STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Institutional Learning Outcomes

Stella Maris College, an autonomous Catholic institution of higher education, is committed to the highest standards of academic excellence based on sound values and principles, where students are strengthened with whole person education to lead purposeful lives in service to the community and the nation.

The Institutional Learning Outcomes (ILOs) of Stella Maris College (SMC) reflect the broader mission and purpose of the institution. They are the overarching set of learning outcomes that all students, regardless of discipline, must achieve at graduation. All programme and course learning outcomes are mapped to the institutional outcomes, thus reflecting an overall alignment of values, knowledge and skills expected at programme completion. ILOs are designed to help guide individual departments and disciplines in the development of their programme learning outcomes.

The ILOs of SMC are formed by two components:

1. **Core commitments**: Knowledge and scholarship, values and principles, responsible citizenship, service to community
2. **Institutional values**: Quest for truth, spirit of selfless service, empowerment

Upon graduation, students of Stella Maris College will

- Display mastery of knowledge and skills in their core discipline (**Knowledge and Scholarship)**
- Exhibit in all actions and attitudes a commitment to truth and integrity in all contexts, both personal and professional (**Values and Principles)**
- Demonstrate knowledge about their role in society at local and global levels, and actively work for social and environmental justice (**Responsible Citizenship)**
- Engage in the process of self-discovery through a life-long process of learning (**Quest for truth**)
- Demonstrate readiness to serve those who are in need (**Spirit of selfless service**)
- Be able to function effectively and with confidence in personal and professional contexts **Empowerment)**

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Programme Learning Outcomes/Intended Programme Learning Outcomes

Graduates of a Bachelor's Degree will have a broad and coherent body of knowledge in their disciplines, with a deep understanding of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

At the end of an undergraduate programme students will be able to

- Describe and define critical concepts in their discipline
- Explain and discuss concepts and ideas pertaining to their discipline
- Demonstrate a broad understanding of their discipline
- Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
- Demonstrate understanding of the interconnections of knowledge within and across disciplines
- Apply knowledge, theories, methods, and practices in their chosen field of study to address real-world challenges and opportunities
- Demonstrate proficiency in experimental techniques and methods of analysis appropriate for their area of specialisation
- Generate and analyse data using appropriate quantitative tools
- Construct and test hypotheses
- Demonstrate cognitive and technical skills to synthesise knowledge in interrelated disciplines
- Demonstrate critical thinking and judgement in identifying and solving problems with intellectual independence
- Demonstrate the skills needed to be able to function successfully in their field
- Show responsibility and understanding of local and global issues
- Demonstrate through their actions and speech that they are agents of social justice and change
- Practice the discipline's code of ethics in their academic, professional and personal lives
- Practice the values of democracy and principles of human rights
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Demonstrate intercultural, interracial, interclass, inter-caste, and ethical competency
- Exhibit the ability to work in teams
- Exhibit a strong sense of professionalism in a range of contexts
- Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities

STELLA MARIS COLLEGE (AUTONOMOUS), CEHNNAI – 600 086

DEPARTMENT OF MATHEMATICS

PROGRAMME DESCRIPTION

The B.Sc. Mathematics Degree programme lays equal emphasis on motivating and training students towards higher education in the discipline and employability. While the courses cover a wide spectrum of skills for specific corporate and creative sectors, the logic inbuilt in the courses helps in improved analytical skills. Computational techniques introduced through the courses in the first and second years trains students to solve problems with creative and critical thinking. The theoretical inputs to develop interest in Mathematical Communication.

PROGRAMME SPECIFIC LEARNING OUTCOMES

On successful completion of this programme, students will be able to

- Demonstrate proficiency in solving problems using logical thinking
- use software to visualize mathematical concepts
- interpret problems both physically and geometrically
- use software to solve mathematical and Statistical problems
- demonstrate understanding of probability, statistical distributions and its applications to sampling theory and statistical tools in-depth at the Allied level
- acquire wide range of knowledge from General Electives chosen from different disciplines
- demonstrate competency in solving problems in Calculus, Analytical Geometry of 2 and 3 dimensions, Vector Calculus and Vector Analysis
- demonstrate proficiency in solving linear programming problems and networking models
- solve problems in Laplace Transforms, Fourier Transforms and $\boldsymbol{Z}$ transforms and to realize the use of these in problem solving
- demonstrate the study of various algebraic structures viz., Group, Ring, Fields, Vector Spaces
- derive challenging outcomes in both Real and Complex Analysis
- demonstrate proficiency in visualising Mechanics in real life problems
- visualise Elements of Space Science as an application of mathematics
- demonstrate proficiency in solving Numerical Analysis problems using C-programming

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086

B.Sc. DEGREE : BRANCH I-MATHEMATICS - SHIFT I

COURSES OF STUDY

(Effective from the academic year 2019-2020)

CHOICE BASED CREDIT SYSTEM

C-Credit, **L**-Lecture Hours, **T**-Tutorial Hours, **P**- Practical Hours, **Ex**-Exam Hours,
CA- Continous Assessment Marks, **ES**-End Semester Marks, **M**-Maximum Marks

Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
SEMESTER-I									
19MT/MC/DC14	Differential Calculus	4	4	1	0	3	50	50	100
19MT/MC/AT13	Algebra and Trigonometry	3	3	1	0	3	50	50	100
19MT/GC/ES12	Environmental Studies	2	2	0	0	-	50	-	100
19MT/SS/PS13	Life Skills:Personal and Social	3	3	0	0	-	50	-	100
Allied Core Offered to the Department of Physics									
19MT/AC/MP15	Mathematics for Physics I	5	5	0	0	3	50	50	100
Allied Core Offered to the Department of Chemistry									
19MT/AC/MC15	Mathematics for Chemistry I	5	5	0	0	3	50	50	100
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100
SEMESTER-II									
19MT/MC/IC23	Integral Calculus	3	3	1	0	3	50	50	100
19MT/MC/AG24	Analytical Geometry	4	4	1	0	3	50	50	100
Allied Core Offered to the Department of Physics									
19MT/AC/MP25	Mathematics for Physics II	5	5	0	0	3	50	50	100
Allied Core Offered to the Department of Chemistry									
19MT/AC/MC25	Mathematics for Chemistry II	5	5	0	0	3	50	50	100
	Life Skills: Personality Development (EL)	3	3	0	0	-	50	-	100
	Basic Tamil I / General Elective I	2	2	0	0	-	50	-	100
SEMESTER-III									
19MT/MC/EG34	Elements of Graph Theory	4	4	1	0	3	50	50	100
19MT/MC/DE34	Differential Equations	4	4	1	0	3	50	50	100
19MT/AC/ST35	Mathematical Statistics I	5	5	0	0	3	50	50	100
19MT/SS/HC13	Life Skills:Health, Energy and Computer Basics	3	3	0	0	-	50	-	100
Allied Core Offered to the Department of Commerce - B.Com (General) - Shift I									
19MT/AC/MT35	Mathematics for Commerce	5	5	0	0	3	50	50	100
CD / ET / SC	Value Education	2	2	0	0	-	50	-	100
	Basic Tamil II / General Elective II	2	2	0	0	-	50	-	100
SEMESTER-IV									
19MT/MC/SS44	Sequence and Series	4	4	1	0	3	50	50	100
19MT/MC/DM43	Discrete Mathematics	3	3	1	0	3	50	50	100
19MT/AC/ST45	Mathematical Statistics II	5	5	0	0	3	50	50	100
	Major Elective I								

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086

B.Sc. DEGREE : BRANCH I-MATHEMATICS - SHIFT I

COURSES OF STUDY

(Effective from the academic year 2019-2020)

CHOICE BASED CREDIT SYSTEM

C-Credit, **L**-Lecture Hours, **T**-Tutorial Hours, **P**- Practical Hours, **Ex**-Exam Hours,
CA- Continous Assessment Marks, **ES**-End Semester Marks, **M**-Maximum Marks

Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
SEMESTER-V									
19MT/MC/VA53	Vector Analysis and Applications	3	3	1	0	3	50	50	100
19MT/MC/AS55	Algebraic Structures	5	5	1	0	3	50	50	100
19MT/MC/RA55	Principles of Real Analysis	5	5	0	0	3	50	50	100
19MT/MC/IT54	Integral Transforms	4	4	1	0	3	50	50	100
Interdisciplinary Core Course (MT and CS) to Students of Mathematics									
19ID/IC/MS55	Mathematics through Scientific Software	5	1	0	5	3	50	50	100
	General Elective III	2	2	0	0	-	50	-	100
	SAP / SL	2	2	0	0	-	50	-	100
SEMESTER-VI									
19MT/MC/VL64	Vector Spaces and Linear Transformations	4	4	1	0	3	50	50	100
19MT/MC/CA65	Principles of Complex Analysis	5	5	1	0	3	50	50	100
19MT/MC/PM65	Principles of Mechanics	5	5	1	0	3	50	50	100
19VE/SS/HL63	Life Skills:An Approach to a Holistic Way of Life	3	3	0	0	-	50	-	100
	Major Elective II								
	General Elective IV	2	2	0	0	-	50	-	100
Major Elective Courses									
19MT/ME/OT45	Optimization Techniques	5	5	0	0	3	50	50	100
19MT/ME/PR45	Project	5	1	5	0	-	25	75	100
19MT/ME/ES45	Elements of Space Science	5	5	0	0	3	50	50	100
19MT/ME/NM45	Numerical Methods with Programs in C	5	4	0	2	3	50	50	100
General Elective Courses									
19MT/GE/WM22	The Fascinating World of Mathematics	2	2	0	0	-	50	-	100
19MT/GE/CW22	Celestial Wonders	2	2	0	0	-	50	-	100
19MT/GE/AM22	Automata	2	2	0	0	-	50	-	100
19MT/GE/BM22	Basic Mathematics	2	2	0	0	-	50	-	100
Independent Elective Course									
19MT/UI/CO23	Combinatorics	3	0	0	0	3	-	100	100

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

DIFFERENTIAL CALCULUS

CODE: 19MT/MC/DC14 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To understand the concepts of differential calculus in depth
- To analyze the behavior of various curves

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- define the basic concepts and principles of differential calculus
- use derivatives to solve a variety of problems
- develop an appreciation of calculus as a coherent body of knowledge

Unit 1 **(12 Hours)**

Successive Differentiation

1.1 The n^{th} derivatives of some special functions
1.2 The n^{th} derivatives of rational algebraic functions
1.3 Leibnitz's Theorem for the n^{th} derivative of the product of two functions

Unit 2 **(13 Hours)**

Curvature

2.1 Formulae for radius of curvature
2.2 A theorem on curvature
2.3 Curvature at the origin
2.4 Chord of curvature through the origin (pole)
2.5 Centre of curvature
2.6 Property of the centre of curvature
2.7 Evolute and Involute
2.8 Properties of the evolute

Unit 3 **(14 Hours)**

Envelopes

3.1 Definition of envelope
3.2 Envelope of straight lines
3.3 Envelope of the curves
3.4 Envelope of a special family
3.5 Envelope of two-parameter family

Unit 4 **(13 Hours)**

Extrema of functions of two variables

4.1 Extrema with two variables
4.2 Necessary conditions for maximum and minimum of extrema with two variables

4.3 Determination of maxima and minima of extrema with two variables
4.4 Lagrange's method of undetermined multipliers

Unit 5 **(13 Hours)**

Characteristics of some special curves

5.1 Cycloid
5.2 Catenary
5.3 Evolutes of parabola and ellipse
5.4 Logarithmic (or Equiangular) spiral
5.5 Spiral of Archimedes
5.6 Witch of Agnesi
5.7 Cardiod
5.8 Limacon
5.9 Lemniscate

Singular Points

5.10 Double Points
5.11 Classification of Double Points
5.12 Conditions for existence of double points on an algebraic curve

BOOK FOR STUDY

B.C. Das and B.N. Mukherjee, *Differential Calculus* 52nd Edition, Kolkata: U.N. Dhur and sons Pvt. Ltd., 2012.

Chapter 8: 8.1- 8.5, 8.7 and 8.8
Chapter 13: 13.1-13.6
Chapter 15: 15.1 – 15.12
Chapter 17: 17.1-17.9
Chapter 20: 20.2, 20.3, 20.7, 20.13 - 20.18
Chapter 21: 21.1, 21.2, 21.6

BOOKS FOR REFERENCE

G.C. Chaubey. S.K.D Dubey, M.U Khan, D.S Pandey, *A Textbook of Advanced Calculus*, New Delhi: Wisdom, 2012.

R. Courant, F. John, *Introduction to Calculus and Analysis - Volume One*, New York : Springer-Verlag, 2000.

Elliot Mendelson, *Calculus*, Schaum's solved problem Series, Tata Mcgraw-Hill Publishing Company Limited,New Delhi, 2004.

R.K Ghosh, Maity K.C., *Differential Calculus*, Kolkata: New Central Book, 2001.

Narayanan, S. and T.K. Manicavachagam Pillai. *Calculus Volume–I.* Madras: Viswanathan S., 2000.

F. B. Hildebrand. *Advanced Calculus for Applications*. Prentice-hall, inc.: London,1962.

WEB RESOURCES

http://sydney.edu.au/stuserv/documents/maths_learning_centre/differentialcalculus.pdf
http://www.mathsisfun.com/calculus/

PATTERN OF ASSESSMENT

Problems: 100%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes

Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50

Quiz / Seminar/Presentation/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**

Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS
(Effective from the academic year 2019 - 2020)

ALGEBRA AND TRIGONOMETRY

CODE: 19MT/MC/AT13 **CREDITS: 3**
L T P: 3 1 0
TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To impart knowledge of solving algebraic, transcendental and trigonometric equations
- To gain understanding of the different expansions of circular functions and relation between circular and hyperbolic functions and to identify diagonalizable matrices

COURSE LEARNING OUTCOMES:

On successful completion of the course, students will be able to

- simplify, factor, evaluate and perform operations on polynomial equations
- exhibit competence in calculating Eigen values and Eigen vectors, and thereby diagonalizing square matrices
- demonstrate comprehension involving expansions and expressions of circular and hyperbolic functions

Unit 1 (11 Hours)

Theory of Equations

1.1 Relations between the Roots and Coefficients of Equations involving cubic and higher order
1.2 Symmetric Function of Roots
1.3 Transformation of Equations
1.4 Increase or Decrease the Roots of a Given Equation by a Given Quantity
1.5 Removal of terms
1.6 To Form an Equation where Roots are any Power of the Roots of a Given Equation

Unit 2 (10 Hours)

Series Expansions

2.1 Exponential series
2.2 Logarithmic series
2.3 Application of exponential and logarithmic series to limits and approximations

Unit 3 (10 Hours)

Properties of Matrices

3.1 Eigenvalues and Eigenvectors
3.2 Cayley - Hamilton Theorem
3.3 Similar Matrices
3.4 Diagonalization of a Matrix

Unit 4 **(10 Hours)**

Trigonometry

4.1 Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$

4.2 Expansions of $cos^n\theta$ and $sin^n\theta$ in a Series of Sines and Cosines of Multiples of θ

4.3 Expansions of $\cos\theta$ and $\sin\theta$ in Powers of θ

Unit 5 **(11 Hours)**

Trigonometry (contd.)

5.1 Euler's Formula for $e^{i\theta}$

5.2 Hyperbolic Functions

5.3 Relations between Circular and Hyperbolic Functions

5.4 Inverse Hyperbolic Functions in Terms of Logarithmic Functions

5.5 Logarithm of Complex Quantities

BOOKS FOR STUDY

Manicavachagam Pillay T.K., Natarajan T. and K.S. Ganapathy, *Algebra –Vol I.* Madras: S. Viswanathan, 2006.

Chapter 4 Sections 1 - 11
Chapter 6 Sections 11,12, 15 (15.1,15.2 only), 17 - 20

Manicavachagam Pillay T. K., Natarajan T. and K.S. Ganapathy, *Algebra- Vol. II.* Madras: S. Viswanathan, 2006.

Chapter 2 Section 16

Narayanan. S, and Manicavachagam Pillay T. K., *Trigonometry*. Madras: S. Viswanathan, 2007.

Chapter 3 Section 1-5 (excluding formation of equations)
Chapter 4 Section 1-2.3
Chapter 5 Section 5

BOOKS FOR REFERENCE

Harikishnan, *Trigonometry*. New Delhi: Atlantic, 2005.

Veerarajan T., *Trigonometry, Algebra and Calculus*. New Delhi: Tata McGraw Hill, 2003.

Venkataraman M.K., Manorama Sridhar, *Classical Algebra and Trigonometry*. Chennai: Sivasankar, 2001.

Singaravelu A., *Algebra & Trigonometry – I* , Chennai: A.R. Publications, 2015.

