Integral Calculus(New Central Books Agency)
5. Shanti Narayan, P.K. Mittal- Integral Calculus- (S. Chand & Co.)

6. Howard Anton et. Al. Calculus, Seventh Edition, John Wiley

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	4	2	1	7
II	3	2	1	6
III	3	2	1	6
IV	2	3	1	6
Total number 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 MATHEMATICS (UG CBCS 2017)
FOURTH SEMESTER

MM4CRT01 : VECTOR CALCULUS, THEORY OF NUMBERS AND LAPLACETRANSFORM

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

Syllabus

Text Books:

1. Thomas Jr., Weir M.D, Hass J.R – Thomas' Calculus (12th Edition) Pearson, 2008.
2. **David M Burton - Elementary Number Theory, 7thEdition,McGraw Hill Education(India) Private Ltd.**
3. Erwin Kreyszig : Advanced Engineering Mathematics, Ninth Edition, Wiley, India.

Module I: Vector Differentiation **(25 hrs)**

(A quick review of vectors), A vector equation and Parametric equations for lines and equation for a plane in space only (the distance from a point to a line and a plane and angle between planes are excluded) Vector functions, Arc length and Unit tangent vector, Curvature and the Unit normal vector, Tangential and Normal Components of Acceleration, Directional derivatives and Gradient vectors, tangent planes and Normal lines only.

Relevant sections from 12.5, 13.1, 13.3, 13.4, 13.5, 14.5, 14.6 (tangent planes and normal lines only) of Text 1

Module II: Vector Integration (30 hrs)

Line integrals, Vector fields and line integrals: Work, Circulation and Flux, Path Independence, Conservative Fields and Potential Functions (Proofs of theorems excluded), Green's theorem in the plane (Statement and problems only), Surfaces and Area: Parameterisations of surfaces, Implicit surfaces, Surface integrals, Stokes' theorem (Statement and simple Problems only), Divergence theorem only (Statement and Problems only) Gauss' law onwards are excluded.

Sections 16.1 to 16.6 and relevant portions from 16.7 & 16.8 of Text 1

Module III: Theory of Numbers (15 hrs)

Basic properties of congruence, Fermat's theorem, Wilson's theorem, Euler's phi function.

Text 2 : Chapter 4: section 4.2, Chapter 5: sections 5.2, 5.3 and Chapter 7: section 7.2.

Module IV: Laplace transforms (20 hrs)

Laplace transform, Linearity of Laplace transform, First shifting theorem, Existence of Laplace

transform, Transforms of derivatives, Solution of ordinary differential equation & initial value problem, Laplace transform of the integral of a function, Convolution and Integral equations. Text 3 (Sections 6.1, 6.2 and 6.5)

References

1. Anton, Bivens and Davis, Calculus (10th Edition) International Student Version, John Wiley & sons 2015
2. David M. Burton, Elementary Number Theory (7^{th} Edition), Mc Graw Hill Education
3. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.
4. Shanti Narayan, P.K Mittal – Vector Calculus (S. Chand)
5. Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics (Oxford)
6. Ghosh, Maity – Vector Analysis (New Central books)

QUESTON PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
I	3	2	1 or 2	6 or 7
II	3	3	1 or 2	7 or 8
III	3	2	1	6
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 MATHEMATICS (UGCBCS 2017)

FIFTH SEMESTER

MM5CRT01 : MATHEMATICAL ANALYSIS

6 Hrs/Week (Total Hours : 108) **4 Credits**

SYLLABUS

Text Book : Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition) John Wiley & Sons, In. 2007

MODULE I: REAL NUMBERS 30 hours

Finite and Infinite Sets, The Algebraic and Order Properties of R, Absolute Value and Real Line, The Completeness Property of R, Applications of the Supremum Property, Intervals.

Chapter 1: Section 1.3 and Chapter 2 : Sections 2.1, 2.2,2.3,2.4,2.5

MODULE II: SEQUENCES 30 hours

Sequences and their Limits, Limit Theorems, Monotone Sequences, Subsequences and the Bolzano- Weierstrass Theorem, The Cauchy Criterion, Properly Divergent Sequences.

Chapter 3 : Sections 3.1,3.2,3.3,3.4, 3.5,3.6

MODULE III: SERIES 24 hours

Introduction to Series, Absolute Convergence, Tests for Absolute convergence, Tests for nonabsoute Convergence

Chapter 3 : Section 3.7, Chapter 9 : Sections 9.1,9.2,9.3

MODULE IV: LIMITS 24 hours

Limits of Functions, Limit Theorems, Some Extensions of the Limit Concept.

Chapter 4 : Sections 4.1,4.2,4.3

References:

1. Richard R Goldberg - Methods of real Analysis, 3rd edition , Oxford and IBM Publishing Company (1964)
2. Shanti Narayan - A Course of Mathematical Analysis, S Chand and Co. Ltd (2004)
3. Elias Zako - Mathematical Analysis Vol 1, Overseas Press, New Delhi (2006)
4. J.M Howie - Real Analysis, Springer 2007.
5. K.A Ross- Elementary - Real Analysis, Springer, Indian Reprints.
6. S.C Malik, Savitha Arora - Mathematical Analysis, Revised Second Edition

QUESTION PAPER PATTERN

Module	Part A 2 Marks	Part B 5 Marks	Part C 15 Marks	Total
1	3	2	1	6
2	3	3	1	7
3	3	2	1	6
4	3	2	1	6
Total number of questions	12	9	4	25
Total number of questions to be answered	10	6	2	18
Total	20	30	30	80

B.Sc DEGREE PROGRAMME(UGCBCSS2017)
MATHEMATICS (CORE COURSE 6)

FIFTH SEMESTER

M5CRT02 DIFFERENTIAL EQUATIONS

6 hours/week (Total: 108 hours) 4 credits

Syllabus

Text Book:

1. G.F. Simmons, S.G. Krantz - Differential Equations, (Tata McGraw Hill-NewDelhi). **(Walter Rudin Student Series)**
2. Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)

Module I What is a differential equation(26 hrs.)

The nature of solutions, Separable equations, First order linear equations, Exact equations, Orthogonal trajectories and families of curves, Homogeneous equations, Integrating factors, Reduction of order-dependent variable missing-independent variable missing

Text 1. Chapter 1 (Sections 1.2 to 1.9) Module II

Second order linear equations(26 hrs.)

Second order linear equations with constant coefficients (which includes Euler's equidimensional equations given as exercise 5 in page 63 of Text 1), The method of undetermined coefficients, The method of variation of parameters, The use of a known solutionto find another, Higher order linear equations

Text 1. Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4, 2.7 (example 2.17 is excluded))

Module III Power Series solutions and special functions(26 hrs.)

Introduction and review of power series,Series solutions of first order differential equations, Second order linear equations: ordinary points (specially note Legendre's equations given as example 4.7), Regular singular points, More on regular singular points.

Text 1. Chapter 4 (Sections4.1 4.2, 4.3, 4.4, 4.5)Method IV

Partial Differential equations (30 hrs.)

Methods of solution of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$, Origin of first order partial differential equations, Linear equations of the first order , Lagrange's method(proof of theorem 2 and theorem 3 are excluded)Integral surfaces passing through a given curve

Text 2. Chapter 1 (Section 3)

Chapter 2 (Section 1, 2 and section 4 (no proof of theorem 2 and theorem 3) and section5)

Reference:

1. **Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).**
2. A.H.Siddiqi& P. Manchanda – A First Course in Differential Equation with Applications (Macmillian)

3. **G.F. Simmons – Differential equation with applications and historical notes 2nd Edn (Tata McGraw Hill)**
4. E.A. Coddington- An Introduction to Ordinary Differential Equation, PHI.
5. **Zafar Ahsan - Differential Equations and their Applications, 2nd edition, PHI**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 5 Marks	Part C 15Marks	Total
I	3	4	1	**8**
II	4	2	1	**7**
III	2	2	1	**5**
IV	3	1	1	**5**
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 MATHEMATICS (UGCBCS 2017)

FIFTH SEMESTER MM5CRT03 :

ABSTRACT ALGEBRA

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

Syllabus

Text book :John B. Fraleigh : A First Course in Abstract Algebra (7th Edition) (Pearson)

Module I **(25 hrs)**

Groups and subgroups-Binary operations, Isomorphic binary structures, Groups-definition and examples, elementary properties of groups, finite groups and group tables, subgroups, cyclic subgroups, cyclic groups, elementary properties of cyclic groups.

Part I: Sections 2, 3, 4, 5 and 6

Module II: (25 hrs)

Permutations, cosets, and direct products-groups of permutations, Cayley's theorem, orbits, cycles and the alternating groups, cosets and the theorem of Lagrange, direct products.

Part II: Sections 8, 9, 10, 11.1 and 11.2

Module III (20 hrs)

Homomorphisms and Factor groups - Homomorphisms, properties of homomorphisms, factor groups, The Fundamental Homomorphism theorem, normal subgroups and inner automorphisms, simple groups.

Part III: Sections 13, 14, 15.14 to 15.18

Module IV (20 hrs)

Rings and fields-definitions and basic properties, homomorphisms and isomorphisms, Integral domains- divisors of zero and cancellation, integral domains, the characteristic of a ring. Ideals and factor rings. Homomorphisms and factor rings.

Part IV: Sections 18 and 19 and Part V: Section 26.

References :

1. I. N. Herstein - Topics in Algebra
2. Joseph A Gallian - Contemporary Abstract Algebra, Narosa Pub. House .
3. Artin – Algebra , PHI

QUESTON PAPER PATTERN

Module	Part A (2 marks)	Part B (5 marks)	Part C (15 marks)	Total
I	3	3	1	7
II	4	2	1	7
III	2	2	1	5
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 MATHEMATICS (UGCBCS 2017)

FIFTH SEMESTER

CODE : HUMAN RIGHTS AND MATHEMATICS FOR ENVIORNMENTAL STUDIES

CORE MODULE SYLLABUS FOR ENVIRONMENTAL STUDIES& HUMAN RIGHTS

FOR UNDER GRADUATE COURSES OF ALL BRANCHESOF HIGHER EDUCATION

Vision

The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. The United Nations Coference on Environment and Development held in Rio de Janerio in 1992 and world Summit on Sustainable Development at Johannesburg in 2002 have drawn the attention of people aroundthe globe to the deteriorating condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environment issues..

India is rich in biodiversity which provides various resources for people. Only about 1.7 million living organisms have been described and named globally. Still many more remain to be identified and described. Attempts are made to conserve them in ex-situ and in-situ situations. Intellectual property rights (IPRs) have become important in a biodiversity-rich country like India to protect microbes, plants and animals that have useful genetic properties. Destruction of habitats, over-use of energy resource and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of lifeon earth may get wiped out in the near future.

In spite of the deteriorating status of the environment, study of environment have so far not received adequate attention in our academic programme. Recognizing this, the Hon'ble Supreme Court directed the UGC to introduce a basic course on environment at every level in college education. Accordingly, the matter was considered by UGC and it was decided that a six months compulsory core module course in environmental studies may be prepared and compulsorily implemented in all the University/Colleges of India.

The syllabus of environmental studies includes five modules including human rights. The first two modules are purely environmental studies according to the UGC directions. The second two modules are strictly related with the core subject and fifth module is for human rights.

Objectives

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues. By developing and enhancing critical and creative thinking skills, It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future, encourage character building, and develop positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment for protecting the nature and natural resources.

- To help the students in acquiring the basic knowledge about environment and to inform the students about the social norms that provide unity with environmental characteristics and create positive attitude about the environment.

4 hours/week (Total Hrs: 72) 4 credits

SYLLABUS

Text Book :

1. **Thomas Koshy : Fibonacci and Lucas numbers with applications, John Wiley & Sons, Inc (2001).**

Unit 1 :Multidisciplinary nature of environmental studies

Definition, scope and importance (**2 hrs**)
Need for public awareness.

Unit 2 : Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems.

a) **Forest resources** : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles. (**10 hrs**)

Unit 3: Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

(**6 hrs**)

ModuleII

Unit 1: Biodiversity and its conservation

- Introduction
- Biogeograhical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-sports of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

(8 hrs)

Unit 2: Environmental Pollution

Definition
Causes, effects and control measures of: -

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides. (**8hrs**)

Unit 3: Social Issues and the Environment

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness (**10 hrs**)

Module III : Fibonacci Numbers in nature

The rabbit problem, Fibonacci numbers, recursive definition, Lucas numbers, Different types of Fibonacci and Lucas numbers. Fibonacci numbers in nature : Fibonacci and the earth, Fibonacci

and flowers, Fibonacci and sunflower, Fibonacci, pinecones, artichokes and pineapples, Fibonacci and bees, Fibonacci and subsets, Fibonacci and sewage treatment, Fibonacci and atoms, Fibonacci and reflections, Fibonacci, paraffins and cycloparaffins, Fibonacci and music, Fibonacci and compositions with 1's and 2's.

Text 1 : Chapters 2 & 3 (excluding Fibonacci and poetry, Fibonacci and electrical networks)

Module IV : Golden Ratio (10 Hrs)

The golden ratio, mean proportional, a geometric interpretation, ruler and compass construction, Euler construction, generation by Newton's method. The golden ratio revisited, the golden ratio and human body, golden ratio by origami, Differential equations, Gattei's discovery of golden ratio, centroids of circles,

Text 1 : Chapters 20, 21

Module V : Human rights

Unit1-Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Unit-2 Human Rights and United Nations – contributions, main human rights related organs - UNESCO,UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-3 EnvironmentandHuman Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspectof New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc. **(8 Hrs)**

Internal: Field study

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

References

1. .Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)
6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)
15. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
16. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
17. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)
18. (M) Magazine (R) Reference (TB) Textbook

Human Rights

1. Amartya Sen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)

3. Law Relating to Human Rights, Asia Law House,2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt.Ltd, New Delhi,
5. S.K.Khanna, Children And The Human Rights, Common Wealth Publishers,1998.2011.
6. Sudhir Kapoor, Human Rights in 21st Century,Mangal Deep Publications,Jaipur,2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

QUESTON PAPER PATTERN

Module	Part A (2 marks)	Part B (5 marks)	Part C (15 marks)	Total
I	4	2	1	7
II	3	2	1	7
III	2	2	1	5
IV	3	3	1	7
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 MATHEMATICS (UGCBCS 2017)

SIXTH SEMESTER

MM6CRT01 : REAL ANALYSIS

5 Hrs/Week (Total Hours : 90) **4 Credits**

SYLLABUS

Text Book : Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition) John Wiley & Sons, In

MODULE I: CONTINUOUS FUNCTIONS 30 hours

Continuous Functions, Combinations of Continuous Functions, Continuous Functions on Intervals, Uniform continuity, Monotone and Inverse Functions.

Chapter 5: Sections 5.1,5.2,5.3,5.4,5.6

MODULE II: DIFFERENTIATION 30 hours

The Derivative, The Mean Value Theorem, L' Hospital Rules, Taylor's Theorem

Chapter 6: Sections 6.1,6.2,6.3,6.4

MODULE III: THE REIMANN INTEGRAL 24 hours

The Riemann Integral, Riemann Integrable Functions, The Fundamental Theorem

Chapter 7: Sections 7.1,7.2,7.3

MODULE IV: SEQUENCES AND SERIES OF FUNCTIONS 24 hours

Point wise and Uniform Convergence, Interchange of Limits, Series of Functions.

Chapter 8: Sections 8.1,8.2, Chapter 9: Section 9.4

References:

1. Richard R Goldberg - Methods of real Analysis, 3rd edition , Oxford and IBM Publishing Company (1964)
2. Shanti Narayan - A Course of Mathematical Analysis, S Chand and Co. Ltd (2004)
3. Elias Zako - Mathematical Analysis Vol 1, Overseas Press, New Delhi (2006)
4. J.M Howie - Real Analysis, Springer 2007.
5. K.A Ross- Elementary - Real Analysis, Springer, Indian Reprints.
6. S.C Malik, Savitha Arora - Mathematical Analysis, Revised Second Edition

QUESTON PAPER 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
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)

SIXTH SEMESTER

MM6CRT02 : GRAPH THEORY AND METRIC SPACES

6 hours/week (Total Hrs : 108) **4 credits**

Text books:

1. John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers
2. **G. F. Simmons -- Introduction to Topology and Modern analysis (Tata McGraw Hill)**

Module I : Graph Theory (36 Hrs)

An introduction to graph. Definition of a Graph, More definitions, Vertex Degrees, Sub graphs, Paths and cycles, the matrix representation of graphs,

Text 1: Chapter 1 (Sections 1.1, 1.3 to 1.7)

Module II: Graph Theory (30 Hrs)

Trees. Definitions and Simple properties, Bridges, Spanning trees. Cut vertices and Connectivity. Euler's Tours, the Chinese postman problem. Hamiltonian graphs & the travelling salesman problem.