WEB RESOURCES

http://www.edurite.com/kbase/application-of-matrices-in-real-life
http://www.decodedscience.com/practical-uses-matrix-mathematics/40494
http://malini-math.blogspot.in/2011/08/applications-of-trigonometry-in-real.html
http://www.intmath.com/help/useoftrig.php

PATTERN OF ASSESSMENT

Problems 100%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

General Core Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

SYLLABUS
(Effective from the academic year 2019-2020**)**
ENVIRONMENTAL STUDIES

CODE:19MT/GC/ES12 **CREDITS:2**
L T P:2 0 0
TOTAL TEACHING HOURS:26

OBJECTIVES OF THE COURSE

- To help students to gain the fundamental knowledge of the environment
- To create in students an awareness of current environmental issues
- To inculcate in students an eco-sensitive, eco-conscious and eco-friendly attitude

COURSE LEARNING OUTCOMES
On successful completion of this course, students will be able to

- Articulate the interdisciplinary context of environmental issues
- Adopt sustainable alternatives that integrate science, humanities and social perspectives
- Appreciate the importance of biodiversity and a balanced ecosystem
- Calculate one's carbon footprint

Unit 1 **(10 Hours)**

1.1 Introduction: The multidisciplinary nature of environmental studies; Environmental Ethics-Role of the Individual in protecting the environment

1.2 Natural Resources: renewable (forests and water)and non-renewable (minerals)-energy resources: renewable and non-renewable sources, impact of over-exploitation

1.3 Ecosystems: terrestrial (forest, grassland and desert) and aquatic (ponds, oceans and estuaries); structure and function

1.4 Biodiversity: India as a mega-diversity nation; threats to biodiversity; i*n-situ* and *ex-situ* conservation of biodiversity

1.5 Solid Waste Management, Source Segregation and Rain Water Harvesting

Unit 2 **(10 Hours)**

2.1 Environmental Pollution: Air, Water, Noise and Plastic Pollution: causes, effects and control measures -Impact of over-population on pollution and health – carbon footprint

2.2 The Environmental Dimension of Sustainable Development: The United Nations Sustainable Development Goals of the 2030 Agenda

2.3 Climate Change and Environmental Disasters: Natural Disasters: floods, earthquakes, cyclones, tsunamis and landslides; man-made disasters: Bhopal Gas Tragedy and Chernobyl Nuclear Disaster

2.4 Environmental Movements: Chipko, Silent Valley and Narmada Bachao Andolan International Agreements: Montreal Protocol, Kyoto Protocol and Climate Change Conferences

2.5 An Overview of Environmental Laws in India: Environmental (Protection) Act 1986, Biological Act, 2002, National Green Tribunal Act, 2010, Coastal Regulation Zone Notification, 2011

Unit 3 **(6 Hours)**

3.1 A study of the eco-friendly initiatives on campus

3.2 A critical review of an environmental documentary film

3.3 Ecofeminism and the contributions of Indian Women Environmentalists

3.4 The highlights of Environmental Encyclical-*Laudato si*-On Care for our Common Home

3.5 Environmental Calendar

BOOK FOR STUDY

Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses,* (2nd ed.) Universities Press, 2013.

BOOKS FOR REFERENCE

Bhattacharya, K.S. Arunima Sharma, *Comprehensive Environmental Studies* Narosa Publishing House Pvt.. Ltd., New Delhi, 2015.

Saha, T.K., *Ecology and Environmental Biology* Books and Allied (P) Ltd., Kolkata 2016.

Sharma, J.P. *Environmental Studies (for undergraduate classes)* 3rd edition, University Science Press, 2016.

JOURNALS

Journal of Environmental Studies and Sciences

Journal of Environmental Studies

WEB RESOURCES

www.enn.com

www.nationalgeographic.com

PATTERN OF ASSESSMENT

Continuous Assessment Test: **Total Marks: 25** **Duration: 60 minutes**

Section A-10 x 1 = 10 Marks (All questions to be answered) Multiple Choice Questions

Section B - 3 x 5 = 15 Marks (3 out of 6 to be answered in 150 words each)

Other Component: **Total Marks: 25**

Any **one** of the following for 25 marks

Quiz/Scrap Book/Assignment / Poster Making/Case Study/Project/Survey/Model-Making

No End Semester Examination

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

SYLLABUS
(Effective from the academic year 2019 - 2020)

LIFE SKILLS: PERSONAL AND SOCIAL

CODE: 19MT/SS/PS13 **CREDITS: 3**
L T P: 3 0 0
TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To enable students to understand the working of Indian Governance and laws
- To empower students as citizens by teaching them how to use the RTI, the PIL and the FIR
- To provide students an insight into the strengths and virtues essential to improve wellbeing
- To bring about awareness of societal dynamics
- To create awareness, impart knowledge and hone skills necessary to make sound financial decisions

COURSE LEARNING OUTCOMES

On successful completion of this course, students will be able to

- demonstrate knowledge of the working of the government
- file RTIs, PILs and FIRs
- improve their quality of life
- exhibit social consciousness
- exhibit prudent behaviour in managing personal finance

Unit 1 **(13 Hours)**

Legal Literacy

1.1 Structure of Government- Central and State, Urban and Rural
1.2 Laws pertaining to Women (CEDAW) and Children (POCSO)
1.3 Right to Information Act 2005, drafting and filing an RTI
1.4 Introduction to PIL, Landmark PIL cases -Vishaka Vs. State of Rajasthan, Hussainara Khatoon Vs. State of Bihar, MC Mehta Vs. Union of India
1.5 Importance of FIR and lodging an FIR

Unit 2 **(13 Hours)**

2.1 Understanding Self

2.1.1 Psychological wellbeing - meaning, components and barriers
2.1.2 Gratitude- meaning, nature and expression
2.1.3 Resilience- meaning, nature, benefits and simple techniques for building resilience.

2.2 Understanding Society

2.2.1 Concepts of class, caste, gender, disability, race, culture, religion, ethnicity, context and language

2.2.2 Importance of societal analysis

2.2.3 Social indicators of development – HDI, GDI, Poverty Index, Hunger Index

2.2.4 Issues and challenges for social change in India

Unit 3 (13 Hours)

Personal Financial Planning

3.1 Meaning, Need and Importance of Personal Financial Planning

3.2 Core concepts in Financial Planning – Budget, Savings and Investment

3.3 Converting non-essential expenditure into Savings and Investment

3.3.1 Forms of Savings – Deposits, Insurance

3.3.2 Types of Investments – Securities, Real Estate and Gold

3.4 Digital transformation in Finance

3.4.1 De-Mat Account

3.4.2 Net Banking and Mobile Banking

BOOKS FOR REFERENCE

Agarwal, R.C. Constitutional Development and National Movement of India. New Delhi: S. Chand, 1988.

Ahuja Ram. Social Problems in India. Rawat Publications. 3rd Edition, 2014

Allan, R. Modern Politics and Government. New York: Palgrave MacMillan, 2000.

Baumgardner, S., & Crothers, M. Positive Psychology. Chennai: Pearson. 1st Edition,2015.

Grenville-Cleave, B. *Positive Psychology A practical Guide*. United Kingdom: Icon Books Ltd, 2012.

Pandey, J.N. Constitutional Law of India. Allahabad: Central Law Agency, 2014.

Weiner, M. The Indian Paradox. New Delhi: Sage , 1989.

PATTERN OF ASSESSMENT

Continuous Assessment: **Total Marks: 50**

Two to three Task based components

Task based classroom activities

Case studies

Group discussions

Group presentation

Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
Allied Core Course Offered by the Department of Mathematics for
B.Sc. (Physics) Degree Programme

SYLLABUS
(Effective from the academic year 2019-2020)
MATHEMATICS FOR PHYSICS - I

CODE : 19MT/AC/MP15 **CREDITS : 5**
L T P : 5 0 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To provide basic mathematical concepts required for students pursuing Physics
- To provide basic mathematical tools used for computation in Physics
- To introduce the concept of Operational Research

COURSE LEARNING OUTCOMES
On successful completion of the course, students will be able to

- understand basic mathematical concepts required for students pursuing Physics
- understand basic mathematical tools used for computation in Physics
- familiarize with the basics of Linear Programming Problem
- apply appropriate mathematical tools in Physical problems

Unit 1 **(12 Hours)**

Properties of Matrices

1.1 Eigenvalues and Eigenvectors
1.2 Cayley Hamilton Theorem
1.3 Similar Matrices
1.4 Diagonalization of Matrices possessing Distinct Eigenvalues
1.5 Eigenvalues for symmetric matrices

Unit 2 **(15 Hours)**

Differential Calculus

2.1 Higher Derivatives - n^{th} derivative – Standard Results
2.2 Trigonometric Transformations
2.3 Formation of Equations Involving Derivatives
2.4 Liebnitz's formula for n^{th} derivative - Problems involving Liebnitz's formula

Integral Calculus

2.5 Methods of Integration of functions of the Following Types:

$$\frac{1}{(x+p)\sqrt{ax^2+bx+c}};\ \sqrt{(x-a)(b-x)};\ \frac{1}{\sqrt{(x-a)(b-x)}};\ \sqrt{\frac{(x-a)}{(b-x)}}.$$

Unit 3 **(13 Hours)**

Differential Equations

3.1 Partial Differential Equation
3.2 Formation of Equations by Elimination of Constants and an Arbitrary Function
3.3 Definition of General, Particular, Complete and Singular Integral
3.4 Solutions of First Order Equations in their Standard Forms
3.5 Lagrange's Method of Solving of Linear Equations $Pp + Qq = R$

Unit 4 **(12 Hours)**

Fourier Series

4.1 Definition of Fourier Series

4.2 Finding Fourier Coefficients for a given Periodic Function with Period 2π

4.3 Odd and Even Functions

4.4 Half - Range Series

4.5 Development in sine and cosine series

Unit 5 **(13 Hours)**

Linear Programming Problem

5.1 Formulation of LPP

5.2 Graphical Method

5.3 Simplex Method

BOOKS FOR STUDY

Narayanan, S., Hanumantha Rao and T.K. Manicavachagam Pillai, *Ancillary Mathematics – Volume - I.* Madras.:Viswanathan, S, 2012.

Chapter 3: Sections 3.4, 3.5

Chapter 6: Sections 6.1

Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy. *Ancillary Mathematics* – Volume – II. Madras.: Viswanathan, S, 1995 Reprint 2011.

Chapter 1 : Sections 8 (cases 5-9)

Chapter 2 : Sections 1 - 5

Chapter 6 : Sections 1-3, 5, 6.

Kalavathy S, *Operations Research,* Vikas Publishing House, Noida, Fourth Edition 2013

Chapter 2 : Sections 2.1, 2.2

Chapter 3 : Sections 3.1 – 3.3

Chapter 4 : Sections 4.1, 4.2

BOOKS FOR REFERENCE

Joseph, Edwards, *An Elementary Treatise on the Differential Calculus*, London: Macmillan, 1948.

Manicavachagam Pillai T.K., Natarajan T. and Ganapathy K. S, *Algebra Volume I.* Madras.: Viswanathan, S., 2006.

Manicavachagam Pillai T.K., Natarajan T. and Ganapathy K. S, *Algebra Volume II.* Madras.: Viswanathan, S., 2004.

Singaravelu A., Allied *Mathematics, Chennai*: Meenakshi, 2010

Sundaresan V., K.S. Ganapathy Subramanian, K. Ganesan. *Resource Management Techniques,* 4th ed. Arapakkam: A.R. Publications, 2007.

WEB RESOURCES

http://sydney.edu.au/stuserv/documents/maths_learning_centre/differentialcalculus.pdf
http://www.mathsisfun.com/calculus/

PATTERN OF ASSESSMENT

Derivation: 20% ; Problems:80%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
Allied Core Course Offered by the Department of Mathematics for
B.Sc. (Chemistry) Degree Programme

SYLLABUS
(Effective from the academic year 2019-2020)

MATHEMATICS FOR CHEMISTRY – I

CODE : 19MT/AC/MC15 **CREDITS : 5**
L T P : 5 0 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To provide basic mathematical concepts required for students pursuing Chemistry
- To provide basic mathematical tools used for computation in Chemistry
- To introduce the concept of Finite difference

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have understood basic mathematical concepts required for students pursuing Chemistry
- have understood basic mathematical tools used for computation in Chemistry
- have familiarized with the basics of finite difference
- develop an appreciation of calculus as a coherent body of knowledge

Unit 1 **(12 Hours)**

Properties of Matrices

1.1 Eigenvalues and Eigenvectors
1.2 Cayley Hamilton Theorem
1.3 Similar Matrices
1.4 Diagonalization of Matrices possessing Distinct Eigenvalues
1.5 Eigenvalues for symmetric matrices

Unit 2 **(13 Hours)**

Theory of Equations

2.1 Relation Between Roots and Coefficients
2.2 Solution of Equations under given Conditions On Roots
2.3 Transformation of Equations
2.4 Reciprocal Equations

Unit 3 **(14 Hours)**

Differential Calculus

3.1 Differentiation of Hyperbolic and Inverse Hyperbolic Functions
3.2 Higher Derivatives - n^{th} derivative – Standard Results
3.3 Trigonometric Transformations
3.4 Formation of Equations Involving Derivatives

Integral Calculus

3.5 Methods of Integration of functions of the Following Types:

$$\frac{1}{(x+p)\sqrt{ax^2+bx+c}};\ \sqrt{(x-a)(b-x)};\ \frac{1}{\sqrt{(x-a)(b-x)}};\ \sqrt{\frac{(x-a)}{(b-x)}}.$$

Unit 4 **(13 Hours)**

Differential Equations

4.1 Partial Differential Equation
4.2 Formation of Equations by Elimination of Constants and an Arbitrary Function
4.3 Definition of General, Particular, Complete and Singular Integral
4.4 Solutions of First Order Equations in their Standard Forms
4.5 Lagrange's Method of Solving of Linear Equations $Pp + Qq = R$

Unit 5 **(13 Hours)**

Finite Difference Methods

5.1 Finite Differences
5.2 Forward Difference Table
5.3 Interpolation Methods
5.4 Newton's Forward Formula
5.5 Newton's Backward Formula
5.6 Binomial Method
5.7 Lagrange's Formula

BOOKS FOR STUDY

Narayanan, S and T.K. Manicavachagam Pillai. *Calculus Volume–I,* Madras: Viswanathan S., 2000.

Chapter 2: Sections 3.11- 3.14
Chapter 3: Sections 1.1 – 1.6

Narayanan, S. Hanumantha Rao and T.K. Manicavachagam Pillai, *Ancillary Mathematics Volume - I.* Madras. Viswanathan, S., 2012.

Chapter 2: Sections 2.2 -2.4
Chapter 3: Sections 3.4, 3.5
Chapter 4: Sections 4, 4.1 - 4.3

Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy. *Ancillary Mathematics Volume – II.* Madras. Viswanathan, S, 2011.

Integral Calculus- Chapter 1: Sections 8 (cases 5 & 8)
Differential Equations – Chapter 6: Sections 1-3, 5, 6.

BOOKS FOR REFERENCE

B.C. Das and B.N. Mukherjee, *Differential Calculus*, U.N. Dhur and sons Private Limited, Kolkata: 52nd edition 2012.

Manicavachagam Pillai T.K, Natarajan T and Ganapathy K. S, *Algebra Volume I,* Madras: Viswanathan, S., 2006.

Manicavachagam Pillai T.K., Natarajan T. and Ganapathy K. S, *Algebra Volume II.* Madras: Viswanathan, S., 2004.

Singaravelu A., *Allied Mathematics*, Chennai: Meenakshi, 2010.

S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, *Numerical Methods*, Scitech Publications PVT. LTD., 2008.

Singaravelu A., Ramaa R., *Calculus of Finite Differences & Numerical Analysis (Allied Paper I)*. Chennai: Meenakshi, 2003.

PATTERN OF ASSESSMENT

Problems – 90 % and Theory – 10%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting at least two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

INTEGRAL CALCULUS

CODE: 19MT/MC/IC23 **CREDITS: 3**

L T P: 3 1 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To evaluate integration of irrational functions and improper integrals
- To understand the concepts of double and triple integration

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the concepts of double and triple integration
- use Beta-Gamma functions as a tool to evaluate integrals
- use numerical integration for approximating the integrals that are difficult or impossible to integrate analytically

Unit 1 **(11 Hours)**

Methods of Integration

1.1 Integration of irrational functions of the type: $\frac{1}{(x-k)\sqrt{ax^2+bx+c}}$, $\sqrt{\frac{x-\alpha}{\beta-x}}$ $\frac{1}{(Ax^2+B)\sqrt{Cx^2+D}}$, $\frac{1}{(ax^2+bx+c)\sqrt{Ax^2+Bx+C}}$ $\sqrt{(x-\alpha)(\beta-x)}$, $\frac{1}{\sqrt{(x-\alpha)(\beta-x)}}$,

1.2 Integration of functions of type: $\frac{1}{a+b\cos x}$, $\frac{1}{\sqrt{a^2\cos^2 x+b^2\sin^2 x}}$

Unit 2 **(10 Hours)**

Improper Integrals

2.1 Infinite Integrals

2.2 Discontinuous Integrands

2.3 Comparison Test

Unit 3 **(11 Hours)**

Beta and Gamma Integrals

3.1 Definitions of Beta and Gamma Integrals

3.2 Recurrence Formula for Gamma Functions

3.3 Properties of Beta Functions

3.4 Relation between Beta and Gamma Functions

Unit 4 **(10 Hours)**

Multiple Integrals

4.1 Mid-point rule for Double Integral

4.2 Iterated Integrals

4.3 Double Integrals over General Regions

4.4 Double Integrals in Polar Coordinates

4.5 Surface Area

Unit 5 **(10 Hours)**

Multiple Integrals (contd.)