Text 1: Chapter 2 (Sections 2.1, 2.2 & 2.3, 2.6); Chapter 3 (Sections 3.1 (algorithm deleted), 3.2 (algorithm deleted), 3.3, and 3.4 (algorithm deleted)).

Module III: Metric Spaces (18 Hrs)

Metric Spaces – Definition and Examples, Open sets, Closed Sets, Cantor set.

Text 2: Chapter 2 (sections 9, 10 and 11).

Module IV: Metric spaces (24 Hrs)

Convergence, Completeness, Continuous Mapping (Baire's Theorem included).

Text 2: Chapter 2 (Sections 12 and 13).

Reference:

1. Douglas B West Peter Grossman - Introduction to Graph Theory
2. R. Balakrishnan, K. Ranganathan - A textbook of Graph Theory, Springer International Edition
3. S. Arumugham, S. Ramachandran - Invitation to Graph Theory, Scitech. Peter Grossman,
4. S. Bernard and J.M Child - Higher Algebra, AITBS Publishers, India,2009

QUESTON PAPER PATTERN

Module	Part A (2 marks)	Part B (5 marks)	Part C (15 marks)	Total
I	4	2	1	7
II	4	3	1	8
III	2	2	1	5
IV	2	2	1	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 DEGREE PROGRAMME MATHEMATICS (UGCBCS 2017)

SIXTH SEMESTER MM6CRT03 :

COMPLEX ANALYSIS

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

Syllabus

Text book:

James Ward Brown & Ruel V. Churchill - Complex variables and applications (8^{th} edition)

Pre-requisites **(4 hours.)**

A quick review on Complex numbers and its properties, vectors and moduli, complex conjugates, exponential forms, arguments and its properties, roots of complex numbers, and regions in complex plane.

(No question shall be asked from this section.)

Module I: Analytic functions (28 hours)

Functions of a complex variable, limits, theorems on limits, continuity, derivatives, differentiation formulas, Cauchy-Riemann equation, sufficient condition for differentiability, analytic functions, examples, harmonic functions. Elementary functions, the Exponential function, logarithmic function, complex exponents, trigonometric functions, hyperbolic functions, inverse trigonometric and hyperbolic functions.

Chapter 2 (Sections 12, 15, 16, 18 to 22, 24 to 26); Chapter 3 (Sections 29, 30, 33 to 36).

Module II: Integrals (25 hours)

Derivatives of functions, definite integrals of functions, contours, contour integrals, some examples, upper bounds for moduli of contour integrals, antiderivates , Cauchy-Goursat theorem (without proof), simply and multiply connected domains, Cauchy's integral formula,an extension of Cauchy's integral formula, Liouville's theorem and fundamental theorem of algebra, maximum modulus principle.

Chapter 4 (Sections 37 to 41, 43, 44, 46, 48 to 54);
Chapter 5 (Sections 55 to 60 and 62).

Module III: Series (15 hours)

Convergence of sequences and series, Taylor's series, proof of Taylor's theorem, examples, Laurent's series (without proof), examples.

Chapter 5 (Sections 55 to 60 and 62)

Module IV: Residues and poles (18 hours)

Isolated singular points, residues, Cauchy's residue theorem, three types of isolated singular points, residues at poles, examples. Applications of residues, evaluation of improper integrals, example.

Chapter 6 (Sections 68 to 70 and 72 to 74);
Chapter 7 (Section 78)

Reference:

1. Lars V. Ahlfors - Complex Analysis – An Introduction to the Theory of Analytic Functions of one Complex Variables (4^{th} edition), (McGRAW-HILL)
2. J M Howie: Complex Analysis, Springer
3. Shanti Narayan - Theory of functions of a complex variable
4. Steven G Krantz - Complex Variables – A Physical approach with applications and MATLAB, Chapman & Hall/CRC (2007).
5. Kasana - Complex Variables: Theory and Applications , 2^{nd} edition
6. B. Choudhary - The Elements of Complex Variables.
7. A. David Wunsch – Complex Analysis with Applications (Pearson)

QUESTON PAPER PATTERN

Module	Part A (2 marks)	Part B (5 marks)	Part C (15 marks)	Total
I	5	3	1	9
II	3	3	1	7
III	2	1	1	4
IV	2	2	1	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 DEGREE PROGRAMME MATHEMATICS (UGCBCS 2017)

SIXTH SEMESTER MM6CRT04 :

LINEAR ALGEBRA

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

SYLLABUS

Text Book :

1. S. Blyth and E. F. Robertson : Basic Linear Algebra, Springer, Second Ed.(2002)

Module 1

A review of algebra of matrices is followed by some applications of matrices, analytic geometry, systems of linear equations and difference equations. Systems of linear equations: elementary matrices, the process of Gaussian elimination, Hermite or reduced row-echelon matrices. Linear combinations of rows (columns), linear independence of columns, row equivalent matrices, rank of a matrix, column rank, normal form, consistent systems of equations.

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

Module 2

Invertible matrices, left and right inverse of a matrix, orthogonal matrix, vector spaces, subspaces, linear combination of vectors, spanning set, linear independence and basis.

Text 1: Chapter 4 and Chapter 5.

Module 3

Linear mappings: Linear transformations, Kernel and range, Rank and Nullity, Linear isomorphism. Matrix connection: Ordered basis, Matrix of f relative to a fixed ordered basis, Transition matrix from a basis to another, Nilpotent and index of nilpotency.

Text 1: Chapter 6 and Chapter 7.

Module 4

Eigenvalues and eigenvectors: Characteristic equation, Algebraic multiplicities, Eigen space, Geometric multiplicities, Eigenvector, diagonalisation, Tri-diagonal matrix.

Text 1: Chapter 9**.**

Reference:

1 Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (Second Edition), Academic Press 2009, an imprint of Elsevier.
2 David C Lay: Linear Algebra, Pearson
3 Sheldon Axler - Linear Algebra Done Right (Third Edition, Undergraduate text in Mathematics), Springer 2015.
4 S. H. Friedberg, Arnold J. Insel and Lawrence E. Spence, - Linear Algebra, 2nd Edition, PH Inc.
5 S. Kumaresan - Linear Algebra: A Geometric Approach, Prentice Hall India Learning Private Limited; New title edition (2000)
6 Gilbert Strang – Linear Algebra and its applications, Thomson Learning,

QUESTON PAPER PATTERN

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

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME (UGCBCS 2017)

MATHEMATICS (CHOICE BASED COURSE)

(DURING THE SIXTH SEMESTER)

B.Sc. DEGREE PROGRAMME MATHEMATICS (UGCBCS 2017)SIXTH SEMESTER

MM6CBT01 : OPERATIONS RESEARCH

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

Syllabus

Text Book: J.K SHARMA-OPERATIONS RESEARCH- THEORY AND APPLICATIONS, MACMILLAN PUBLISHERS, INDIA Ltd.

Module I: Linear Programming:- Model formulation and solution by the Graphical Method and the Simplex method (20Hrs.)

General Mathematical Model of LPP, Guidelines on linear Programming model formulationand examples of LP Model formulation.Introduction to graphical method, definitions, Graphical solution methods of LP Problems, Special cases in linear Programming, Introduction to simplex method, Standard form of an LPP, Simplex algorithm(Maximization case),Simplex algorithm (Minimization case),The Big M Method, Some complications and their resolution, Types of linear Programming solutions.

Chapter 2: Sections 2.6 to 2.8
Chapter 3: Sections 3.1 to 3.4
Chapter 4: Sections 4.1 to 4.6

Module II: Duality in Linear Programming (12 Hrs.)

Introduction, Formulation of Dual LPP, standard results on duality, Advantages of Duality,Theorems of duality with proof.

Chapter 5: Sections: 5.1 to 5.3, 5.5 with appendix.

Module III:Transportation and Assignment Problems (22 Hrs.)
Introduction, Mathematical model of Transportation Problem, The Transportation Algorithm, Methods for finding Initial solution, Test for optimality, Variations in Transportation Problem, Maximization Transportation problem,Introduction and mathematical models of Assignment problem, Solution methods of Assignment problem, variations of the assignment problem.

Chapter9: Sections 9.1 to 9.7
Chapter 10 : sections 10.1 to 10.4

Module IV: Theory of Games (18 Hrs.)

Introduction, Two-person zero sum games, pure strategic (Minimax and Maximin principles), Games with saddle point, mixed strategies, Games without saddle point, The rules of dominance, solution methods: Games without saddle point (Arithmetic method, Matrix method, Graphical method and Linear programming method)

Chapter 12: Section 12.1 to 12.6

Reference books:

1. .Kanti Swarup, P.K Gupta and Man Mohan-Operations Research (Sultan Chandand sons).
2. Frederick S Hillier and Gerald J. Lieberman -Introduction to operations research (Seventh edition),Mc Graw Hill edition.
3. Hamdy A Taha-Operations Research-An introduction (seventh edition), PrenticeHall of India Pvt.Ltd.).

Question Paper Pattern

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

Complementary Courses

COMPLEMENTARY PHYSICS FOR MATHEMATICS

Semester I **2 credits (36 hours)**

PH1CMT01: PROPERTIES OF MATTER & ERROR ANALYSIS

Module I

Elasticity **(13 hours)**

Stress- strain- Hooke's law- Elastic moduli- Poisson's ratio- twisting couple- determination of rigidity modulus- static and dynamic methods- static torsion- torsion pendulum, bending of beams- cantilever, uniform and non-uniform bending, I section girder.

Module II

Surface tension **(3 hours)**

Molecular theory of surface tension - surface energy - excess pressure in a liquid drop,factors affecting surface tension - applications

Hydrodynamics **(7 hours)**

Streamline and turbulent flow - critical velocity - Coefficient of viscosity - Derivation of Poiseuille's equation, Stokes equation-Determination of viscosity by Poiseuille's method - Brownian motion – Viscosity of gases – Bernoulli's theorem.

Module III **(13 hours)**

Error Analysis

Basic ideas – uncertainties of measurement – importance of estimating errors – dominant errors – random errors – systematic errors - rejection of spurious measurements. Estimating and reporting errors – errors with reading scales, errors of digital instruments

— number of significant digits –absolute and relative errors — standard deviation. Propagation of errors – sum and differences – products and quotients – multiplying by constants — powers

References:

1. Elements of properties of matter, D S Mathur
2. Advanced course in Practical Physics by D Chattopadhyay
3. Properties of Matter- Brijlal and N. Subrahmanyam (S. Chand and Co.)
4. Concepts of Modern Physics- A. Beiser (Tata McGraw-Hill, 5th Edn.)
5. Modern Physics- G. Aruldas and P. Rajagopal (PHI Pub

6. Physics- Resnick and Halliday
7. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, John R. Taylor - Univ. Science Books

Semester II **2 credits (36 hours)**

PH2CMT01: MECHANICS AND ASTROPHYSICS

Module I

Motion under Gravity (5 hours)

Velocity- acceleration- force — acceleration due to gravity - compound pendulum(symmetric and asymmetric) radius of gyration — Kater's Pendulum- centripetal acceleration and force - centrifugal force

Rotational Dynamics (10 hours)

Angular velocity- angular momentum- torque- conservation of angular momentum- angular acceleration- moment of inertia- parallel and perpendicular axes theorems- moment of inertia of rod, ring, disc, cylinder and sphere- flywheel

Module II

Oscillations (9 hours)

Periodic and oscillatory motion- simple harmonic motion- differential equation, expressionfor displacement, velocity and acceleration- graphical representation- energy of a particle executing simple harmonic motion - damped oscillation- forced oscillation and resonance.

Waves (4 hours)

Waves-classifications- progressive wave- energy of progressive wave- superposition of waves-theory of beats- Doppler Effect.

Module III

Astrophysics (8 hours)

Temperature and color of a star- elements present in a stellar atmosphere- mass of star- life time of a star- main sequence stars-HR diagram- evolution of stars- white dwarf- supernova explosion- neutron star- black hole- (all topics to be treated qualitatively)

References

1. Elements of properties of matter, D S Mathur Mechanics- H.S.Hans and S.P.Puri. (TMH)
2. Mechanics, D S Mathur
3. Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad

4. A text book on oscillations waves and acoustics, M.Ghosh , D Bhattacharya
5. Introduction to Astrophysics-Baidyanath Basu.
6. Mechanics by D.S. Mathur and P.S. Hemne, S. Chand.
7. Waves, Mechanics & Oscillations- S B Puri

Semester III **3 credits (54 hours)**

PH3CMT01: MODERN PHYSICS AND ELECTRONICS

Module I

Modern Physics **(18 hours)**

Basic features of Bohr atom model-formula for energy- vector atom model- various quantum numbers-coupling schemes — LS & JJ-Pauli's exclusion principle- magnetic moments of orbital electrons

Atomic nucleus-classification-basic properties of nucleus-charge, mass, spin, magnetic moment binding energy and packing fraction-nuclear forces-salient features

Radioactivity- properties of alpha, beta and gamma-Soddy Fajan's displacement law, law of radioactive disintegration-decay constant-half life and mean life-radioactive equilibrium
- measurement of radioactivity-radio carbon dating

Module II

Quantum Mechanics **(12 hours)**

Inadequacies of classical physics-experimental evidences-evidences for quantum theory- Planck's hypothesis-foundation of quantum mechanics-wave function & probability density- Schrödinger equation-time dependent and time independent particle in a potential box.

Spectroscopy **(6 hours)**

Optical spectra- spectral terms, selection rules, hyperfine structure; molecular spectra- rotational, vibrational and electronic spectra; Raman effect- experimental study, quantum theory; fluorescence and phosphorescence; comparison of Raman, fluorescence and IR spectra; NMR

Module III

Electronics (8 hours)

Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p-n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers- bridge rectifier-ripple factor, efficiency. Bipolar junction transistor- Construction and operation.

Module IV

Digital Electronics (10 hours)

Different number systems — decimal, binary, octal, hexa decimal number systems- conversion between different number systems- binary mathematics — addition, subtraction (1's compliment and 2's compliment methods) - basic theorems of Boolean algebra- de Morgan's theorems – Simplification of Boolean equations - AND, OR, NOT,NAND, NOR, XOR gates- truth tables- half adder- full adder

References

1. Modern Physics- R. Murugeshan, Er. Kirthiga Sivaprasad
2. Principles of electronics, V K Mehta
3. Digital principles and applications- A. P. Malvino and P. Leach
4. Concepts of Modern Physics: Arthur Beiser (TMH).
5. Basic Electronics , B L Thereja (S. Chand)

Semester IV 3 credits (54 hours)

PH4CMT01: OPTICS & ELECTRICITY

Module I

Interference, Diffraction and Polarization (22 hours)

Light waves- phase difference and coherence, optical path and phase change, principleof superposition, Analytical treatment of interference-young's double slit experiment, conditions for interference, bandwidth - Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength

Fresnel and Fraunhofer diffractions.Fresnel's theory of approximate rectilinear propagation of light-.Fraunhofer diffraction.Theory of Plane transmission grating- determination of wavelength-dispersive power of grating. Prism and grating spectra, resolving power, Rayleigh criterion, resolving power of grating,

Polarization, types of polarization, Brewster's law, dichroism, birefringence – e ray and o- ray, polarizer and analyser, Malu's law, optical activity

Module II

Laser and Fiber Optics (10 hours)

Principle of operation of laser-population inversion, metastable states, optical resonator- components of laser-active medium, pump, optical resonant cavity- principal pumping schemes- three level and four level- laser beam characteristics applications of lasers. Light propagation in optical fibers, acceptance angle, numerical aperture-step index fiber
- graded index fiber.