5.1 Triple Integrals

5.2 Applications of Triple Integrals

5.3 Change of Variable in Double Integral

BOOKS FOR STUDY

James Stewart. *Calculus – Concepts and Contexts*, Second Edition. United States: Brooks Cole Thomson Learning, 2001

Chapter 5 Section 5.10

Chapter 12 Section 12.1(exempted for evaluation), 12.2 – 12.4, 12.6, 12.7, 12.9

Narayanan S. and Manicavachagam Pillay T.K. *Calculus - Vol II***.** Chennai: S. Viswanathan, 2012.

Chapter 1 Sec. 8 (cases v – x), 9, 10

Chapter 7 Sec. 2.1, 2.3, 3 and 4

BOOKS FOR REFERENCE

Alan Jeffrey. *Handbook of Mathematical formulas and Integrals*. United States: Academic, Third Edition 2005.

Khalil Ahmad, Arya Jaganath and Srivastava R J. *Textbook of Integral Calculus and Differential Equations*. New Delhi: Anamaya Publishing, 2005

Singh U.P, Siddiqui N.H, Srivastava R.J. *Integral Calculus.* New Delhi : Wisdom Press, 2011.

WEB RESOURCES

http://www.mathsisfun.com/calculus/

https://homepage.tudelft.nl/11r49/documents/wi4006/gammabeta.pdf

PATTERN OF ASSESSMENT

Theory: 10%; Problems: 90%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes

Section A: 3 × 2 = 06 (Three questions to be set)

Section B: 3 × 8 = 24 (Four questions to be set)

Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50

Seminars/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**

Section A: 10 × 2 = 20 (Twelve questions to be set selecting at least two from each unit)

Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)

Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019 - 2020)

ANALYTICAL GEOMETRY

CODE: 19MT/MC/AG24 **CREDITS: 4**

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVE OF THE COURSE

- To introduce the concepts of two dimensional coordinate geometry in depth
- To introduce the concept of three dimensional geometry

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- recognize the type of conic sections and understand its properties
- be familiar to planes, straight lines, sphere and cone in three dimensional co-ordinate geometry
- demonstrate knowledge of geometry and its applications in the real world

Unit 1 **(12 Hours)**

General Second Degree Equation

1.1 Condition for a General Second Degree Equation to Represent a Conic

1.2 Centre of the Conic given by the General Second degree Equation (concept only)

1.3 Lengths and Positions of the Axes of the Central Conic

$ax^2 + 2hxy + by^2 = 1$ (concept only)

Unit 2 **(13 Hours)**

Ellipse

2.1 Conjugate Diameters and its Properties

2.2 Equi-Conjugate Diameters

Hyperbola

2.3 Asymptotes

2.4 Conjugate Hyperbola

2.5 Relation between the Equation of a Hyperbola, its Asymptotes and Conjugate Hyperbola

2.6 Rectangular Hyperbola

Unit 3 **(13 Hours)**

Plane

3.1 General Equation

3.2 Intercept Form

3.3 Normal Form

3.4 Angle Between two Planes

3.5 Equation of Plane through the Line of Intersection of two Given Planes

3.6 Length of Perpendicular from a given Point to a Plane

Unit 4 **(13 Hours)**

Straight Line

4.1 Symmetrical Form
4.2 Line through two points
4.3 Reduction of the Unsymmetrical Form to the Symmetrical Form
4.4 Condition for a Line to Lie on a Plane
4.5 Plane through a given Line
4.6 Condition for two Lines to be Coplanar
4.7 Equation of the Plane Containing the two Lines
4.8 Shortest Distance between two Skew Lines and Equation of the Line Containing the Shortest Distance

Unit5 **(14 Hours)**

Sphere and Cone

5.1 Equation of a Sphere with given Centre and Radius
5.2 General Form of the Equation of a Sphere
5.3 Plane Section of a Sphere
5.4 Intersection of Two Spheres
5.5 Equation of a Circle on a Sphere
5.6 Equation of Sphere Passing through given Circle
5.7 Tangent Plane to a Sphere
5.8 Right Circular Cone; Necessary Condition for a General Equation of Second Degree to Represent a Cone
5.9 Equation of a Cone with given Vertex, Axis and Semi-Vertical Angle

BOOKS FOR STUDY

Manicavachagam Pillay T.K, and Natarajan T., *A Text book of Analytical Geometry Part I - Two dimensions*. Madras: S. Viswanathan, 2012.

Chapter 7 Sec. 16.1–16.4
Chapter 8 Sec. 4 – 13
Chapter 10 Sec. 3 – 6

Manickavachagam Pillay T.K. and Natarajan T., *A Text Book of Analytical Geometry - Part II* (Three Dimensions). Chennai: Ananda Book Depot, Reprint 2017.

Chapter 2 Sec. 1 – 10
Chapter 3 Sec. 1 – 8
Chapter 4 Sec. 1 – 8
Chapter 5 Sec. 2.1

BOOKS FOR REFERENCE

Singh, Shalini. *Two Dimensional Geometry*. New Delhi: Sarup, 2000.

Hari Krishnan. *Coordinate Geometry of Two Dimensions*. New Delhi: Atlantic, 2006.

Arup Mukherjee. *Analytical Geometry of two and three Dimensions*. Kolkata: Arunabha Sen Books and Allied, 2010.

Narayan, Shanti P.K., *Mittal Analytical Solid Geometry***,** New Delhi: S Chand, 2016.

WEB RESOURCE

https://www.askiitians.com/blog/co-ordinate-geometry-works-real-space-five-practical- examples/
https://www3.ul.ie/~rynnet/swconics/applications_of_conic_sections.htm

PATTERN OF ASSESSMENT

Theory : 10% ; Problems: 90%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Assignments/Problem Solving

End-Semester Examination: Total Marks: 100 Duration: 3 hours
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Allied Core Course Offered by the Department of Mathematics for B.Sc. (Physics) Degree Programme

SYLLABUS

(Effective from the academic year 2019-2020)

MATHEMATICS FOR PHYSICS – II

CODE : 19MT/AC/MP25 **CREDITS : 5**

L T P : 5 0 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To provide basic mathematical concepts required for students pursuing Physics
- To introduce problem solving skills using Numerical Methods
- To teach statistical tools using correlation

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand basic mathematical concepts required for students pursuing Physics
- understand problem solving skills using Numerical methods
- understand problem solving using correlation
- apply Laplace transform in appropriate Physical problems

Unit 1 **(12 Hours)**

Beta, Gamma Integrals

1.1 Definitions of Beta and Gamma Integrals
1.2 Recurrence Formula for Gamma Functions
1.3 Properties of Beta Functions
1.4 Relation between Beta and Gamma Functions

Unit 2 **(13 Hours)**

Numerical Differentiation and Integration

2.1 Finite Differences- Forward and Backward
2.2 Derivatives using Newton's Forward Difference Formula
2.3 Derivatives using Newton's Backward Difference Formula
2.4 Numerical Integration using Trapezoidal Rule
2.5 Numerical Integration using Simpsons rule

Unit 3 **(14 Hours)**

Multiple Integrals

3.1 Definitions of Double and Triple Integrals
3.2 Change of Order of Integration for Two Variables
3.3 Double Integrals and Triple Integrals in Cartesian Coordinates

Unit 4 **(13 Hours)**

Laplace Transform

4.1 Definition and Transform of $f'(t)$ & $f''(t)$
4.2 Laplace Transform of Functions e^{-at}, *cos at, sin at,* and t^n where 'n' is a Positive Integer

4.3 First Shifting Theorem - Laplace Transform of e^{-at} *cos bt*, e^{-at} *sin bt* and e^{-at} t^n
4.4 Inverse Laplace Transform
4.5 Solving Second Order Differential Equations with Constant Coefficients using Laplace Transform

Unit 5 **(13 Hours)**

Statistics

5.1 Correlation
5.2 Scatter diagram and its uses
5.3 Karl Pearson's Coefficient of Correlation
5.4 Correlation coefficient for a Bivariate Frequency Distribution
5.5 Probable error of correlation coefficient
5.6 Spearman's rank correlation coefficient
5.7 Merits and demerits of rank correlation coefficient

BOOKS FOR STUDY

Narayanan S. and Manicavachagam Pillay T.K., *Calculus-Vol II***.** Chennai: S.Viswanathan, 2012.

Chapter 7 Sec. 2.1, 2.3, 3 - 5

Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy., *Ancillary Mathematics* – Volume – II. Madras.: Viswanathan, S, 1995 Reprint 2011.

Chapter 3 Sec 1 - 3
Chapter 7 Sec 1 – 6

R. S. N. Pillai and V. Bagavathi, *Statistics*, S. Chand & company Ltd, New Delhi, 2007.

Chapter 12: Page No: 363 – 395.

Sastry S.S., *Introductory Methods of Numerical Analysi.,* Prentice – Hall of India Private Limited :New Delhi(2000).

Chapter 3 : Sections 3.3, 3.3.1, 3.3.2
Chapter 5 : Sections 5.1, 5.2(Numerical differentiation only), 5.4, 5.4.1, 5.4.2, 5.4.3

BOOKS FOR REFERENCE

Gupta B.D., *Numerical Analysis.* Delhi:.Konark Publishers pvt. Ltd. , 1999

S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, 2007 Reprint 2014

Jeffrey Alan, *Handbook of Mathematical formulas and Integrals*, United States: Academic, 2004.

Narayanan S. & T.K. *Manicavachagam Pillay, Calculus-Vol I,* Madras: S. Viswanathan, 1997.

Vedamurthy, V.N., N. Ch. S. N. Iyengar. *Numerical Methods.* Delhi : Vikas Publishing House, 1998.

WEB RESOURCES

http://www.javaquant.net/papers/Laplacetransform.pdf

http://www.intmath.com/laplace-transformation/10-applications.php

PATTERN OF ASSESSMENT

Theory 30%; Problems : 70%

Continuous Assessment: Total Marks: 50 Duration: 90 minutes

Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50

Quiz/Seminar/Presentation/Group discussion/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**

Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Allied Core Course Offered by the Department of Mathematics for B.Sc. (Chemistry) Degree Programme

SYLLABUS

(Effective from the academic year 2019-2020)

MATHEMATICS FOR CHEMISTRY – II

CODE: 19MT/AC/MC25 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To introduce the concept of abstract Algebra
- To realize the application of Laplace transform to solve Differential Equations
- To teach statistical tools using correlation

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have understood basic mathematical concepts required for students pursuing Chemistry
- solve problems in abstract algebra
- have understood problem solving using correlation
- able to appreciate the solution of differential equations using Laplace transforms

Unit 1 **(12 Hours)**

Laplace Transform

1.1 Definition of Laplace transform

1.2 Transforms of $f'(t)$ & $f''(t)$

1.3 Transformation of function e^{-at}, $\cos at$, $\sin at$ and t^n, where 'n' is a positive integer

1.4 First shifting theorem - Laplace transforms of $e^{-at}\cos bt$, $e^{-at}\sin bt$ and $e^{-at}t^n$.

Unit 2 **(13 Hours)**

Inverse Laplace Transform

2.1 Inverse Laplace transforms of functions relating to $e^{-at}\cos bt$, $e^{-at}\sin bt$ and $e^{-at}t^n$

2.2 Applications to solutions of ordinary differential equations with constant Coefficients

Unit 3 **(13 Hours)**

Fourier Series

3.1 Fourier series: definition

3.2 Finding Fourier coefficients for a given periodic function with period 2π

3.3 Odd and even functions

3.4 Half - range series

Unit 4 **(13 Hours)**

Statistics

4.1 Correlation

4.2 Scatter diagram and its uses
4.3 Karl Pearson's coefficient of correlation
4.4 Correlation coefficient for a bivariate frequency distribution
4.5 Probable error of correlation coefficient
4.6 Spearman's rank correlation coefficient
4.7 Merits and demerits of rank correlation coefficient

Unit 5 **(14 Hours)**

Group Theory

5.1 Groups –Definitions and Examples
5.2 Properties of a Group
5.3 Order of an Element
5.4 Subgroups
5.5 Permutation groups
5.6 Cyclic groups
5.7 Cosets and Lagrange's Theorem
5.8 Normal Subgroups and Quotient Groups

BOOKS FOR STUDY

Venkatachalapathy S. G., *Modern Algebra*, Margham Publications (India) Pvt.,Ltd., Chennai, Second Edition 2004, Reprint 2016.
Chapter 2: Page No. - 2.1 – 2.38
Chapter 3: Page No. - 3.1 – 3.20
Chapter 4: Page No. - 4.1 – 4.14
Chapter 5: Page No. - 5.6 – 5.22
(Chapter 2, 3, 4 and 5 – Definitions & Simple problems only)
Chapter 7: Page No. - 7.1 – 7.4 (Definitions only)

Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy., *Ancillary Mathematics* Book II Madras:S. Viswanathan Printers & Publishers, 2011.
Chapter 2: Sections 1 - 4
Chapter 7: Sections 1 - 6

Pillai R. S. N. and V. Bagavathi, *Statistics*, S. Chand & company Ltd, New Delhi, 2007.
Chapter 12: Page No: 363 – 395.

BOOKS FOR REFERENCE

P.N.Arora, Topics in Algebra, Sultan Chand and Sons,New Delhi, Ninth Revised Edition 2005.

Narayanan S. and T.K. Manicavachagam Pillay T. K., *Calculus - Volume III*. Madras: S. Viswanathan, 2006.

Santiago, M. L. *Modern Algebra.* New Delhi : Tata McGraw-Hill, 2001.

Vital P.R. *Mathematical Statistics*. Chennai: Margam, 2002.

PATTERN OF ASSESSMENT

Theory: 10% ; Problems: 90%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Assignments/Problem Solving

End Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting at least two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019 - 2020)

ELEMENTS OF GRAPH THEORY

CODE: 19MT/MC/EG34 **CREDITS: 4**

LT P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To introduce basic concepts of graph theory
- To develop theoretical aspects of graph theory
- To apply graph theory based tools in solving practical problems

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand fundamental definitions of graph theory
- have learnt a clear perspective of solving real life problems using graph theory
- analyze one way communication problems in networking
- use a combination of theoretical knowledge and independent mathematical thinking for creative research in graph theory

Unit 1 **(13 Hours)**

Basic Concepts of Graph theory

1.1 Graphs-vertices and edges

1.2 Degrees

1.3 Subgraphs

1.4 Isomorphism

1.5 Matrices

1.6 Operations on Graphs

Unit 2 **(13 Hours)**

Degree Sequences

2.1 Degree Sequences

2.2 Graphic Sequences

Connectedness

2.3 Walks, Trails and Paths

2.4 Connectedness and Components

2.5 Blocks

Unit 3 **(13 Hours)**

Eulerian and Hamiltonian Graphs

3.1 Eulerian Graphs

3.2 Konigsberg Bridge Problem

3.3 Fleury's Algorithm
3.4 Hamiltonian Graphs
3.5 Closure of a graph

Unit 4 **(13 Hours)**

Trees

4.1 Characterisation of Trees
4.2 Centre of a Tree

Planarity

4.3 Definition and Properties
4.4 Characterization of Planar Graphs

Unit 5 **(13 Hours)**

Directed Graphs

5.1 Directed Graphs
5.2 Indegree and Outdegree
5.3 Sequential Representation of Directed Graphs
5.4 Warshall's Algorithm – Shortest Paths

BOOKS FOR STUDY

Arumugam S. & Ramachandran S., *Invitation to Graph Theory*. Chennai: Scitech, 2013.

Chapter 2 Sections 2.1 - 2.4, (Exclude Ulam's Conjecture) 2.8 - 2.9
Chapter 3 Sections 3.1, 3.2
Chapter 4 Sections 4.1 - 4.3
Chapter 5 Sections 5.1, 5.2
Chapter 6 Sections 6.1, 6.2
Chapter 8 Sections 8.1, 8.2

Seymour Lipschutz, Lipson Marc Lars, *Schaum's Outline of Theory and Problems of Discrete Mathematics*, Second Edition, Eleventh reprint 2002, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2010.