Module III

Dielectrics (10 hours)

Dielectrics- polar and non-polar dielectrics- polarization- sources of polarization-Gauss's law in dielectrics-permittivity- dielectric displacement vector- dielectric constant- susceptibility- ferro-electricity.

Module IV

Varying Currents (12 hours)

Transient currents — Growth and decay of current in an inductive circuit — charging anddischarging of a capacitor through a resistance - Peak, mean, rms and effective values of a.c, Ac circuits-AC through RC, LC, LR and LCR series circuits resonance-sharpness of resonance-power factor.

References:

1. Optics - Brijlal and N. Subrahmanyam, S Chand-2015
2. Electricity and Magnetism , D C Tayal
3. Electricity and Magnetism- J. H. Fewkes & John Yarwood
4. Electricity and Magnetism – R. Murugeshan

5. Nuclear physics –Irvin Kaplan
6. Lasers – theory & applications- Thyagarajan & Ghatak
7. Concepts of Modern Physics- A. Beiser
8. Laser Physics and Applications, V K Jain (Narosa Publication)
9. Optical Fiber Communications, John M Senior

The Structure of the 4 Complementary Courses in Statistics offered for B.Sc. Mathematics (Model I) Programme

Semester	Course Type	Course Code with Title	Credits	Lecture Hours	
				Per Week	Total
1	Complementary	ST1CMT01 - Descriptive Statistics	3	4	72
2	Complementary	ST2CMT02 - Probability Theory	3	4	72
3	Complementary	ST3CMT03 - Probability Distributions	4	5	90
4	Complementary	ST4CMT04 - Statistical Inference	4	5	90

Complementary Course to B. Sc. Mathematics Programme

Semester I - Course I

ST1CMT01 - DESCRIPTIVE STATISTICS

(Common to B. Sc. Mathematics, B.Sc. Physics and B. Sc. Computer Applications Programme)

Hours per week - 4

Number of credits - 3

Module I:Different aspects of data, and its collection

Statistics as collected facts and figures, and as a science for extracting information from data. Concepts of a statistical population and sample. Different types of characteristics and data- qualitative and quantitative, cross-sectional and time-series, discrete and continuous, frequency and non-frequency. Different types of scale- nominal and ordinal, ratio and interval. Collection of data- census and sampling. Different types of random samples- simple random sample,systematic, stratified and cluster (description only).

(20L)

Module II :Central tendency and Dispersion

Averages- Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean and Weighted averages..Absolute Measures of dispersion- Range, Quartile Deviation, Mean Deviation and Standard Deviation. Combined mean and standard deviation, C.V, relative measures of dispersion, Ogives and Box plot.(problems based on the above topics)

(20L)

Module III :, Moments, Skewness and Kurtosis

Raw moments, central moments and their inter relation. Skewness- Pearson's, Bowly's and moment measures of skewness. Kurtosis- percentile and moment measure of kurtosis(problems based on the above topics).. (15L)

Module IV : Index Numbers

Definition of Index Numbers. Price Index Numbers. Price Index Numbers as Simple (A. M.,G. M.)and Weighted averages (A. M.)of price relatives. Laspeyer's, Paasche's and Fisher's Index Numbers. Time-Reversal and Factor-Reversal tests. Cost of living index numbers-family budget and aggregate expenditure methods. An introduction to Whole sale Price Index and Consumer Price Index.(problems based on the above topics)..

(17L).

SCHEME OF QUESTION PAPER

(The number of questions from the four modules to be asked in the 3 parts of thequestion paper)
Use of non - programmable Calculator and Statistical tables allowed.

Part	**Marks of each Question**	**No. of Questions**					**Total Marks**	**To be answered**	
		Module				**Total**		**No. of Questions**	**Total Marks**
		1	**2**	**3**	**4**				
A	**2**	**3**	**3**	**3**	**3**	**12**	**24**	**10**	**20**
B	**5**	**3**	**2**	**2**	**2**	**9**	**45**	**6**	**30**
C	**15**	**1**	**1**	**1**	**1**	**4**	**60**	**2**	**30**
Total Questions		**7**	**6**	**6**	**6**	**25**	**129**	**18**	**80**
Total Mark		**36**	**31**	**31**	**31**	**129**			

REFERENCES

1. Goon, A. M.,Gupta M. K. and Dasgupta,B(1986).Fundamentals of Statistics,Volume1, world press, Kolkota

2. Gupta, S. C. and Kapoor, V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.

3. Gupta, S. C. and Kapoor, V. K.(2007).Fundamentals of applied Statistics,SultanChandand Sons.
4. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.
5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson Education Inc.
6. Mood, A. M., Graybill, F.A. and Bose, F.A.(1974).Introduction to Theory of Statistics, Oxford and IBH publishers.
7. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.
8. Mukhopadhya, P. (1999). Applied Statistics, New central book agency private limited, Kolkata
9. Seemon, T.(2014). Basic Statistics.Narosa Publishing House

Note: The 5 marks for the Assignment component of Internal assessment

may be given for solving problems from the above syllabus, at least two assignment.

Complementary Course to B. Sc. Mathematics Programme

Semester II - Course II

ST2CMT02 - PROBABILITY THEORY

(Common to B. Sc. Mathematics, B.Sc. Physics and B. Sc. Computer Applications Programme)

Hours per week - 4

Number of credits - 3

Module I : Probability

Random experiments. Complement, union and intersection of events and their meaning. Mutually exclusive, equally likely and Independent events. Classical, Frequency and Axiomatic approaches to probability. Monotone property, Addition theorem (up to 3 events. Conditional probability. Multiplication theorem(up to 3 events). Independence of events.. Bayes' theorem.(problems based on the above topics) (20L)

Module II : Probability Distribution of Univariate Random Variables

Concept of random variables. discrete and continuous random variables. Probability mass and density functions, and cumulative distribution functions. Evaluation of conditional and unconditional probabilities. Change of variables- methods of jacobian and cumulativedistribution function (one variable case). (problems based on the above topics) (17L)

Module III : Probability Distribution of Bivariate Random Variables

Concept of a two-component random vector. Bivariate probability mass and density functions. Marginal and conditional distributions. Independence of bivariate random variables.(problems based on the above topics). (15L)

Module IV : Correlation and Regression

Bivariate data. types of correlation. scatter diagram. Karl Pearson's product- moment and Spearman's rank correlation coefficients. regression equations- fitting of polynomial

equations of degree one and two ; exponential curve, power curve. Two type of regressioncurves, Identification of regression equations. (problems based on the above topics).

(20L)

SCHEME OF QUESTION PAPER

(The number of questions from the four modules to be asked in the 3 parts of thequestion paper)
Use of non - programmable Calculator and Statistical tables allowed.

Part	**Marks of each Question**	**No. of Questions**					**Total Marks**	**To be answered**	
		Module				**Total**		**No. of Questions**	**Total Marks**
		1	**2**	**3**	**4**				
A	**2**	**3**	**3**	**3**	**3**	**12**	**24**	**10**	**20**
B	**5**	**3**	**2**	**2**	**2**	**9**	**45**	**6**	**30**
C	**15**	**0**	**1**	**1**	**2**	**4**	**60**	**2**	**30**
Total Questions		**7**	**6**	**6**	**6**	**25**	**129**	**18**	**80**
Total Mark		**36**	**31**	**31**	**31**	**129**			

REFERENCES

1. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.
2. Hogg R. V., Mckean J. W., and Craig A. T.(2014) Introduction to Mathematical Statistics, 6th edition, Pearson Education Inc.
3. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.
4. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.
5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson Education Inc.

6. Mood, A. M., Graybill, F.A. and Bose, F.A.(1974).Introduction to Theory of Statistics, Oxford and IBH publishers.
7. Ross, S.(2003). A first comes in probability Pearson, Education Publishers, Delhi

Note: The 5 marks for the Assignment component of Internal assessment

may be given for solving problems from the above syllabus, at least two assignment.