Chapter 9 Sections 9.1 – 9.3, 9.5 (Omit Transitive Closure), 9.6

BOOKS FOR REFERENCE

Adrian J. Bondy, U. S. R. Murty, *Graph Theory with Applications*, Wiley, 1991

Balakrishnan B, *Textbook of Graph Theory*, Springer, 2000.

Joyner David W, Melles Caroline Grant, *Adventures in Graph Theory*, Springer International Publishing, 2018

Chartrand Gary, *Introductory Graph Theory*, Courier Corporation, 2012

Deo Narsingh, *Graph Theory with Applications to Engineering and Computer Science*, Courier Dover Publications, 2016

Diestel Reinhard, *Graph Theory*, Springer, 2006

WEB RESOURCES

http://www.open-graphtheory.org/
https://www.britannica.com/topic/graph-theory
http://mathforum.org/library/topics/graph_theory/

PATTERN OF ASSESSMENT

Theory: 30%, Derivations: 40% and Problems: 30%

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments/Problem Solving/Exhibition

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE BRANCH I - MATHEMATICS
SYLLABUS
(Effective from the academic year 2019 – 2020)

DIFFERENTIAL EQUATIONS

CODE: 19MT/MC/DE34 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To gain logical skills in the formulation of differential equations
- To expose students to use differential equation as a powerful tool in problem solving and to inculcate the application of differential equations in real world problems

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- find the solution of ordinary differential equations and system of differential equations
- use differential equations as a tool to model the real world problems and hence understand the behavior of the dynamical problems
- find complete solution of a non-homogeneous partial differential equation as a linear combination of the complementary function and a particular solution

Unit 1 **(15 Hours)**

Second order differential equations

1.1 Second order differential equations with constant coefficients, Particular integral of the form $e^{ax}V$ where V is a function of x
1.2 Linear equations with variable coefficients
1.3 Equations reducible to the linear homogeneous equation
1.4 Variation of Parameters

Unit 2 **(13 Hours)**

Simultaneous differential equations

2.1 Simultaneous equations of the first order and first degree
2.2 Solutions of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
2.3 Simultaneous linear differential equations with constant coefficients

Unit 3 **(12 Hours)**

Applications of System of Linear Differential Equations

3.1 The Shape of a Hanging Cable
3.2 Undamped and Damped Motion.
3.3 Electrical Circuits
3.4 Coupled Springs
3.5 Mixture Problems
3.6 Arms Race

Unit 4 **(14 Hours)**

Partial Differential Equations of the First Order

4.1 Introduction

4.2 Formulation of Partial Differential Equation by Eliminating Arbitrary Constants and Arbitrary Functions

4.3 Classification of Integrals

4.4 Some Particular Method – Type I - IV

4.5 Linear Partial Differential Equation of Order One - Lagrange's Method

Unit 5 **(11 Hours)**

Partial Differential Equations of Higher Order with Constant Coefficients

5.1 Homogeneous Linear Partial Differential Equations with Constant Coefficients

5.2 Solutions of Partial Differential Equations

5.3 Complementary Function

5.4 Particular Integral

BOOKS FOR STUDY

Narayanan, S. and Manicavachagam Pillay, T. K. *Calculus - Vol. III*. Chennai: S. Viswanathan Printers & Publishers, 2006

Chapter 2 : Section 4(d), 8 – 10

Chapter 3 : Sections 1 – 6

Siddiqi, A.H. and P. Manchanda, *A First Course in Differential Equations with Applications*. New Delhi: Macmillan India Ltd., 2006

Chapter 7 : Section 7.3, 7.6

Chapter 8 : Section 8.7

Bhu Dev Sharma, *Differential Equations*. Meerut: Kedar Nath Ram Bath, Revised Edition 2015.

Chapter 17 Section 17.1 – 17.4

Chapter 18 Section 18.1, 18.2 , 18.5

Chapter 19 Section 19.1 -19.6

BOOKS FOR REFERENCE

William E. Boyce and Richard C. Diprima, *Elementary Differential Equations and Boundary Value Problems,* USA: Wiley, Reprint 2013.

Amarnath.T, *An Elementary Course in Partial Differential Equation* (2nd Edition). New Delhi: Narosa Publishing House, 2003.

Narayan S. and T.K. Manicavachagom Pillay, *Differential Equations and its Applications*. Chennai: S.Viswanathan Printers & Publishers Pvt. Ltd., 2001.

Rai, B., D.P. Choudhury, and H.I. Freedman, *A Course in Ordinary Differential Equations*. New Delhi: Narosa Publishing House, 2002.

Sharma J.N. and Kehar Singh, *Partial Differential Equations for Engineers and Scientists.* New Delhi: Narosa Publishing House, 2000.

Sharma, J.N. and R.K.Gupta, *Differential Equations*. Meerut: Krishna Prakashan Mandir, 1992.

WEB RESOURCES

http://www.analyzemath.com/calculus/Differential_Equations/applications.html
http://faculty.bard.edu/belk/math213s14/ApplicationsOfDifferentialEquations.pdf
www.ugrad.math.ubc.ca/coursedoc/math100/notes/.../intro.html

PATTERN OF ASSESSMENT

Theory: 20% Problems: 80%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Group discussion/Assignments/Project/Problem solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019 - 2020)

MATHEMATICAL STATISTICS – I

CODE: 19MT/AC/ST35 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 65

OBJECTIVE OF THE COURSE

- To extend and formalize knowledge of the theory of probability and use of Baye's theorem
- To inculcate the concepts of random variables, mathematical expectation and correlation
- Fostering the concept of discrete and continuous probability distributions

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- demonstrate understanding of probability functions and use Baye's theorem for future events
- compute expectations, moments and correlation coefficients
- acquire knowledge of discrete and continuous distributions and their properties

Unit 1 **(12 Hours)**

Probability

1.1 Baye's Theorem for Future Events

Random Variables

1.2 Cumulative Distribution Function

1.3 Two-Dimensional Random Variables

Unit 2 **(14 Hours)**

Moments

2.1 Introduction

2.2 Definitions of Mean and Variance

2.3 Elementary Properties of Mean and Variance

2.4 Expected Value of a Function of a Random Variable

2.5 Expected Values of a Two Dimensional Random Variable

2.6 Covariance of X, Y

2.7 Conditional Expected Values – Definitions

2.8 Moment Generating Function – Definition

2.9 Properties of Characteristic Function

2.10 Cumulant Generating Function

2.11 Joint Characteristic Function of a Two Dimensional Random Variable

Unit 3 **(14 Hours)**

Special Discrete Probability Distributions

3.1 Binomial Distribution

3.2 Characteristic Function, Mean and Variance,
3.3 Recurrence Formula
3.4 Mode of the Binomial Distribution
3.5 Poisson Distribution
3.6 Poisson Distribution as a Limiting Form of Binomial Distribution
3.7 Moment Generating Function and Central Moments
3.8 Recurrence Formula
3.9 Mode of the Poisson Distribution
3.10 Additive property

Unit 4 **(13 Hours)**

Normal Distribution

4.1 Normal distribution
4.2 Normal Probability Curve and its Characteristics
4.3 Mean and Variance
4.4 Median and Mode
4.5 Central Moments
4.6 Mean Deviation about the Mean
4.7 Moment Generating Functions
4.8 Additive Property of Normal Distribution
4.9 Normal Distribution as a Limiting Form of Binomial Distribution

Unit 5 **(12 Hours)**

Correlation

5.1 Correlation
5.2 Scatter Diagram and its Uses
5.3 Karl Pearson's Coefficient of Correlation
5.4 Correlation of Grouped Bi-Variate Data
5.5 Probable Error of Correlation Coefficient
5.6 Rank Correlation Coefficient
5.7 Merits and Demerits of Rank Correlation Coefficient

BOOKS FOR STUDY

Gupta S. C. and Kapoor V. K., *Fundamentals of Mathematical Statistics*, New Delhi: Sultan Chand & Sons, Reprint 2016.

Chapter 3: Section 3.8.5
Chapter 4: Section 4.2

Veerarajan T., *Fundamentals of Mathematical Statistics*, First edition, Chennai: Yes Dee Publishing Pvt Ltd, 2017.

Chapter 5: Sections 5.1 – 5.4 (omit 5.4.9)
Chapter 7: Sections 7.1 – 7.6
Chapter 8: Sections 8.1 – 8.4
Chapter 9: Sections 9.1 (9.1.1 – 9.1.3), 9.2 (9.2.1 – 9.2.5, 9.2.7)
Chapter 10: Section 10.9 (10.9.1 – 10.9.5, 10.9.7 – 10.9.9)

Pillai R. S. N. and Bagavathi V., *Statistics*, New Delhi : S. Chand & Company Ltd, Reprint 2007.

Chapter 12: Page No: 363 – 395.

BOOKS FOR REFERENCE

Arumugam S. and Issac A., *Statistics*, Palayamkottai: New Gamma Publishing House, 1999.

David Freedman, Robert Pisani, Roger Purves, *Statistics*, 4th Edition New Delhi: Vinod Vaistha for Viva Books, 2009.

Sancheti D.C. and Kapoor V. K., *Statistics: Theory, Methods & Application*, New Delhi : S. Chand & Company Ltd, 2014.

Vittal P.R., *Mathematical Statistics*, Chennai: Margham Publications Pvt. Ltd., 2002.

WEB RESOURCES

https://fs.blog/2018/09/bayes-theorem/
http://makemeanalyst.com/normal-distribution-binomial-distribution-poisson-distribution/
https://www.statisticshowto.datasciencecentral.com/probability-and-statistics/correlation-coefficient-formula/

PATTERN OF ASSESSMENT

Theory: 60 % (Derivations/Properties/Theorems) Problem: 40 %

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting at least two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Soft Skills Course Offered to students of
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme

SYLLABUS
(Effective from the academic year 2019 – 2020)

LIFE SKILLS – HEALTH, ENERGY AND COMPUTER BASICS

CODE: 19MT/SS/HC13 **CREDITS: 3**
L T P: 3 0 0
TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To sensitise students to the fact that good health lies in nature
- To create an awareness about energy obtained from different components of food and to plan for a balanced diet
- To enable students to understand the significance of energy conservation and strategies for conserving energy
- To provide a basic knowledge of computer fundamentals and Email configuration

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- identify the importance of a few plants and their health benefits
- recognise the causes and symptoms of common disorders
- calculate food energy values and follow the Recommended Dietary Allowances (RDA) and appreciate the need for them.
- conserve energy and use it responsibly
- understand computer configuration for purchase of personal computer and E mail setting

Unit 1 **(13 Hours)**

Food and Health

1.1 Traditional food and their health benefits

1.1.1 **Six tastes –** Natural guide map towards proper nutrition

1.1.2 Nutritional value and significance of Navadhanya (Sesame seed, Bengal gram, Horse gram, Green gram, Paddy seeds, White beans, Wheat, black gram and Chick pea) and Greens (Vallarai, Thuthuvalai, Manathakkali, Pulichakeerai, Agathi Keerai, Murungai Keerai, Karuveppilai, Puthina and Kothamalli)

1.2 Causes, symptoms and home remedies for the following ailments

Common cold, Anaemia, Hypothyroidism, Obesity, Diabetes, Mellitus, Polycystic Ovarian Syndrome, Ulcer, Wheezing and Hypertension

Unit 2 **(13 Hours)**

Food and energy balance

2.1 Units of Energy, Components of Total Energy Requirement – Basal Metabolic Rate, energy requirements for (work) physical activity and Thermic effect of food

2.2 Factors affecting Basal Metabolic Rate and Thermic Effect of food

2.3 Recommended Dietary Allowances and Balanced Diet, Food Energy Values-Calculation

Unit 3 **(13 Hours)**

3.1 Energy conservation

3.1.1 Needs for Energy Conservation – Power consumption of domestic appliances – Electrical Energy Audit – Strategies for Energy Conservation - Modern lighting systems– Light emitting diode (LED), Compact fluorescent lamps (CFL), Green indicators and Inverter, Green building - Home lighting using Solar cell - Solar water heaters- Water and waste management - Biogas plant

3.1.2 Safety Practices in using electronic gadgets and electricity at home – Precautions - Shock- Use of testers to identify leakage

3.2 Computer fundamentals

3.2.1 Essentials of Purchasing a Personal Computer - Fundamentals of Networks – Local Area Network, Internet, Networking in real-time scenario- Computer Hacking – Computer Forensics Fundamentals – Cyber Laws - Secure Browsing

3.2.2 **Configuring Email**

Configure Email Settings – Attachments – Compression – Organizing Emails – Manage Folders - Auto Reply - Electronic Business Card - Email Filters- Manage Junk Mail - Calendar - Plan Meetings, Appointments - Scheduling Emails

3.2.3 Emerging Trends in IT - 3D Printing, Cloud Storage, Augmented Reality, Artificial Intelligence, Internet of Things (IoT)

BOOKS FOR REFERENCE

Achaya K. T. *The Illustrated Foods of India*. Oxford Publications, 2009.

Guyton, A.C. *Text Book of Medical Physiology*. (12th ed.). Philadelphia: W.B. Saunders & Co., 2011.

Joe Benton, *Computer Hacking: A Beginner's Guide to Computer Hacking, How to Hack, Internet Skills, Hacking Techniques, and More!,* Createspace Independent Pub, 2015.

John Vacca, *Computer Forensics*: Computer Crime Scene Investigation, Laxmi Publications 2015.

Pradeep Sinha, Priti Sinha, *Computer Fundamentals 6th Edition*, BPB Publications, 2003.

Srilakshmi, B. *Nutrition Science* (4th Revised Edition), New Delhi: New Age International (P) Ltd., 2014.

Suzanne Le Quesne *Nutrition: A Practical Approach*, Cornwall: Thomson, 2003.

Therapeutic Indes – Siddha, 1st edition, SKM Siddha and Ayurveda, 2010.

Trevor Linsley, *Basic electrical installation work.* Newnes rint of Elsevier 2011.

PATTERN OF ASSESSMENT

Continuous Assessment: **Total Marks: 50**

Two to three Task based components
Task based classroom activities
Case studies
Group discussions
Group presentation
Role play

No End Semester Examination

No CA test

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Allied Core Course Offered by the Department of Mathematics for B.Com. (Commerce – General Shift I) Degree Programme

SYLLABUS

(Effective from the academic year 2019-2020)

MATHEMATICS FOR COMMERCE

CODE: 19MT/AC/MT35 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To inculcate problem solving skills and quantitative analysis
- To introduce the technique to solve linear programming problem

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- acquire the skill to solve problems and have quantitative analysis
- model real time problems and solve
- solve problems using various techniques

Unit 1 **(13 Hours)**

Matrices

1.1 Types of matrices
1.2 Characteristic equation of a matrix
1.3 Cayley - Hamilton Theorem (without proof)
1.4 Eigen Values and Eigen Vectors
1.5 Diagonalization of 3×3 matrices with distinct eigen values

Unit 2 **(15 Hours)**

Theory of Equations

2.1 Formation and Solution of Equation with Imaginary and Irrational Roots
2.2 Relation between Roots and Coefficients
2.3 Solution of Equations under given Conditions
2.4 Symmetric Functions of the Roots of an Equation in terms of its Coefficients
2.5 Reciprocal equations

Unit 3 **(12 Hours)**

Series Expansion

3.1 Binomial series
3.2 Exponential series
3.3 Logarithmic series

Unit 4 **(12 Hours)**

Numerical Analysis

4.1 The Bisection Method
4.2 Newton Raphson Method
4.3 Gaussian Jordan Elimination
4.4 Gaussian Elimination
4.5 Iterative Methods
4.6 Jacobi Method
4.7 Gauss Seidal Method

Unit 5 **(13 Hours)**

Linear Programming Problem

5.1 General L.P.P.
5.2 Canonical and standard forms of L.P.P.
5.3 The Simplex Algorithm
5.4 The Big M – method

BOOKS FOR STUDY

Arumugam S., A. Thangapandi Isaac and A. Somasundaram. *Numerical Methods*, Chennai: Scitech, 2002.

Chapter 3: Section 3.3, 3.5
Chapter 4: Section 4.3, 4.4, 4.7, 4.8

Sundaresan V., K.S. Ganapathy Subramanian and K. Ganesan, *Resource Management Techniques*, Chennai: A.R. Publications, 2014.

Chapter 3: Section 3.1.1 – 3.1.4, 3.2.1

Venkatachalapathy S.G, *Allied Mathematics*, Chennai: Margham Publications, 2011.

Chapters 2 – 4
Chapter 5: Pages 5.1 – 5.32
Chapter 6: Pages 6.3 – 6.13, 6.36 – 6.57

BOOKS FOR REFERENCE

Abdul Rasheed A. *Allied Mathematics*. Chennai: Vijay Nicole Imprints Private Limited, Reprint 2008

Kalavathy S. *Operations Research.* Noida: Vikas Publishing House Pvt. Ltd., Fourth Edition 2013, Reprint 2016.

Kandasamy and Thilagavathy. *Mathematics.* New Delhi: S Chand, 2004.

Sankarappan S, S Kalavathy, Santha B Prabha. *Applied Mathematics*. Chennai: Vijay Nicole Imprints Private Limited, 2009

WEB RESOURCES

https://ece.uwaterloo.ca/~h23chung/MATH%20215/MATH%20215%20-%20Eigen%20Vectors,%20Eigenvalues,%20and%20the%20Cayley-Hamilton%20Theorem.pdf
https://www.math.cuhk.edu.hk/course_builder/1617/mmat5520/Eigen.pdf
http://www.universityofcalicut.info/SDE/VI%20Sem.%20B.Sc%20Maths%20-%20Additional%20Course%20in%20lie%20of%20Project%20-Theory%20of%20equations%20&%20fuzzy%20set.pdf
http://www.math.iitb.ac.in/~baskar/book.pdf
https://www.math.ucla.edu/~tom/LP.pdf
http://ncert.nic.in/ncerts/l/lemh206.pdf

PATTERN OF ASSESSMENT

Theory 10%; Problems : 90%

Continuous Assessment: Total Marks: 50 Duration: 90 minutes
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

SEQUENCES AND SERIES

CODE: 19MT/MC/SS44 **CREDITS: 4**

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To understand the concept of convergence of a real sequence
- To discuss the techniques of testing the behavior of infinite series of real Numbers
- To express periodic functions as infinite series

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand countable and uncountable sets of real numbers
- acquire the knowledge of the behavior of the sequence
- develop the techniques of testing the behavior of infinite series of real Numbers
- express periodic functions as infinite series

Unit 1 **(12 Hours)**

Sets and Functions

1.1 Functions – Real Valued Functions
1.2 Equivalence, Countability
1.3 Real Numbers
1.4 Least Upper Bounds

Unit 2 **(13 Hours)**

Sequences of Real Numbers

2.1 Definition of Sequence and Subsequence
2.2 Limit of a Sequence
2.3 Convergent and Divergent Sequences
2.4 Bounded Sequences
2.5 Monotone Sequences
2.6 Operations on Convergent and Divergent Sequences

Unit 3 **(14 Hours)**

Sequences of Real Numbers (contd.)

3.1 Limit Superior and Limit Inferior
3.2 Cauchy Sequences

Series of Real Numbers

3.3 Convergence and Divergence
3.4 Series with Non-negative Terms
3.5 Alternating Series
3.6 Conditional Convergence and Absolute Convergence

Unit 4 **(14 Hours)**

Tests for Convergence of a Series of Real Numbers

4.1 Tests for Absolute Convergence
4.2 Series whose terms form a Non-increasing Sequence
4.3 Summation by Parts

Unit 5 **(12 Hours)**

Fourier Series

5.1 Definition of Fourier Series
5.2 Expansions of Periodic Functions with Period 2π
5.3 Odd and Even Functions
5.4 Half-range Fourier Series
5.5 Development in cosine and sine Series

BOOKS FOR STUDY

Goldberg Richard.R, *Methods of Real Analysis*. New Delhi: Indian Edition. Oxford, Reprint 2017.

Chapter 1 : Section 1.3 – 1.7
Chapter 2 : Sections 2.1 – 2.10
Chapter 3 : Sections 3.1 – 3.4, 3.6 – 3.8

Narayanan S. and Manicavachagom Pillay T. K., *Calculus -Volume III*. Madras: S. Viswanathan, 2006.

Chapter 6 : Sections 1 – 5

BOOKS FOR REFERENCE

Banner Adrian, *The Calculus Lifesaver*, Princeton University Press, ebook.

Bhat V. K, Jarol Scott, *Introduction to Real Analysis*, New Delhi: Narosa, 2012.

Karunakaran V, *Real Analysis*. Chennai: Pearson, 2012.

Kumar Ajit, Kumarasan S. *A Basic Course in Real Analysis*, USA: CPC Press 2014

Robert, G Bartle, *Introduction to Real Analysis*, John Wiley, New York.

Terrance J Quinn, *Pathways to Real analysis*, New Delhi: Narosa, 2009.

WEB RESOURCES

https://www.whitman.edu/mathematics/calculus/calculus_11_Sequences_and_Series.pdf

http://www.math.utah.edu/online/1220/notes/ch9.pdf

http://www.math.harvard.edu/~engelwar/MathS305/Sequences%20and%20Series%20Text%20abridged.pdf

PATTERN OF ASSESSMENT

Theory: 70%; Problems: 30%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Theory writing techniques/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019 - 2020)

DISCRETE MATHEMATICS

CODE: 19MT/MC/DM43 **CREDITS: 3**

L T P: 3 1 0

TOTAL TEACHING HOURS: 52

OBJECTIVE OF THE COURSE

- To introduce the concepts on ordered relations
- To develop logical thinking and problem solving skill
- To introduce formal languages as a tool to model natural language into computer language

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- acquire the knowledge of reasoning and to reason validity of a statement
- understand ordered relations and apply in Boolean expressions
- gain knowledge of using formal language as tool to convert natural language into machine language

Unit 1 **(12 Hours)**

Logic and Propositional Calculus

1.1 Logical equivalence
1.2 Algebra of Propositions
1.3 Arguments
1.4 Logical Implication
1.5 Propositional Functions, Quantifiers
1.6 Negation of Quantified Statements
1.7 Normal Forms

Unit 2 **(10 Hours)**

Lattices

2.1 Lattice
2.2 Properties of lattices
2.3 Lattices as Algebraic System
2.4 Bounded, Complemented and Distributive lattices

Unit 3 **(10 Hours)**

Boolean Algebra

3.1 Basic properties of Boolean algebra
3.2 Boolean expressions
3.3 Logic gates and circuits
3.4 Boolean function
3.5 Method to find Truth table of a Boolean Function

3.6 Karnaugh Map

Unit 4 **(10 Hours)**

Finite State Automata

4.1 Finite state machines
4.2 Finite state automata
4.3 Non-deterministic finite state automaton
4.4 Equivalence of DFSA and NDFSA

Unit 5 **(10 Hours)**

Languages and Grammars

5.1 Languages and Regular expressions
5.2 Languages determined by FSA
5.3 Grammars
5.4 Derivation trees for context free grammar

BOOKS FOR STUDY

Lipschutz Seymour, Marc Lars Lipson, *Schaum's Outline of Theory and Problems of Discrete Mathematics* Third Edition, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2010

Chapter 4 Sections 4.6, 4.7, 4.9 - 4.13

Babu Ram, *Discrete Mathematics*, Noida: Pearson - Dorling Kindersley (India) Pvt. Ltd., 2011

Chapter 6 Sections 6.1 – 6.3, 6.5
Chapter 7 Sections 7.1, 7.3 – 7.6
Chapter 9 Sections 9.1 (omit sections 9.1.4 – 9.1.6), 9.2 – 9.4
Chapter 10 Sections 10.1 – 10.4

BOOKS FOR REFERENCE

Tremblay J.P. and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2004

Malik D.S. and M.K.Sen, *Discrete Mathematics*, India Binding House, Indian Edition, 2008

Norman L.Biggs, *Discrete Mathematics*, Second Edition, India: Oxford University Press, 2003

Ralph P. Grimaldi and B.V. Ramana, *Discrete and Combinatorial Mathematics*, Fifth Edition, New Delhi: Dorling Kindersley (India) Pvt. Ltd., 2004

Rowan Garnier and John Taylor, *Discrete Mathematics*, Third Edition, CRC Press, Special Indian Edition, 2011

Sharma, *Discrete Mathematics*, Chennai: Macmillan India Ltd., 2003

PATTERN OF ASSESSMENT

Theory: 40%; Problems: 60%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Seminar/Presentation/Group discussion/Assignments/Problem solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

MATHEMATICAL STATISTICS – II

CODE: 19MT/AC/ST45 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To introduce the notion of regression and time series analysis
- To inculcate the concepts of the sampling distribution, hypothesis testing and analysis of variance

COURSE LEARNING OUTCOMES:

On successful completion of the course, students will be able to

- use appropriate sampling distribution for the test of hypothesis
- construct the interval estimation for different parameters
- understand the concept of Analysis of Variance

Unit 1 **(12 Hours)**

Regression

1.1 Definition
1.2 Uses of Regression Analysis
1.3 Difference Between Correlation and Regression
1.4 Method of Studying Regression
1.5 Mathematical Properties
1.6 Standard Error of Estimate

Unit 2 **(13 Hours)**

Sampling Theory and Tests of Significance

2.1 Introduction
2.2 Point Estimation
2.3 Testing of Hypothesis
2.4 Standard Error
2.5 Tests of Significance for Attributes
2.6 Tests of Significance for Large Samples
2.7 Testing the difference Between Means of two samples
2.8 Tests of Significance for Small Samples (*t*-test)
2.9 The Use of *P*-Values for Decision Making in Testing Hypotheses

Unit 3 **(14 Hours)**

Chi Square test

3.1 Characteristics of χ^2 – test
3.2 χ^2 – test of Goodness of Fit
3.3 χ^2 as a test of Independence

Interval Estimation

3.4 Confidence Interval for the Mean
3.5 Confidence Interval for Difference between the Means
3.6 Confidence Interval for Difference between the Means in Case of Paired Observations
3.7 Confidence Interval for Proportions
3.8 Confidence Interval for Variance and Standard Deviations

Unit 4 **(13 Hours)**

F – test and Analysis of Variance

4.1 F – test or the Variance Ratio Test
4.2 Assumptions in F – test
4.3 Applications of F – test
4.4 Analysis of Variance
4.5 One – Way Classification
4.6 Two – Way Classification

Unit 5 **(13 Hours)**

Analysis of Time Series

5.1 Definition
5.2 Uses of Time Series
5.3 Time Series Models
5.4 Components of Time Series
5.5 Measurement of Secular Trend
5.6 Measurement of Seasonal Variations

BOOKS FOR STUDY

Pillai R. S. N. and Bagavathi V., *Statistics*, New Delhi: S. Chand & Company Ltd, Reprint 2007.

Chapter 13: Page No: 431 – 480
Chapter 15: Page No: 555 – 595
Chapter 20: Page No: 777 – 799
Chapter 21: Page No: 802 – 812

Gupta O. P. and Vishal Sharma, *Mathematical Statistics*, Meerut: Mohan Print Media (P) Ltd., 2019.

Chapter 21: 21.3 – 21. 9 (Pg. No: 804 – 823)

Gupta S. P., *Statistical Methods*, New Delhi: Sultan Chand & Sons, 2003.

Chapter 15: 15. 1 - 15. 7 (Pg. No: 642 – 672)

Walpole Ronald E. Raymond H. Myers, Sharon L. Myers, Keying Ye. *Probability & Statistics for Engineers &; Scientists*. Pearson Education International, 8th Edition: 2007

Chapter 10: 10.4

BOOKS FOR REFERENCE

Arumugam S. and Issac A., *Statistics*, Palayamkottai: New Gamma Publishing House, 1999.

Subramaniam N. *Probability and Statistics*. Erode : SCM, 2005.

Richard I, Levin and David S. Rubin. *Statistics for Management***.** New Delhi: Prentice Hall, 2000.

Sancheti D.C. and Kapoor V. K., *Statistics: Theory, Methods & Application,* New Delhi : S. Chand & Company Ltd, 2014.

WEB RESOURCES

https://stattrek.com/regression/linear-regression.aspx
https://statistics.laerd.com/statistical-guides/hypothesis-testing.php
https://www.spss-tutorials.com/anova-what-is-it/
http://www.statsoft.com/textbook/time-series-analysis

PATTERN OF ASSESSMENT
Theory: 40% **Problem: 60%**

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A: 3 × 2 = 06 (Three questions to be set)
Section B: 3 × 8 = 24 (Four questions to be set)
Section C: 1 × 20 = 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Seminars/Quiz/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10 × 2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5 × 8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2 × 20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

VECTOR ANALYSIS AND APPLICATIONS

CODE: 19MT/MC/VA53 **CREDITS: 3**

L T P: 3 1 0

TOTAL TEACHING HOURS: 5 2

OBJECTIVES OF THE COURSE

- To familiarize the concept of magnitude and direction of a quantity
- To introduce the concepts and applications of line, surface and volume integral

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the concepts of divergence, curl, and the Laplacian along with their physical and geometrical interpretations
- develop the ideas of line, surface and volume integrals and its calculations in rectangular, cylindrical and spherical coordinate systems
- investigate the relation between the line, surface and volume integrals

Unit 1 **(10 Hours)**

Vector Differentiation

1.1 Scalar and Vector Functions
1.2 Scalar Fields and Vector Fields
1.3 Derivative of a Vector Function
1.4 Geometrical Significance of $\frac{d\vec{r}}{dt}$
1.5 Unit Tangent Vector of a Curve
1.6 Derivative of Sum, Scalar and Vector Product of Vector Functions
1.7 Partial Derivatives of a Vector Function

Gradient

1.8 Gradient of a Scalar Point Function
1.9 Formulas involving Gradient
1.10 Directional Derivative of a Scalar Function

Unit 2 **(10 Hours)**

Divergence and Curl

2.1 Divergence of a Vector Point Function
2.2 Curl of a Vector Point Function
2.3 Solenoidal and Irrotational Vectors
2.4 Laplace's Equation
2.5 Vector Identities

Unit 3 **(10 Hours)**

Vector Integration

3.1 Integration of Vector Functions
3.2 Definite Integrals
3.3 Line Integral, Surface Integral, Volume Integral

Unit 4 **(10 Hours)**

Vector Integration (contd.)

4.1 Relation between the Line Integral and Surface Integral: Stokes' Theorem (statement only)
4.2 Relation between the Surface Integral and Volume Integral: Gauss Divergence Theorem (statement only)
4.3 A Special Case of Stokes' Theorem: Green's Theorem in Two Dimensions (statement only)
4.4 Verification of the Theorems

Unit 5 **(12 Hours)**

Application of Vector Differentiation and Vector Integration to Differential Geometry and Mechanics

5.1 Geometrical Significance of the gradient
5.2 Physical Interpretation of Divergence
5.3 Physical Interpretation of Curl
5.4 Unit Normal Vector to given Surfaces
5.5 Orthogonal Curvilinear Coordinate Systems – Cylindrical and Spherical Coordinate Systems
5.6 Divergence and Curl of a Vector Point Function in terms of a Curvilinear Coordinates

BOOK FOR STUDY

Shalini Singh, *Vector Calculus*, New Delhi: Sarup & Sons, 2013.
Chapter 2, 3, 4 (excluding Sections 2.3, 2.4, 2.5)

BOOKS FOR REFERENCE

Absos Ali Shaikh and Sanjib Kumar Jana, *Vector Analysis with Applications***,** New Delhi: Narosa, 2009

Prasun Kumar Nayak, *Vector Algebra and Analysis with Applications*, Hyderabad: Universities Press Pvt. Ltd., 2017

Seymour Lipschutz, Dennis Spellman, Murray R. Spiegel, *Vector Analysis and an Introduction to Tensor Analysis* (Second Edition)**,** Schaum's Outline Series, New Delhi: Tata McGraw Hill, 2009

WEB RESOURCES

https://www.khanacademy.org/math/multivariable-calculus/integrating-multivariable-functions/line-integrals-in-vector-fields-articles/a/line-integrals-in-a-vector-field
https://www.math24.net/geometric-applications-line-integrals/
https://unacademy.com/lesson/surface-integral-geometric-interpretation/ZXI8F1HY

PATTERN OF ASSESSMENT

Theory: 10%; Problems: 90%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Open Book Test/Group Discussion/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

ALGEBRAIC STRUCTURES

CODE: 19MT/MC/AS55 **CREDITS: 5**

L T P: 5 1 0

TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To introduce the concept of abstract algebra
- To develop an understanding of fundamental algebraic structures

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have a working knowledge of important mathematical concepts in abstract algebra
- understand the structure and characteristics of groups, rings and fields
- gain experience in proving theorems and solving problems

Unit 1 **(15 Hours)**

Group Theory

1.1 Elementary Properties of Groups

1.2 Finite Groups

1.3 Subgroups

1.4 Cyclic Groups – Properties, Classification of Subgroups of Cyclic Groups

Unit 2 **(16 Hours)**

Permutation Groups

2.1 Cycle notation

2.2 Properties of Permutations

Symmetry Groups

2.3 Isometries

2.4 Classification of Finite Plane Symmetry Groups

2.5 Classification of Finite Groups of Rotations in $\mathbb{R}^3$

Isomorphisms

2.6 Cayley's Theorem

2.7 Properties of Isomorphisms

2.8 Automorphisms

Unit 3 **(15 Hours)**

Cosets and Lagrange's Theorem

3.1 Properties of Cosets

3.2 Lagrange's Theorem and Consequences

3.3 An Application of Cosets to Permutation Groups

Normal Subgroups and Factor Groups

3.4 Normal subgroups

3.5 Factor Groups

Unit 4 **(16 Hours)**

Group Homomorphism

4.1 Properties of Homomorphisms
4.2 The First Isomorphism Theorem

Ring Theory

4.3 Properties of Rings
4.4 Subrings
4.5 Integral Domains
4.6 Fields
4.7 Characteristic of a Ring

Unit 5 **(16 Hours)**

Ring Theory (contd.)