Complementary Course to B. Sc. Mathematics Programme

Semester III - Course III

ST3CMT03 - PROBABILITY DISTRIBUTIONS

(Common to B. Sc. Mathematics, B.Sc. Physics and B. Sc. Computer Applications Programme)

Hours per week - 5

Number of credits - 4

Module I : Mathematical Expectation

Expectation of random variables and their functions. Definition of - Raw moments, central moments and their interrelation, A.M, G.M, H.M, S.D, M.D., covariance, Pearson's correlation coefficient in terms of expectation.MGF and characteristic function and simple properties. Moments from mgf. (Problems based on these topics)

(20L)

Module 2 : Standard Probability Distributions

Uniform(discrete/continuous), Bernoulli, binomial, Poisson, geometric, hyper-geometric, exponential, gamma- one and two parameter(s),beta(type I and type II),- mean, variance, mgf, additive property, lack of memory property. Normal distribution with all properties.(Problems based on these topics)

(25L)

Module 3 - Law of Large Numbers and Central Limit Theorem

Chebychev's inequality, Weak Law of Large Numbers- Bernoulli's and Chebychev's form.Central Limit Theorem(Lindberg- Levy form with proof).(Problems based on these topics)

(20L)

Module 4 - Sampling Distributions

Concept of sampling from a probability distribution .i.i.d. observations. Concept of sampling distributions, Statistic(s) and standard error(s). Mean and variance of sample mean when sampling is from a finite population. Sampling distribution of mean and variance from normal distribution. Chi-square, t, F distributions and statistics following these distributions. Relation

among Normal, Chi-square, t and F distributions.(Problems based on these topics)

(25L)

SCHEME OF QUESTION PAPER

(The number of questions from the four modules to be asked in the 3 parts of thequestion paper)
Use of non - programmable Calculator and Statistical tables allowed.

Part	**Marks of each Question**	**No. of Questions**					**Total Marks**	**To be answered**	
		Module				**Total**		**No. of Questions**	**Total Marks**
		1	**2**	**3**	**4**				
A	**2**	**3**	**3**	**3**	**3**	**12**	**24**	**10**	**20**
B	**5**	**3**	**2**	**2**	**2**	**9**	**45**	**6**	**30**
C	**15**	**1**	**2**	**0**	**1**	**4**	**60**	**2**	**30**
Total Questions		**7**	**6**	**6**	**6**	**25**	**129**	**18**	**80**
Total Mark		**36**	**31**	**31**	**31**	**129**			

REFERENCES

1. Goon A. M., Gupta M. K., and Dasgupta B.(2005). Fundamentals of Statistics, Vol. II, 8th edition, World Press, Kolkatta.
2. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons.
3. Hogg R. V., Mckean J. W., and Craig A. T.(2014). Introduction to Mathematical Statistics, 6th edition, Pearson Education Inc.
4. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.
5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson Education Inc.

6. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.

Note: The 5 marks for the Assignment component of Internal assessment

may be given for solving problems from the above syllabus, at least two assignment.

Complementary Course to B. Sc. Mathematics Programme

Semester IV - Course IV

ST4CMT04 - STATISTICAL INFERENCE

(Common to B. Sc. Mathematics, B.Sc. Physics and B. Sc. Computer Applications Programme)

Hours per week - 5

Number of credits - 4

Module I : Point Estimation

Concepts of Estimation, Estimators and Estimates. Point and interval estimation. Properties of good estimators- unbiasedness, efficiency, consistency and sufficiency. factorization theorem(statement). (problems based on these topics).

(25L)

Module II : Methods of Estimation, Interval Estimation

Methods of moments, maximum likelihood. Invariance property of ML Estimators (without proof).minimum variance. Cramer-Rao inequality(statement only) 100(1-α)% confidence intervals for mean, variance and proportions(problems based on these topics)

(20L)

Module III : Testing of Hypotheses, Large Sample Tests

Statistical hypotheses, null and alternate hypotheses, simple and composite hypotheses, type-I and type-II errors. Critical Region. Size and power of a test, p-value, Neyman-Pearson approach. Large sample tests - z-tests for means, difference of means, proportion and difference of proportion, chi-square tests for independence, homogeneity.

(25L)

Module IV : Small Sample Tests

Normal tests for mean, difference of means and proportion (when σ known), t-tests for mean anddifference of means(when σ unknown), paired t-test, test for proportion(binomial), chi-square test, F-test for ratio of variances. (derivation not required)

(20L)

SCHEME OF QUESTION PAPER

(The number of questions from the four modules to be asked in the 3 parts of the question paper)

Use of non - programmable Calculator and Statistical tables allowed.

Part	Marks of each Question	No. of Questions					Total Marks	To be answered	
		Module				Total		No. of Questions	Total Marks
		1	2	3	4				
A	**2**	**3**	**3**	**3**	**3**	**12**	**24**	**10**	**20**
B	**5**	**3**	**2**	**2**	**2**	**9**	**45**	**6**	**30**
C	**15**	**1**	**1**	**1**	**1**	**4**	**60**	**2**	**30**
Total Questions		**7**	**6**	**6**	**6**	**25**	**129**	**18**	**80**
Total Mark		**36**	**31**	**31**	**31**	**129**			

REFERENCES

1. Goon A. M., Gupta M. K., and Dasgupta B.(2005). Fundamentals of Statistics, Vol.I, 8th edition, World Press, Kolkatta.
2. Gupta S. C. and Kapoor V. K.(2002). Fundamentals of Mathematical Statistics, 11thedition, Sultan Chand and Sons.
3. Hogg R. V., Mckean J. W., and Craig A. T.(2014). Introduction to MathematicalStatistics, 6th edition, Pearson Education Inc.
4. R.S.N. Pillai, Bagavathi(2010). STATISTICS- Theory and Practice, S.Chand publications.
5. Miller, I. and Miller, M.(2014). Mathematical Statistics, 8th edition, Pearson EducationInc.
6. Medhi J.(2006). Statistical Methods, 2nd edition, New Age International Publishes.

Note: The 5 marks for the Assignment component of Internal assessment

may be given for mini group project with some real life data Primary or secondary. Thisgives the students an opportunity to understand the application of the statistical methodsthey have studied.

Common Courses

MAHATMAGANDHIUNIVERSITY SYLLABI FOR COMMON COURSES-

UGPROGRAMMES

2017ADMISSIONSONWARDS

COURSE1-Fine-tuneYourEnglish

Course Code	**EN1CCT01**
Title of the course	**Fine-tune Your English**
Semesterinwhichthecourseistobe taught	**1**
No. of credits	**4**
No. of contact hours	**90**

AIMOFTHECOURSE

The courseis intended to introducethe students to the basics ofgrammar, usage and effective communication.

OBJECTIVESOFTHECOURSE

On completion of the course, the student should beable to:1. confidentlyuse English in both written and spoken forms. 2.Use English forformal communication effectively.

COURSEOUTLINE

SECTIONA:TheSentenceanditsStructure

CHAPTER ONE: How to Write Effective Sentences

CHAPTER TWO: Phrases—What are They?

CHAPTER THREE: The Noun Clauses

CHAPTER FOUR: The Adverb Clause

CHAPTER FIVE: “If All the Trees Were Bread and Cheese”

CHAPTER SIX: The Relative Clause

CHAPTER SEVEN: How Clauses are Conjoined

SECTIONB:Word-ClassesandRelatedTopics

CHAPTER EIGHT: Understanding the Verb

CHAPTER NINE: Understanding Auxiliary Verbs

CHAPTER TEN: Understanding Adverbs
CHAPTER ELEVEN: Understanding Pronouns
CHAPTER TWELVE: The Reflexive Pronoun
CHAPTER THIRTEEN: The Articles I CHAPTER
FOURTEEN: The Articles II CHAPTER FIFTEEN:
The Adjective CHAPTER SIXTEEN: Phrasal Verbs
CHAPTER SEVENTEEN: Mind your Prepositions

SECTIONC:ToErrisHuman

CHAPTER EIGHTEEN: Concord
CHAPTER TWENTY: Errors, Common and Uncommon
CHAPTER TWENTY-ONE: False Witnesses

SECTIOND:TheWorldofWords CHAPTER
THIRTY-TWO: Word Formation
CHAPTER THIRTY-THREE: Using the Specific Word
CHAPTER THIRTY-SEVEN: Body Vocabulary

SECTIONG:TenseandRelatedTopics

CHAPTER FORTY-SEVEN: 'Presentness' and Present Tenses
CHAPTER FORTY-EIGHT: The 'Presentness' of a Past Action
CHAPTER FORTY-NINE: Futurity in English
CHAPTER FIFTY: Passivisation

SECTIONH:IdiomaticLanguageCHAPTER
FIFTY-ONE: 'Animal' Expressions CHAPTER
FIFTY-TWO: Idiomatic Phrases

SECTIONI:InterrogativesandNegatives

CHAPTER FIFTY-FIVE: Negatives
CHAPTER FIFTY-SIX: How to Frame Questions
CHAPTER FIFTY-SEVEN: What's What?
CHAPTER FIFTY-EIGHT: The Question Tag

SECTIONJ:ConversationalEnglish

CHAPTER SIXTY-TWO: Is John There Please?