5.1 Ideals and Factor Rings
5.2 Prime Ideals and Maximal Ideals
5.3 Ring Homomorphisms
5.4 Properties of Ring Homomorphisms
5.5 Field of Quotients

BOOKS FOR STUDY

Gallian Joseph A., *Contemporary abstract algebra*, New Delhi: Cengage Learning, 8th Edition, Reprint 2016.

Chapters 2 – 7, 9 – 10, 12 – 15, 27 (Pages 42-91, 99-113, 118-152, 185-192, 208-221, 245-293, 461-466 only)

BOOKS FOR REFERENCE

Dipak Chatterjee, *Abstract Algebra*, 2nd Edition, New Delhi: Prentice Hall of India, 2005.

Herstein, I. N., *Topics in Algebra* 2nd ed. New Delhi: Wiley, 2007, Reprint 2017.

Kishore Arora, *Concepts and Applications of Group Theory*, New Delhi : Anmol Publications Pvt. Ltd., 2003.

Neal H. McCoy, Gerald J. Janusz, *Introduction to Abstract Algebra*, Sixth Edition. New Delhi: Academic Press, 2005

Santiago, M. L., *Modern Algebra*. New Delhi : Tata McGraw-Hill, 2001.

WEB RESOURCES

https://www.maa.org/press/periodicals/loci/joma/group-visualization-with-igroup-exploreri
www.mathcs.emory.edu/~dzb/teaching/421Fall2014/VGT-Ch-1-2.pdf

PATTERN OF ASSESSMENT

Theory: 80%; Problems: 20%

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Seminars/Quiz/Group Discussion/Assignments/Problem Solving/Theorem Writing Technique

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

PRINCIPLES OF REAL ANALYSIS

CODE: 19MT/MC/RA55 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To enhance the knowledge of abstract mathematics on the real line
- To introduce the concepts for understanding and analyzing abstract mathematics on the metric space

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have acquired knowledge of abstract mathematics on the real line
- have learnt the concepts for understanding and analyzing abstract mathematics on the metric space
- have the knowledge of real functions, limit of functions and their properties

Unit 1 **(15 Hours)**

Limits and Continuity on $\mathbb{R}^1$

1.1 Limit of a Function on the Real Line

1.2 Functions Continuous at a Point on the Real Line – Reformulation

1.3 Discontinuous functions on $\mathbb{R}^1$

Unit 2

Limits and Continuity on Metric Spaces **(16 Hours)**

2.1 Metric Space

2.2 Limits in Metric Spaces

2.3 Functions Continuous on a Metric Space

2.4 Open Sets

2.5 Closed Sets

Unit 3

Connectedness and Completeness on Metric Spaces **(15 Hours)**

3.1 Connected Sets

3.2 Bounded Sets and Totally Bounded Sets

3.3 Complete Metric Spaces

Unit 4 **(16 Hours)**

Compactness on Metric Spaces

4.1 Compact Metric Spaces

4.2 Continuous Functions on a Compact Metric Space

4.3 Continuity of an inverse function

4.4 Uniform Continuity

Unit 5 **(16 Hours)**

Riemann Integration

5.1 Definition of the Riemann Integral
5.2 Properties of the Riemann Integral
5.3 Derivatives
5.4 Rolles' Theorem
5.5 The Law of the Mean
5.6 Fundamental Theorem of Calculus
5.7 Improper Integrals

BOOK FOR STUDY

Goldberg Richard R. *Methods of Real Analysis*. Indian Edition. New Delhi: Oxford, 1970, Reprint 2017.

Chapter 4 – Section: 4.1 – 4.3
Chapter 5 – Sections: 5.1 – 5.6
Chapter 6 – Sections: 6.1 – 6.8
Chapter 7 – Sections: 7.2, 7.4 - 7.10

BOOKS FOR REFERENCE

Kumar Ajit, Kumarasan S. *A Basic Course in Real Analysis*, USA: CPC Press 2014

Mainak Mukherjee, *A Course in Real Analysis*, New Delhi: Narosa, 2011.

Malik S C, *Principles of Real Analysis*. Third edition. New Delhi: New Age, 2011.

Nader Vakil, *Real Analysis through Modern Infinitesimals*, Cambridge, 2011.

Shanti Narayan, M.D.Raisinghania, Elements of Real Analysis, New Delhi: S.Chand, eighth revised edition 2007.

WEB RESOURCES

http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF
http://www.personal.psu.edu/dpl14/java/calculus/limits.html
https://www.math.stonybrook.edu/~aknapp/download/b2-realanal-inside.pdf
https://www.jirka.org/ra/realanal.pdf
https://www.isid.ac.in/~tridip/Teaching/MathEco/LectureNotes/05RealAnalysisBasicConcepts.pdf
http://www.freebookcentre.net/Mathematics/Real-Analysis-Books.html

PATTERN OF ASSESSMENT

Theory : 60%; Problem 40%

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**

Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Theorem writing techniques/Quiz/Assignments/Problem Solving

End Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

INTEGRAL TRANSFORMS

CODE: 19MT/MC/IT54 **CREDITS: 4**

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To introduce the concept of Laplace, Fourier and **Z** – transform of different functions
- To learn the application of Laplace transform to solve Differential Equations and **Z** transform to solve Difference equations

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the different methods of finding transforms of different functions
- appreciate the procedure to obtain solution of differential equations involving Laplace transform
- visualize the use of **Z**-transform in solving difference equation

Unit 1 **(12 Hours)**

Laplace Transform

1.1 Definition of Laplace Transform

1.2 Laplace Transform of e^{-at}, $\cos at$, $\sin at$ and t^n, where a is a Positive Integer

1.3 Laplace Transform of Periodic Functions

1.4 Some General Theorems

1.5 Evaluation of Integrals using Laplace Equations

1.6 Inverse Laplace Transform

Unit 2 **(14 Hours)**

Application of Laplace Transform to Differential Equations

2.1 Laplace Transform to Solve System of Differential Equations with Constant Coefficient

2.2 Laplace Transform to Solve Ordinary Differential Equations with Variable Coefficients

2.3 Laplace Transform to solve Differential Equations Involving Integrals

2.4 Laplace Transform to Evaluate Certain Integrals

Unit 3 **(12 Hours)**

Fourier Transform

3.1 Definition of Fourier Transform

3.2 Fourier Integral Theorem

3.3 Fourier Transform Pair

3.4 Properties of Fourier Transforms

Unit 4 **(13 Hours)**

Z - Transforms

4.1 Definition of **Z** – Transform
4.2 **Z** – Transforms of Some Standard Sequences
4.3 Existence of **Z** – Transform
4.4 Properties of **Z** – Transform
4.5 Initial and Final Value Theorem

Unit 5 **(14 Hours)**

Z – Transform (contd.)

5.1 Inverse **Z** – Transform
5.2 Evaluation of Inverse **Z** – Transform – Power Series Method, Partial Fraction Method, Inversion Integral Method
5.3 Solution of Difference Equations using **Z**– Transform

BOOKS FOR STUDY

Narayanan S. and T.K. Manicavachagam Pillay T. K., *Calculus - Volume III*. Madras: S. Viswanathan, 2006.
Chapter 5 Sections 1 – 12

S. Santha, *Transforms and Partial Differential Equations*, Vijay Nicole Imprints Private Limited, Chennai, 2009.
Chapter 4 Sections 4.1 – 4.5
Chapter 5 Sections 5.1 – 5.6, 5.8 – 5.10

BOOKS FOR REFERENCE

S. Sankarappan, S. Kalavathy, S. Santha, B. Praba, *Applied Mathematics*, Vijay Nicole Imprints Private Limited, Chennai, 2009.

A.R. Vasishtha and R.K. Gupta, *Integral Transforms*, Krishna Prakashan Mandir, Meerut, 1972.

Baidyanath Patra, *An Introduction to Integral Transforms*, Levant Books, India, 2016.

Erwin Kreyszig, *Advanced Engineering Mathematics*, 8th Edition, Wiley India, 2006.

Donald A. McQuarrie, *Mathematical Methods for Scientists & Engineers*, Viva Books Pvt. Ltd. New Delhi, 2009.

WEB RESOURCES

https://www.intmath.com/laplace-transformation/table-laplace-transforms.php
https://www.tutorialspoint.com/signals_and_systems/fourier_transforms.htm
https://www.comm.utoronto.ca/~dkundur/course_info/discrete-time-systems/notes/Kundur_DTS_Chap3.pdf

PATTERN OF ASSESSMENT

Theory: 10% ; Problems: 90%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Open Book Tests/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Interdisciplinary Core Course Offered by the Departments of Mathematics and Computer Science to B.Sc. Mathematics Degree Programme

SYLLABUS

(Effective from the academic year 2019-2020)

MATHEMATICS THROUGH SCIENTIFIC SOFTWARE

CODE: 19ID/IC/MS55 **CREDITS: 5**

L T P: 1 0 5

TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To introduce software tools for implementing Mathematical and Statistical concepts
- To visualize data and mathematical functions
- To prepare and process data for statistical analysis
- To familiarize multimedia techniques to demonstrate a problem or solution

LEARNING OUTCOMES OF THE COURSE

On successful completion of the course, students will be able to

- use software tools for implementing Mathematical and Statistical concepts
- understand data and mathematical functions
- demonstrate a situation through multimedia
- develop the ability to build and assess data for further analysis
- continue further studies in advanced R programming

Unit 1 **(13 Hours)**

Microsoft Excel

1.1 Building Basic Formula – Working with Charts – Pivot Table

1.2 Importing Data – Data Cleaning - Data Validation – Creating named ranges and constants

1.3 Form Controls

1.4 Working with macros and forms

1.5 Solver – Goal Seek

Unit 2 **(18 Hours)**

Multimedia: GIMP

2.1 GIMP Basics – Working with Images – Transformations: Global and Local

2.2 Drawing and Illustration – Logos and Textures

2.3 Animations – Animated Text – Using Animation Tools – Using GAP

Unit 3 **(15 Hours)**

Mathematical Software: MATHCAD

3.1 Creating Mathcad Worksheets: Working with Math, text regions

3.2 Computational Features: Calculations – Operators – Built-in functions – Vectors, Matrices and Data Arrays

3.3 Symbolic Calculations

3.4 Graphing: 2D plots and 3D plots

Unit 4 **(16 Hours)**

Statistical Software: R

4.1 Data Types in R – Numeric, Integer, Complex, Logical, Character, Vectors, Matrices & Arrays, Lists, Data Frames, Factors, Strings

4.2 Graphics using R – Pie Chart, Scatter Plot, Line Plot, Histograms, Box Plot, Bar Plot

Unit 5 **(16 Hours)**

Statistical Analysis using R

5.1 Mean, Median, Mode, Standard Deviation & Variation, Quartile Ranges

5.2 Normal Distribution and Binomial Distribution

5.3 Correlation Analysis and Regression Analysis

5.4 Analysis of Variance (ANOVA)

5.5 Chi Square Test and Hypothesis Testing

BOOKS FOR STUDY & REFEREENCE

Curtis, D. Frye. Microsoft Excel 2013, Step by Step. 2013.

Jason van Gumster Robert Shimonski, *GIMP Bible*, Wiley Publishing, 2010.

Larsen W Ronald, Introduction to Mathcad 13, New Jersey: Pearson Prentice Hall, 2007.

Olivier Lecarme, Karine Delvare, The Book of GIMP: A Complete Guide to Nearly Everything, No Starch Press, 2013.

Sudhamathy, Jothi Venkateswaran. R Programming – An Approach to Data Analytics. Chennai: MJP Publishers, 2018.

User's Guide Mathcad 14. USA: Parametric Technology Corporation, 2007.

WEB RESOURCES

https://www.engr.colostate.edu/ECE562/mathcad.pdf
https://docs.gimp.org/2.10/en/

PATTERN OF ASSESSMENT **Practical: 80%; Theory: 20%**

Continuous Assessment Test **Total Marks: 50** **Duration: 90 minutes**

Section A: 10×1 = 10

Section B: 2×20 = 40 (Three questions to be set)

Other Components: **Total Marks: 50**

Quiz/Assignments/Problem Solving through software/Project

End Semester Examination:

Question paper to be prepared jointly by one course teacher and one internal–external examiner

Total Marks: 100 **Duration: 3 hours**

Section A: 20×1 = 20 (Twenty questions to be set selecting at least three questions from each unit)

Section B: 4×20 = 80 (Five questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

VECTOR SPACES AND LINEAR TRANSFORMATIONS

CODE: 19MT/MC/VL64 **CREDITS: 4**

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- Intended to develop an understanding of linear algebraic structures
- To enable understanding of the concept of linear transformations and their matrix representation

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra
- use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization
- apply the theoretical results developed to obtain the least square curves to fit the data

Unit 1 **(13 Hours)**

Vector Spaces

1.1 General Vector Spaces and Subspaces
1.2 Linear Combinations
1.3 Linear Dependence and Independence
1.4 Properties of Bases

Unit 2 **(13 Hours)**

Vector Spaces (contd.)

2.1 Rank
2.2 Orthonormal Vectors and Projections
2.3 Gram-Schmidt Orthogonalization Process
2.4 Kernel, Range and the Rank-Nullity Theorem

Unit 3 **(13 Hours)**

Transformations

3.1 Matrix Transformations, Rotations and Dilations
3.2 One-to-One Transformations and Inverse Transformations
3.3 Transformations and Systems of Linear Equations

Unit 4 **(13 Hours)**

Coordinate Representations

4.1 Coordinate Vectors

4.2 Change of Basis
4.3 Matrix Representations of Linear Transformations
4.4 Importance of Matrix Representation
4.5 Diagonalization of Matrices
4.6 Diagonalization of Symmetric Matrices - Orthogonal Diagonalization
4.7 Diagonal Matrix Representation of a Linear Operator

Unit 5 **(13 Hours)**

Inner Product Spaces

5.1 Inner Product
5.2 Norm of a Vector
5.3 Orthogonal Vectors
5.4 Approximation of Functions and Coding Theory
5.5 Least Squares Curves

BOOKS FOR STUDY

Williams Gareth, *Linear Algebra with Applications* 6th Edition. New Delhi: Narosa, 2008.
Chapter 2: Section 2.5
Chapter 4: Sections 4.1 – 4.9
Chapter 5: Sections 5.1 – 5.3
Chapter 6: Sections 6.1, 6.3, 6.4

BOOKS FOR REFERENCE

Herstein, I. N., *Topics in Algebra* 2nd ed. New Delhi: Wiley, 2007, Reprint 2017

Lang Serge, *Algebra* 3rd Revised Ed. New Delhi: Springer International Edition, 2004.

Strang, Gilbert. *Linear Algebra and its Applications*, Fourth Edition. New Delhi: Cengage Learning India Pvt. Ltd., 2006.

Stroud, K.A., and Dexter J. Booth, *Linear Algebra*, New York: Industrial Press, 2008.

WEB RESOURCES

http://www.math.ucla.edu/~tao/resource/general/115a.3.02f/GramSchmidt.html
http://www.math.ucla.edu/~tao/resource/general/115a.3.02f/EigenMap.html

PATTERN OF ASSESSMENT
Theory: 60%; Problems: 40%

Continuous Assessment Test: **Total Marks: 50** **Duration: 90 minutes**
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20 = 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Seminars
Quiz
Group Discussion

Assignments
Problem Solving
Theorem Writing Technique

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20 = 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

PRINCIPLES OF COMPLEX ANALYSIS

CODE : 19MT/MC/CA65 **CREDITS: 5**
L T P: 5 1 0
TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To introduce the analysis of complex numbers
- To expose a fertile area of pure mathematics as a source of powerful technique that are widely applied in sciences and advanced Engineering mathematics

COURSE LEARNING OUTCOMES
On successful completion of the course, students will be able to

- demonstrate understanding of the basic concepts in complex analysis
- understand the importance of analytic functions in applications to the field of sciences and advanced Engineering
- apply conformal mapping in solving boundary value problems
- apply the methods of complex analysis to evaluate definite integrals and infinite series

Unit 1 **(15 Hours)**

Analytic Functions

1.1 Functions of a complex variable
1.2 Continuity
1.3 Derivatives
1.4 Cauchy-Riemann Equations
1.5 Sufficient Conditions for Differentiability
1.6 Polar Coordinates
1.7 Analytic Functions
1.8 Harmonic Functions
1.9 Harmonic conjugates

Unit 2 **(15 Hours)**

Elementary Functions

2.1 The Exponential Function
2.2 The Logarithmic Function
2.3 Branches and Derivatives of Logarithms

Mapping by Elementary Functions

2.4 Linear Transformations

2.5 The Transformation $w = \frac{1}{z}$

2.6 Linear Fractional Transformations

2.7 An Implicit Form

2.8 Mappings of the Upper half plane

2.9 The Transformation $w = \sin z$

Unit 3

Integrals **(16 Hours)**

3.1 Cauchy-Goursat Theorem

3.2 Simply Connected Domains

3.3 Multiply Connected Domains

3.4 Cauchy Integral Formula

3.5 An Extension of the Cauchy Integral Formula

3.6 Some Consequences of the Extension

3.7 Liouville's Theorem and the Fundamental Theorem of Algebra

3.8 Maximum Modulus Principle

Unit 4 **(16 Hours)**

Conformal Mapping

4.1 Preservation of Angles

4.2 Scale Factors

Aplications of Conformal Mapping

4.3 Two-dimensional Fluid Flow

4.4 The Stream Function

4.5 Flows Around a Corner and Around a Cylinder

Series

4.6 Taylor Series

4.7 Laurent Series

Unit 5 **(16 Hours)**

Residues and Poles

5.1 Isolated Singular Points

5.2 Residues

5.3 Cauchy's Residue Theorem

5.4 Residue at Infinity

5.5 The Three Types of Isolated Singular Points

5.6 Residues at Poles

5.7 Zeros of Analytic Functions

5.8 Zeros and Poles

Applications of Residues

5.9 Evaluation of Improper Integrals

5.10 Definite Integrals Involving Sines and Cosines
5.11 Argument Principle
5.12 Rouche's Theorem

BOOKS FOR STUDY

Brown J.W. and R.V. Churchill. *Complex Variables and Applications*. New York: McGraw Hill Education, International Edition 1990, Eleventh reprint 2018.

Chapter 2 Sections 12, 18, 19, 21 - 26
Chapter 3 Sections 29 - 31
Chapter 4 Sections 46 - 54
Chapter 5 Sections 57 - 62
Chapter 6 Sections 68 – 75, 76 (Concepts and problems only)
Chapter 7 Sections 78, 79, 85 - 87
Chapter 8 Sections 90 - 96
Chapter 9 Sections 101, 102, 104
Chapter 10 Sections 113 - 115 (Concepts and examples only)

BOOKS FOR REFERENCE

Arumugam S., A.T. Issac, and A. Somasundaram. *Complex Analysis*. Chennai: Scitech, 2001 Reprint 2019.

Dennis G Zill, *First Course in Complex Analysis With Applications*, Second Edition, Jones and Bartlett, 2010.

Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, New Delhi: Wiley India (P) Ltd., 2006.

John H Mathews, *Complex Analysis for Mathematics and Engineering*, New Delhi: Narosa, 2006.

Karunakaran,V, Desai A.R, *Complex analysis*, New Delhi: Narosa, New Delhi, 2005.

WEB RESOURCE

http://www.malinc.se/math/geogebra/complex_numbersen.php

PATTERN OF ASSESSMENT

Theory: 70% ; Problems: 30%

Continuous Assessment: **Total Marks: 50** **Duration: 90 minutes**
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: **Total Marks: 50**
Seminars
Quiz
Problem Solving
Theorem Writing Technique

End-Semester Examination: **Total Marks: 100** **Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

PRINCIPLES OF MECHANICS

CODE: 19MT/MC/PM65 **CREDITS: 5**
L T P: 5 1 0
TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To understand the concept of different forces and moments and their equilibrium with reference to a coordinate system
- To widen appreciation of the variety of phenomena covered by mechanics and the techniques available to handle them
- To provide an adequate foundation for further self-study

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the concepts of Statics and Dynamics applicable in real life
- have acquired wide knowledge of handling problems related to Mechanics
- have acquired sufficient knowledge for further studies in Mechanics at a higher level

Unit 1 **(16 Hours)**

Forces acting on a Particle – Concurrent Forces

1.1 Forces
1.2 Types of Forces
1.3 Parallelogram Law of Forces
1.4 Triangle Law of Forces
1.5 Polygon Law of Forces
1.6 Lami's Theorem
1.7 Conditions of Equilibrium of any Number of Forces Acting on a Particle

Unit 2 **(17 Hours)**

Non-Concurrent Coplanar Forces

2.1 Moment of a Force about a Point and a Line
2.2 Parallel Forces
2.3 Varignon's Theorem
2.4 Couples
2.5 Properties of Couples
2.6 Coplanar Forces
2.7 Reduction of any Coplanar System of Forces
2.8 Conditions of Equilibrium
2.9 Equilibrium of Three Forces Acting on a Rigid Body

Unit 3 **(15 Hours)**

Friction

3.1 Laws of Statical Friction
3.2 Coefficient of Friction
3.3 Angle of Friction
3.4 Cone of Friction
3.5 Law of Kinetic Friction
3.6 Equilibrium of a Particle on an Inclined Plane
3.7 Condition for Sliding and Toppling

Unit 4 **(16 Hours)**

Equilibrium of Strings and Chains

4.1 Equilibrium of Strings and Chains
4.2 Common Catenary
4.3 Suspension Bridge

Linear Motion in a Resisting Medium

4.4 Equations of Motion of a Particle Falling under Gravity in a Resisting Medium under Law of Resistance mkv, mkv^2
4.5 Limiting Velocity

Unit 5 **(15 Hours)**

Rigid Body Dynamics

5.1 Moment of Inertia
5.2 Theorem of Parallel and Perpendicular Axes (statements only)
5.3 Moment of Inertia of Simple Standard Bodies
5.4 Motion of a Rigid Body
5.5 Rotation about a Fixed Axis
5.6 Expressions for Kinetic Energy
5.7 Angular Momentum
5.8 Equation of Motion

BOOKS FOR STUDY

Dharmapadam A.V. *Statics,* Chennai: S. Viswanathan, 2006.

Chapter 1 Sections 1.1 – 1.3
Chapter 2 Sections 2.1 – 2.10, 2.12 – 2.14
Chapter 3 Sections 3.1 – 3.8
Chapter 5 Section 5.1 – 5.3

Dharmapadam A.V. *Dynamics,* Chennai: S. Viswanathan, 2006.

Chapter 8 Section 8.1, 8.2, 8.5, 8.6, 8.7
Appendix II and Appendix III

BOOKS FOR REFERENCE

Pandit Ashok S. *Mechanics.* New Delhi: Narosa, 2001.

Duraipandian P, Laxmi Duraipandian, Muthamizh Duraipandian, *Mechanics,* New Delhi: S.Chand, 2018

Raisinghania M.D., *Dynamics*, New Delhi: S. Chand, 2006.

Vittal P.R.,*Statics*, Margham Publications, Chennai, 2008.

Kakani,S.L, *Mechanics*, New Delhi: Viva, 2005.

Hans H.S, *Mechanics*, New Delhi: Tata McGraw, 2003.

WEB RESOURCES

https://physics.gurumuda.net/moment-of-force-problems-and-solutions.htm
https://www.iit.edu/arc/workshops/pdfs/Moment_Inertia.pdf
http://www.physicsclassroom.com/class/newtlaws/Lesson-2/Types-of-Forces

PATTERN OF ASSESSMENT

Theory: 50%; Problems: 50%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving/ Exhibition

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF VALUE EDUCATION

SYLLABUS

(Effective from the academic year 2019–2020**)**

LIFE SKILLS : AN APPROACH TO A HOLISTIC WAY OF LIFE

CODE:19VE/SS/HL63 **CREDITS:3**

L T P:3 0 0

TOTAL TEACHING HOURS:39

OBJECTIVES OF THE COURSE

- To help students grow in spirituality and to experience themselves as integrated persons
- To help students understand themselves as relational beings and appreciate their role in family and society
- To help students recognize the commonality and differences of the different religious in India
- To help students grow in an awareness of the protective laws regarding women
- To prepare students to make informed choices in family and career

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- Appreciate themselves as integrated persons
- Recognize their role in family and society and become aware of the different protective laws in favour of women
- Make prudent choices for career and family
- Manage work life balance
- Live a harmonious life and be a channel of peace

Unit 1

Spiritual Self **(10 Hours)**

1.1 Understanding spirituality-Understanding the Spiritual side of oneself

1.2 Role of religious practices and growing in spirituality

1.3 Acceptance of self – self-identity, self-worth, self-respect, self-appreciation and self- presentation

1.4 Nurturing self - being at home with self, being able to connect with the inner self

1.5 Relationship with the Divine:
Discovering the Divine in self, creation, and others – St. Francis of Assisi- Canticle of creatures Seeking the Divine through meditation, prayer and worship

Unit 2

Relational Self: Women in the family **(17 Hours)**

2.1 Understanding one's self in the context of family

2.2 Family networks

2.3 Family time – prayer, meals, and relaxation

2.4 Family and social values: respect for others, understanding individual needs and responsibilities – give and take
2.5 Understanding different parenting styles – authoritarian, permissive and democratic
2.6 Appreciating the gift of womanhood – foundress-Mary of the Passion's vision of womanhood
2.7 Opting for marriage, single, religious or a life committed to a cause
2.8 Marriage and family, choice of life partner, marital relationships, planning of family
2.9 Other types of relationships - pre-marital relationships, live-in relationship and LGBT issues
2.10 Roles and responsibilities of women as home makers and career woman, work life balance (WLB)
2.11 Marriage as a sacred bond and fidelity in marriage

Unit 3

Integrated Self **(12 Hours)**

3.1 Integrating the spiritual, relational, social/political self
3.2 Integrating one's past with the present and the future for holistic living
3.3 Social Issues- crimes against women, harassment, gender discrimination, dowry, abortion, separation, divorce and cyber-crimes
3.4 Legal rights of women-property, marital and adoptive rights
3.5 Sensitization to different religions and religious practices in family and society
3.6 Challenges of inter caste and inter religious marriages
3.7 Integration of self with family, community and society

Retreat/Workshop – Required for course completion.

BOOKS FOR REFERENCE

Davidar(Eds). Human Values. All India Association of Christian Higher Education. (AIACHE) New Delhi: 2013.

James, G.M. et.al. In Harmony-Value Education at College Level. Chennai: Prakash, 2011.

James, G.M. Personality Development For Life Issues and Coping Strategies. Chennai: 2011

Teaching / Learning Methods

Lectures /Group Discussions/Presentations/Seminars/Guest Lectures

PATTERN OF ASSESSMENT: **Marks: 50**

Task based/Seminars/Poster Making/Scrap book/Assignment

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE BRANCH I - MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

OPTIMIZATION TECHNIQUES

CODE: 19MT/ME/OT45 **CREDITS: 5**
L T P: 5 0 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To formulate linear programming problem for simple mathematical models
- To develop mathematical skills to analyse and solve linear programming and network models arising from a wide range of applications

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- develop a general understanding of the Operations Research methodology to decision making
- identify best techniques to solve a specific problem in linear model of OR
- gain knowledge to apply CPM and PERT techniques, to plan, schedule, and control project activities.

Unit 1 **(14 Hours)**

Linear Programming

1.1 Formulation of Linear Programming Problems
1.2 Graphical Method of Solution
1.3 Canonical and Standard Form
1.4 Simplex Method
1.5 Artificial Variable Technique: Big-M Method

Unit 2 **(14 Hours)**

Duality in LPP

2.1 Formulation of Dual LPP
2.2 Characteristics of the Dual Problem
2.3 Primal-Dual Optimal Solutions

Transportation Model

2.4 Introduction and assumptions to the Model
2.5 Matrix Terminology
2.6 Formulation and Solution of Transportation Model
    Least Cost method
    Vogel's Approximation method
    MODI's Optimality Test
2.7 Variants in Transportation Problems

Unit 3 **(12 Hours)**

Assignment Model

3.1 Formulation and Solution of the Assignment Models
3.2 Mathematical Representation of Assignment Models

3.3 Comparison with Transportation Model
3.4 Hungarian Method for Solution of the Assignment Problems
3.5 Travelling Salesman Problem
Sequencing Models and Related Problems
3.6 Sequencing Problems – Assumptions in Sequencing Problems
3.7 Processing *n* Jobs through One Machine (SPT rule only)
3.8 Processing *n* Jobs through Two Machines

Unit 4 **(13Hours)**

Theory of Games
4.1Theory of Games
4.2 Characteristics of Games
4.3 Game Models – Definitions
4.4 Rules for Game Theory
4.4.1 Rule 1: Look for a Pure Strategy
4.4.2 Rule 2: Reduce Game by Dominance
4.4.3 Rule 3: Solve for a Mixed Strategy
4.5 Mixed Strategies (2×2 Games) – Mixed Strategies ($2 \times n$ games or $m \times 2$ games)

Unit 5 **(12 Hours)**

Network Analysis in Project Planning
5.1 Project – Project Planning – Project Scheduling – Project Controlling
5.2 W.B.S. – Basic Tools and Techniques of Project Management
5.3 Role of Network Techniques in Project Management
5.4 Network Logic-Numbering the Events
5.5 Activity on Node Diagram
5.6 Merits and Demerits of AON Diagram
5.7 Critical Path Method: Measure of Activity – Time Units
5.8 Critical Path Analysis
5.9 The Three Floats. PERT: Time Estimates
5.10 Frequency Distribution Curve for PERT – Probability of Completing the Whole Project by a given Time

BOOK FOR STUDY

Gupta, Premkumar and Hira D.S. *Operations Research***,** New Delhi**:** S.Chand, 2007.

Chapter 2	Section 2.6, 2.9 – 2.14, 2.16 – 2.17.1
Chapter 3	Section 3.1 – 3.6
Chapter 4	Section 4.1 – 4.3, 4.5 – 4.7, 4.10
Chapter 5	Section 5.1 – 5.4
Chapter 6	Section 6.1 – 6.2 (Exclude 6.1-3)
Chapter 9	Section 9.10 – 9.19
Chapter 14	Section 14.1 – 14.13

BOOKS FOR REFERENCE

Ackoh R.L, *Fundamentals of Operations Research*, New Delhi: Vikas, 1984.

Panneerselvam, R. *Operations Research*. New Delhi : Prentice-hall, 2002.

Ravindran, A., Don. T. Phillips, and James J. Solberg. *Operations Research-Principles and Practice.* 2nd ed. New York: John Wiley, 1987.

Richard Bronson, Govindaswami Naadimuthu, *Schaum's Outlines Operations Research* New Delhi : Tata McGraw Hill, 2011.

Swarup Kanti, Gupta P.K., Man Mohan, *Operations Research*, New Delhi: Sultan Chand, 2009.

WEB RESOURCES

https://www.pitt.edu/~jrclass/or/or-intro.html
http://www.businessmanagementideas.com/personnel-management/operation-research/operation-research-definition-scope-and-techniques/6556
https://nptel.ac.in/courses/110104073/24

PATTERN OF ASSESSMENT
Theory: 20% ; Problems: 80%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Quiz/Project/Assignments/Problem Solving

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH – I – MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

PROJECT

19MT/ME/PR45 **CREDITS : 5**

PREPARATION OF PROJECT

The project shall contain around 25 pages and shall be typed with double spacing. The format is as follows:

1. Cover page shall contain
   a) Title of the project
   b) Project submitted at the elective level for the B.Sc. Degree course in the IV semester
   c) Name of the Candidate
      Department number
   d) Department of Mathematics
      Stella Maris College (Autonomous), Chennai – 600 086
   e) Month, Year

2. The project shall contain
   a) Contents page
   b) At least 2 chapters including an introductory chapter (comprising motivation, basic concepts needed / used in the project and outline of the project)
   c) Conclusions / interpretations arrived at may be given at the end of each problem in the chapter concerned
   d) List of figures / list of abbreviations (if needed) shall be given as an appendix
   e) Bibliography shall be given in alphabetical order at the end in MLA format

3. Each candidate may prepare 3 copies of the project, one copy for her and submit 2 copies to the Head of the department before the commencement of the fourth semester examination.

4. The candidate may be advised that the project will be valued based on the criteria of
   a) Motivation towards the chosen area
   b) formulation of the problem
   c) Methodology, analysis, logic and reasoning
   d) Capacity to interpret the results obtained

5. Internal Assessment will be based on Drafts I and II during the semester

6. The Controller of Examination is requested to arrange for the valuation of the Project as well as the conduct of the Viva – Voce at the college where the candidates take examinations, within two weeks of the last date of examination for B.Sc. degree. The panel of examiners will consist of an internal-external examiner and the Supervisor.