SECTIONK:MiscellaneousandGeneralTopics

CHAPTER SEVENTY-THREE: Letter Writing

In addition there will be an essay question on a general topic.

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CoreText:*Fine-tuneYourEnglish*byDrMathewJoseph.OrientBlackswanand Mahatma Gandhi University

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MAHATMAGANDHIUNIVERSITY

SYLLABIFORCOMMONCOURSES-

UGPROGRAMMES

2017ADMISSIONS ONWARDS

COURSE2-Pearls from the Deep

Course Code	**EN1CCT02**
Title of theCourse	**PearlsfromtheDeep**
Semester in whichthe Course is to be taught	**1**
No. of Credits	**3**
No. of Contact Hours	**72**

AIMOFTHECOURSE

To introducestudents to the differentgenres of literature and to the nicetiesof literary expression.

OBJECTIVESOFTHECOURSE

On completion of the course, the student should beable to:
1. appreciate and enjoyworks of literature.
2. appreciate the aesthetic and structural elementsof literature.

COURSEOUTLINE

Module1[Fiction] **(18hours)**

ErnestHemingway: *TheOldManandtheSea*

Module2[OneActPlays] **(18hours)**

Susan Glaspell: Trifles
Asif Currimbhoy:TheRefugee
A. A. Milne: TheBoyComes Home

Module3[ShortStories](18hours)

GuyDe Maupassant: Two Friends
O. Henry:The Gift of the Magi

K. A. Abbas: Sparrows
FloraAnnie Steel: Valiant Vicky, the Brave Weaver

Module4[Poems](18hours)

Rumi:The Chanceof Humming
Walter Scott:Lochinvar
John Keats:La Belle Dame sans Mercy
Robert Frost: After Apple Picking
Chinua Achebe: Refugee Mother and Child
KamalaDas: MyGrandmother‘s HouseTed
Hughes: Jaguar
Pablo Neruda: TonightI can Write the SaddestLines
P. P. Ramachandran: How Simple!

CoreText:*PearlsfromtheDeep.* Cambridge UniversityPressand Mahatma Gandhi University

MAHATMAGANDHIUNIVERSITY

SYLLABIFORCOMMONCOURES-

UGPROGRAMMES2017ADMISSIONSONWARDSCOURSE

3-ISSUESTHATMATTER

CourseCode	**EN2CCT03**
Titleofthecourse	**ISSUESTHATMATTER**
Semesterinwhichthecourseistobetaught	**2**
No.ofcredits	**4**
No.ofcontacthours	**90**

1.AimoftheCourse:

To sensitize the learners about contemporary issues of concern; to enhance their linguistic skills inEnglish language.

Objectives:

By the end of the course, the learner is able to

- identify major issues of contemporary significance
- respond rationally and positively to the issues raised
- internalise the values imparted through the excerpts
- re-orient himself/ herself asconscious, cautious, concerned, conscientious and concerned human being and
- articulate these values in error free English.

2.CourseOutline:

Module1 **(18hours)**

1. TheUnsurrendered People - Kenzaburo Oe

2. The Old Prison – Judith Wright

3. War– Luigi Pirandello

Module2

(18hours)

4. Persuasions on the Power of the Word - Salman Rushdie

   Peril - Toni Morrison

5. The Burning of the Books- Bertolt Brecht

6. The Censors - Luisa Valenzuela

Module3

(18hours)

7. "The Poisoned Bread" – Bandhumadhav

8.*AWestwardTrip-ZitkalaSa*

9. "The Pot Maker" – TemsulaAo

Module4

(18hours)

10. Does it Matter – Richard Leaky

11. On Killing A Tree - Gieve Patel

12. Hagar: A Story of a Woman and Water (Gift in Green [chapter 2]) – Sarah Joseph

Module5

(18hours)

13.Understanding Refugeeism: An Introduction to Tibetan Refugees in India

14.Refugee Blues – W. H. Auden

15. The Child Goes to the Camp(from Palestine's Children)– GhassanKanafani

CoreText:ISSUESTHATMATTER

MAHATMAGANDHIUNIVERSITY

SYLLABIFORCOMMONCOURSES–UGPROGRAMMES

2017ADMISSIONSONWARDS

COURSE4-Savouring the Classics

Course Code	**EN2CCT04**
Title of theCourse	**SavouringtheClassics**
Semester in which the course is to be taught	**2**
No. of credits	**3**
No. of contact hours	**72**

AIMOFCOURSE

To introducethe studentsto the taste of time testedworld classics.

OBJECTIVESOFTHECOURSE

On completion of the course, the student should:

1. become familiar with the classics from various lands.
2. understandthe features that go into the making of a classic.

OUTLINEOFTHECOURSE

Module1[Poems] **(18hours)**

Homer: "Father and Son" (*Odyssey* Book 16: 113-189) (Translated by Robert Fagles)
Kalidasa: "Lovely is Youth" (Translated by J.G. Jennings)
Omar Khayyam: *Rubaiyat* (quatrains: 25-28) (Translated by Edward Fitzgerald) Dante: Dante meets Virgil (*Inferno* Canto 1: 49-102) (Translated by J.G. Nichols)John Milton: "On his Blindness"

Module2[ShakespeareExcerpts]*R* **(18hours)**
omeoandJuliet: ACT II, Scene ii
TheMerchantofVenice: ACT IV, Scene i

Module3[NovelExcerpts]

Miguel de Cervantes: *DonQuixote* (Chapter 8) (Translated by Edith Grossman) **(18hours)**
Jane Austen: *PrideandPrejudice* (Chapters 1-6)

Victor Hugo: *LesMiserables* (Part 1- Fantine, Book II, Chapters 9-13) (Translated by Christine Donougher)

Module4[ShortFiction] (18hours)

Charles Dickens: *TheBlackVeil*
Leo Tolstoy: *HowMuchLandDoesaManNeed*? (Translated by Louise & Aylmer Maude)
Rabindranath Tagore: *Kabuliwala* (Translated by Mohammad A. Quayum)
Jorge Louis Borges: *TheShapeoftheSword* (Translated by Andrew Hurley)

CoreText:*SavouringtheClassics*

RecommendedReading

Italo Calvino:*WhyReadtheClassics?*

A. C. Bradley: *ShakespeareanTragedy*

Katherine Armstrong: *StudyingShakespeare:APracticalIntroduction*

Gemma McKenzie: *FoundationsofEuropeanDrama*

Harold Bloom: The Western *Canon*

JeremyHawthorn: *StudyingtheNovel*

C. Marydas: *ShakespeareanAestheticsforUniversityWits*

MAHATMAGANDHIUNIVERSITY

SYLLABIFORCOMMONCOURSES-

UGPROGRAMMES

2017ADMISSIONSONWARDS

COURSE5-Literatureand/asIdentity

Course Code	**EN3CCT05**
Title of the course	**Literatureand/asIdentity**
Semesterinwhichthecourseistobe taught	**3**
No. of credits	**4**
No. of contact hours	**90**

AIMOFTHECOURSE

The courseis intended to sensitivise students to thevarious ways in which literature serves as a platform for forming, consolidating, critiquing and re-working the issue of _identity‘at various levels.

OBJECTIVESOFTHECOURSE

On completion of the course, the student should beaware of thefollowing:

1. Thesubtle negotiations of Indigenous and Diasporic identities with-inLiterature.
2. Thefissures, the tensions and the interstices present in South Asian regional identities.
3. The emergence of Life Writing and alternate/alternative/marginal identities.

COURSEOUTLINE

Module1(DiasporicIdentities) (18hours)

Agha Shahid Ali:ISeeKashmir from New Delhi at Midnight
M.G. Vassanji: Leaving ImtiazDharker:
At theLahoreKarhai
ChitraBanerjee Divakaruni:Indian Movie, New Jersey

Module2(SouthAsianIdentities) (18hours)

C. V. Velupillai: No State, No Dog
SadaatHasanManto: The Dog of Tetwal
IntizarHussain: A Chronicle of the Peacocks
Selina Hossain: Double War

Module3(LifeWritings)

(18hours)

Malcolm X: ―Nightmare‖,excerpt from *TheAutobiographyofMalcolmX*.
Sashi Deshpande:Learning to be a Mother in *Janani– Mothers,Daughters,Motherhood*, (ed.) RinkiBhattacharya.

Module4(IndigenousIdentities)

(18hours)

Excerptsfrom*Binti*,theSanthalcreationsongofcosmology, the*BhilliMahabharat*and *GarhwaliSongs*in*PaintedWords-AnAnthologyofTribalLiterature*-Editedby G.N. Devy.
Amos Tutuola: *ThePalm-WineDrinkard*. [Excerpt]

Module5(AlterIdentities)

(18hours)

Nathaniel Hawthorne: TheBirth Mark
John Henrik Clarke: TheBoyWho Painted Christ Black
Ruskin Bond: TheGirl on the Train

CoreText:*Literatureand/asIdentity*

MAHATMAGANDHIUNIVERSITY

SYLLABIFORCOMMONCOURSES-

UGPROGRAMMES

2017ADMISSIONSONWARDS

COURSE6–Illuminations

Course Code	**EN4CCT06**
Title of the course	**Illuminations**
Semester inwhichthecourseistobe taught	**4**
No. of credits	**4**
No. of contact hours	**90**

AIMOFTHECOURSE

To acquaint the learnerswith different formsof inspiring and motivating literature.

OUTLINEOFTHECOURSE

At the end ofthe course,the student shall be able to: 1.
maintain a positive attitude to life.
2. evaluate and overcome setbacks based on the insights that these texts provide.

COURSEOUTLINE

Module1[LifeSketches] (18hours)

Helen Keller: Three Days to See
Jesse Owens: MyGreatest OlympicPrize
Dominic Lapierre: Mother Teresa

Module2[Essays] (18hours)

Lafcadio Hearn: On Reading
Stephen Leacock: Are the Rich Happy?
A.G. Gardiner: On Courage

Module3[Speeches] (18hours)

J.K. Rowling: Thefringebenefits of failure and the importanceof imagination
MalalaYousafzai: NobelLecture

Module4[ShortStories] (18hours)

Oscar Wilde: The Nightingale and the Rose
George Orwell: The Miser

John Galsworthy:Quality
Paolo Coelho: The Beggar and the Baker

Module5[Poems] (18hours)

William Ernest
Henley:InvictusRobert
Frost:TheRoad Not
Taken Kahlil Gibran:
OfGood and Evil
JoyceKilmer: Trees

CoreText:*Illuminations*

Second Languages :Hindi/Malayalam

Hindi

Semester I

Prose/One Act Plays

1. दकपदकन – रकमककमकर वमकर

2. जकन ससपयकरस- ममतक ककललयक

3. बहककक लवदक – लवननद रसतनगक

4. सतक – जक. कस. हलरजकत

5. हरक घकस पर घघटसभर – सकरसनदरद वमकर

(Module-wise Distribution)

MODULE- I MODULE- II MODULE- III MODULE- IV

आईययहम ववृक दयवतत कक

आरतधनत करर

कहमतच्छतददत उतशुचंग शशखर

और धलशु र हररयतलर

जब ममफयल हुआ जब इचंकतज़तर हुससैन अपनर

जन्मभभूमम आयय

भय कफ़न चशोर कत बयटत बहककक लवदक हरक घकस पर घघटसभर

दकपदकन जतन सयप्यतरय सतक

SEMESTER II

Paper- 2- कहिकनन और उरन्यकस (Short stories & Novel)

Course Code-HN2CCT02

उरन्यकस/ Novel

1. अघलतम सककय – चघदरदककघतक

कहिकनन/ Short stories (Text Book-कथक ससस कर)

1. ईदगतह- पयमचचंद

2. हरशलबशोन कक बतखर- अजयय

3. अमरूद कत पयड –जतनरचंजन

4. जचंगल कत दतह- स्वयचंपकतश

5. छशुटट कत ददन- उषत कपयचंवदत

6. बतज़तर मररतमधन- कसैलतश बनवतसर

7. मतमरसशोई मररहतर हसै- कशुमतर अम्बशुज

(Module-wise Distribution)

MODULE- I MODULE- II MODULE- III MODULE- IV

अघलतम सककय अघलतम सककय अघलतम सककय अघलतम सककय

ईदगतह अमरूद कत पयड छशुटट कत ददन मतमरसशोई मररहतर हसै

हरशलबशोन कक बतखर जचंगल कत दतह बतज़तर मररतमधन

SEMESTER III

Paper- 3- कहवितक, वककरण और अननुविकद (Poetry, Grammar & Translation)

कहवितक/ Poetry (Text Book-ककव कनुसनुम)

Course Code-HN3CCT03

1. कबकरदकस – दनहक (4)

2. तकलसकदकस – पद (2)

3. मकरकबकई – पद (2)

4. लबहकरक – दनहक (3)

5. जकगन लफर एक बकर - सयस रककघत लतरदपकठक लनरकलक

6. वसमकसककतसफसल नहकघ- महकदसवक वमकर

7. खसवलक – धलसमल

8. छकननसआयसहहवस- सवरशवर दयकल सकससनक

9. आज़कदक उफर गकलकमक- जकनसनदरदपलत

10. तकमहहककछ करनक चकलहए – चघदरदककघत दसवतकलस

11. सबतस – अरण कमल

12. लदललक दरवकज़क – ककमकर लवकल

13. जघगल कसउजकड मह- लवननद ककमकर शककल

14. बकज़कर – मघगलसश डबरकल

15. बकसवकघशतक कसअघलतम लदनन कक एक आशचयर- रकजसश जनशक

16. दन हकलथयन कक लड़कई – उदयपदरककश

17. ठघडसपकनक कक मशकन - एककघत शरदकवकसतव

18. अचछसआदमक – ककमकर अमबकज

वककरण और अननुविकद (Grammar & Translation)

1. सकमकनय लहघदक वयककरण तथक रचनक –शरदकककषण पकणडसय (Page -19-58 & 111-117)

(Module-wise Distribution)

MODULE- I MODULE- II MODULE- III MODULE- IV

कबकरदकस

तकलसकदकस

लबहकरक

मररतबतई

जकगन लफर एक बकर

वसमकसककतसफसल नहकघ

खसवलक

छकननसआयसहहवस

आज़तदट उफर गशुलतमर

तकमहहककछ करनक चकलहए

सबतस

लदललक दरवकज़क

जघगल कसउजकड मह

बतज़तर

बकसवकघशतक कसअघलतम

लदनन कक एक आशचयर

दन हकलथयन कक लड़कई

ठघडसपकनक कक मशकन

अच्छयआदमर

वतकरण वतकरण

अनशुवतद अनशुवतद

SEMESTER IV

Paper- 4- नकटक और लसंबन कहवितक (Drama & Long Poem)

Course Code-HN4CCT04

नकटक/ Drama

1. कनणककर – जगदकश चनदरद मकथकर

लबल ब कववतत (Long Poem) (Text Book-पतलच लबल ब कववततएए)

1. नगई महकरक- लतरदलनचन

2. शहघशकह कक नकदघ – उमकशघकर चचधरक

3. ढकबक – नकलसश रघकवघशक

4. इतनक दरस मत बयकहनक बकबक – लनमरलक पकतकल

5. जवकहर टनल –अलगनशसखर

(Module-wise Distribution)

MODULE- I MODULE- II MODULE- III MODULE- IV

कनणककर कनणककर कनणककर कनणककर

नगई महकरक शहघशकह कक नकदघ ढकबक जवकहर टनल

इतनक दरस मत

बयकहनक बकबक

Malayalam

Semester I – Katha Sahithyam
Semester II- Kavitha
Semester III – Dhrisyakala Sahithyam
Semester IV - Malayalagadhyarachanakal