   The guidelines for the Viva-Voce examiners would be that

   a) They will satisfy themselves that this is a work of the candidate as certified by the department
   b) The project is in the given format and
   c) The candidate has clear understanding of the concepts, discussed in the project.

The department should certify as follows:

This is to certify that the project in the broad area _____ titled _____ is submitted by _____ at the elective level for the degree of Bachelor of Science (Mathematics) during the year _____

sd/ sd/

Head of the Department Supervisor

PATTERN OF ASSESSMENT: **(Totally Internal - No End semester Examination)**

Total marks: 100 marks

Continuous Assessment:

Project : 25 marks

Draft I

Drafts II

External Evaluation:

Project (Final) : 50 marks

Viva-Voce : 25 marks

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH – I – MATHEMATICS

SYLLABUS

(Effective from the academic year 2019-2020)

ELEMENTS OF SPACE SCIENCE

CODE: 19MT/ME/ES45 **CREDITS: 5**

L T P: 5 0 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To explore the new vistas of the universe governed by mathematics
- To visualize application of mathematics in space science

COURSE LEARNING OUTCOME

On successful completion of the course, students will be able to

- acquire the knowledge of the concepts governed by mathematics to the universe
- visualize the real time application of mathematics in space science
- spot the celestial bodies in the sky by naked eye / binoculars / telescopes

Unit 1

Spherical Trigonometry **(12 Hours)**

1.1 Spherical Trigonometry
1.2 Spherical Triangle- Polar Triangle -Definition
1.3 Some properties of spherical triangles
1.4 Relations between the Sides and Angles of a Spherical Triangle- Cosine, sine, cotangent Formula, Supplemental cosine Formula, Five Parts Formula, Napier's Formula (statements only)
1.5 Napier's analogies
1.6 Napier's Rules
1.7 Simple worked examples based on the concepts only

The Earth

1.8 Dip of Horizon and effects of Dip
1.9 Twilight-Duration of Twilight – Civil, Nautical and Astronomical Twilights

Unit 2 **(11 Hours)**

Celestial Sphere, Diurnal Motion

2.1 Celestial Sphere, Diurnal Motion- Celestial axis, Celestial Equator - Celestial Horizon, Celestial Meridian
2.2 Cardinal points - Declination circles – Verticals – Parallactic angle
2.3 Annual motion of the sun – First point of Aries and first point of Libra
2.4 Celestial Co-ordinates
2.5 To Represent the Different System of Coordinates in the Same Figure
2.6 To find the Relation between Right Ascension and Longitude of the Sun
2.7 To find the Longitude of Sun on any Day
2.8 Latitude of a place
2.9 To find the Right Ascension and Declination of a Body

2.10 To find the Hour Angle of a Body at Rising or Setting
2.11 Morning and evening stars – Circumpolar stars

Unit 3 **(13 Hours)**

Refraction

3.1 Astronomical refraction - General effects of refraction
3.2 To find the Effect of Refraction on the Right Ascension and Declination of a Star
3.3 Horizontal Refraction – Effect of Refraction on Dip and Distance of Visible Horizon, Influence of Temperature and Pressure of Atmosphere on Refraction
3.4 Simple worked examples

Geocentric parallax

3.5 Geocentric Parallax – Effects of geocentric parallax
3.6 Changes in Right Ascension and Declination of a Body due to Geocentric Parallax, Effect of Geocentric Parallax on the Rising and Setting of a Celestial Body
3.7 Angular Diameter-To find relation between horizontal parallax and angular radius of a body
3.8 Geocentric Parallax and Refraction compared - Equatorial Horizontal Parallax
3.9 Simple worked examples

Heliocentric parallax

3.10 Heliocentric Parallax (concept only) - Effect of heliocentric parallax

Aberration

3.11 Aberration of a Star - Effect of Aberration, Comparison of Aberration and Stellar Parallax, Different kinds of Aberration

Unit 4 **(13 Hours)**

Kepler's Laws

4.1 Kepler's laws of planetary motion
4.2 To Calculate the Eccentricity of the Earth's Orbit around the Sun
4.3 Verification of Kepler's law - Newton's deduction from Kepler's laws, To derive Kepler's third law from Newtons law of gravitation
4.4 To find the mass of a planet

Eclipse

4.5 Lunar eclipse – Solar eclipse
4.6 Condition for the Occurrence of Lunar and Solar Eclipse
4.7 Ecliptic Limits - Maximum and Minimum Number of Eclipses near the Node of Lunar Orbit, Maximum Number of Eclipses in a Year
4.8 Eclipse Seasons - Effect of Refraction on a Lunar Eclipse – Importance of total solar eclipse
4.9 Occultations

Planetary Phenomena

4.10 Elongation of a planet
4.11 Direct and Retrograde Motions of Planets (Geocentric motion of planets)
4.12 To find Positions of Two Planets when they are Stationary as seen from each other

Unit 5 **(11 Hours)**

Conversion of Time

5.1 Relation between Sidereal Time and Mean Time
5.2 Conversion of Sidereal Time into Mean Solar Time and vice versa

5.3 Standard times
5.4 The difference between local times
5.5 Simple worked examples based on the concepts only

Sky Observation **(5 Hours)**

Stars and Consellations
Moon
Planets
Eclipse (depends on the occurrence)
Comets, Asteroids and Meteors

BOOKS FOR STUDY

Kumaravelu S., Susheela Kumaravelu, *Astronomy***,** Sivakasi: A. Bhaskara Selvan, 2005.

Chapter 1 Sections 3, 7, 8, 13, 14, 17, 20 – 25, 29, 32
Chapter 2 Sections 40 - 45, 49 - 53, 56, 57, 60 - 64, 66, 68, 72 - 76, 80, 81
Chapter 3 Sections 106,109, 111, 112,116
Chapter 4 Sections 119, 121, 124,131,133,134
Chapter 5 Sections 135 - 138, 141, 144, 145
Chapter 6 Sections 146, 149,150,153-155
Chapter 7 Sections 180-186
Chapter 8 Sections 190, 191
Chapter 9 Sections 195, 196, 202, 203
Chapter 13 Sections 258, 259, 262, 267 - 269, 272, 273, 276, 279, 282, 284
Chapter 14 Sections 285, 288, 289, 298, 299, 300, 301

John Scalzi, *The Rough Guide to Universe,* London: Rough Guides Ltd., 2003.
(only for Sky Observation)

BOOKS FOR REFERENCE

Bhatia, V.B., *Text Book of Astronomy and Astrophysics with elements of Cosmology***,** New Delhi: Narosa, 2001.

Ramachandran, G.V., *A Text Book of Astronomy***,** Madurai: Denobili, 1972.

Sidwick, *Introducing Astronomy***,** London : Faber & Faber, 1957.

Smart, W.M., *Stellar Dynamics,* London : Cambridge, 1938.

Smart, W.M., *Some Famous Stars,* London : Orient Longman, 1956.

Smart, W.M., *A Text Book on Spherical Astronomy,* London : Cambridge, 1997.

WEB RESOURCES

http://www.skyandtelescope.com
https://twitter.com/skyandtelescope/
http://www.livescience.com/space/
http://www.universetoday.com/
http://www.sciencedaily.com/news/space_time/astronomy/

PATTERN OF ASSESSMENT

Theory: 80%; Problems: 20%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Section A: 3×2 = 06 (Three questions to be set)
Section B: 3×8 = 24 (Four questions to be set)
Section C: 1×20= 20 (Two questions to be set)

Other Components: Total Marks: 50
Quiz/Assignments/Presentation

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Section A: 10×2 = 20 (Twelve questions to be set selecting at least two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH I - MATHEMATICS

SYLLABUS
(Effective from the academic year 2019-2020)

NUMERICAL METHODS WITH PROGRAMS IN C
(Theory and Practical)

CODE: 19MT/ME/NM45 **CREDITS: 5**
L T P: 4 0 2
TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

- To expose the standard numerical techniques as a powerful tool in scientific computing
- To enhance the abilities of students to solve problems with the aid of computer

PRE-REQUISITES

Knowledge of C Programming

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the basic principles of scientific and engineering programming
- acquire knowledge of developing algorithms for matrix algebra, numerical solution of ordinary differential equations and for finding roots of non-linear equations
- efficiently use the techniques, skills, and computational skills to solve real time numerical problems

Unit 1 **(10 Hours)**

Numerical Solutions of Algebraic and Transcendental Equations

1.1 Bolzano's Bisection Method
1.2 Newton Raphson Method

Iterative Methods of Solving Simultaneous Equations

1.3 Jacobi's Method
1.4 Gauss Seidel Iteration Method

Practical **(6 Hours)**

1.5 C program to find the Smallest Positive Root / the Largest Negative Root of the equation $f(x) = 0$ by using the Bisection Method and Newton Raphson Method
1.6 C program to solve a System of Linear Algebraic Equations using Gauss Jacobi's Iteration Method and Gauss Siedel Method

Unit 2 **(12 Hours)**

Finite Differences

2.1 Forward Differences
2.2 Backward Differences
2.3 Central Differences

Interpolation with Equal Intervals

2.4 Gregory-Newton's Forward and Backward Interpolation Formulae

2.5 Central Difference Interpolation Formulae – Gauss Forward and Backward Interpolation Formulae, Stirling's Interpolation Formula

Interpolation with Unequal Intervals

2.6 Lagrange's Interpolation Formula for Unequal Intervals

Practical **(6 Hours)**

2.7 C program to Interpolate and Extrapolate using the given pairs of values of *x* and *y* by Newton's Forward and Backward Interpolation Formulae

2.8 C program to Interpolate using the given pairs of values of *x* and *y* by Stirling's Central Difference Interpolation Formula

2.9 C program to Interpolate y using the given pairs of values of *x* and *y* by Lagrange's Interpolation Formula

Unit 3 **(10 Hours)**

Numerical Differentiation

3.1 Values of the Derivatives of *y* based on Newton's Forward and Backward Interpolation Formulae, Stirling's Formula

3.2 Second Order Derivatives of *f(x)* using Newton's Formulae - Maximum and Minimum Value of *f(x)*

Practical **(4 Hours)**

3.3 C program to find the Derivative at the Initial Point of a Tabulated Function by Newton Forward and Backward Interpolation Formula

Unit 4 **(10 Hours)**

Numerical Integration

4.1 Newton Cote's Quadrature Formula

4.2 Trapezoidal Rule

4.3 Simpson's One Third Rule

4.4 Simpson's Three Eighth Rule

Practical **(4 Hours)**

4.5 C program to Evaluate $\int_a^b f(x)dx$ numerically using Trapezoidal and Simpson's rule

Unit 5 **(10 Hours)**

Application

5.1 Numerical Solution to Ordinary Differential Equations

5.2 Euler's Method

5.3 Runge Kutta Method

Practical **(6 Hours)**

5.4 C program to Solve the Differential Equation $\frac{dy}{dx} = f(x, y)$; $y(x_0) = y_0$ at the Pivotal Points by Euler's Method

5.5 C program to Solve Simultaneous Differential Equations $\frac{dy}{dx} = f(x, y, z)$; $\frac{dz}{dx} = g(x, y, z)$; $y(x_0) = y_0$, $z(x_0) = z_0$ at the specified pivotal points by using Runge Kutta Method of the Fourth Order

BOOKS FOR STUDY

Veerarajan T. and Ramachandran T., *Numerical Methods,* New Delhi: McGraw Hill, 2019.
Chapter 3: Sec. 3.2, 3.4
Chapter 4: Sec. 4.5
Chapter 5: Sec. 5.1 – 5.3
Chapter 6: Sec. 6.1 – 6.7
Chapter 7: Sec. 7.6
Chapter 8: Sec. 8.1– 8.3, 8.28
Chapter 10: Sec. 10.16

BOOKS FOR REFERENCE

Gupta B.D., *Numerical Analysis,* New Delhi **:** Konark Publishers Pvt. Ltd, 2000.

Kamala R.S., Solairaj A., Ganesh S., Jansi Rani P.G., *Numerical Method***,** Kumbakonam : Anuradha, 2003.

Kandasamy P.K., Thilgavathy K., Gunavathy, *Numerical Methods***,** New Delhi: S. Chand 2006.

Venkatachalapathy S.G., *Calculus of Finite Differences and Numerical Analysis*, Chennai: Margham Pub., 2003.

WEB RESOURCES
https://numericalmethodstutorials.readthedocs.io/en/latest/
https://www.sanfoundry.com/c-program-solve-linear-equation-one-variable/
https://nptel.ac.in/courses/122106033/

PATTERN OF ASSESSMENT

Derivation: 20%; Problems: 80%

Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes
Theory: (45 minutes)
Section A: $3 \times 2 = 06$ (Three questions to be set)
Section B: $3 \times 8 = 24$ (Four questions to be set)
Practical: (45 minutes)
Section C: $1 \times 20 = 20$ (Two questions to be set)

Other Components: Total Marks: 50
Seminars/Assignments/Problem Solving /Program Writing Technique

End-Semester Examination: **Total Marks: 100 Duration: 3 hours**
Theory: (105 minutes)
Section A: $10 \times 2 = 20$ (Twelve questions to be set selecting atleast two from each unit)
Section B: $5 \times 8 = 40$ (Seven questions to be set without omitting any unit)
Practical: (75 minutes)
Section C: $2 \times 20 = 40$ (Three questions to be set)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

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SYLLABUS

(Effective from the academic year 2019-2020)

THE FASCINATING WORLD OF MATHEMATICS

CODE: 19MT/GE/WM22 **CREDITS : 2**

L T P : 2 0 0

TOTAL TEACHING HOURS: 26

OBJECTIVES OF THE COURSE

- To introduce some Indian Mathematicians and their contributions
- To understand Mathematics through puzzles and paradoxes
- To cite a few real life applications through Mathematical models

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have acquired knowledge of some Indian Mathematicians and their contributions
- understand Mathematics through puzzles and paradoxes
- visualize a few real life applications through Mathematical models

Unit 1 **(10 Hours)**

Some Indian Contributors to Mathematics

1.1 Baudhayana
1.2 Aryabhata
1.3 Bhaskara I
1.4 Shridhara
1.5 Bhaskara II
1.6 Srinivasa Ramanujan
1.7 A.A. Krishnaswami Ayyangar
1.8 Ramaswamy S. Vaidyanathaswamy
1.9 Alladi Ramakrishnan
1.10 P.C. Mahalanobis
1.11 C. R. Rao
1.12 Harish Chandra
1.13 C. S. Seshadri
1.14 Sakunthala Devi
1.15 S. R. Srinivasa Varadhan
1.16 R. Parimala
1.17 Other Contemporary Mathematicians

Unit 2 **(9 Hours)**

Mathematical Puzzles and Paradoxes

2.1 Magic Squares
2.2 Sleeping Beauty Puzzle

2.3 Monty Hall Probability Puzzle
2.4 Crossword
2.5 Number Puzzles by Shakuntala Devi
2.6 Missing Square Paradox
2.7 Potato Paradox
2.8 Zeno's Paradox
2.9 Necktie Paradox
2.10 Three Prisoner's Paradox
2.11 Boy or Girl Paradox
2.12 Sorites Paradox
2.13 Elevator Paradox
2.14 Barber's Paradox

Unit 3 **(7 Hours)**

Project

3.1 Mathematical Model – Applications of Mathematics in real life

BOOKS FOR STUDY AND REFERENCE

Anne Rooney, *The Story of Mathematics*, China: Arcturus, 2008.

George Gheverghese Joseph, *The Crest of the Peacock Non-European Roots of Mathematics*, Chennai: East-West, 1990.

Kapur J.N., *IXOHOXI*, New Delhi: Mathematical Sciences Trust Society, 1998.

Kapur J.N., *Mathematical Games for All*, New Delhi: Mathematical Sciences Trust Society, 1998.

Kapur J.N., *Some Eminent Indian Mathematicians of Twentieth Century*, New Delhi: Mathematical Sciences Trust Society, 1994.

Ye.I.P. Perelman, *Mathematics can be Fun*, Mir Publishers Moscow: 1973, English Translation, 1985.

Shakuntala Devi, *Puzzle to puzzle you*, New Delhi: Orient Paperbacks, 1976, 45th Edition, 2014.

Shakuntala Devi, *Figuring – The Joy of Numbers*, New Delhi: Orient Paperbacks, 1986.

WEB RESOURCE

www.samloyd.com, Mathematical puzzles of Sam Loyd.

PATTERN OF ASSESSMENT: (Totally Internal)
Theory: 20%; Problem: 80%
Continuous Assessment Test: Total Marks: 25 marks Duration: 40 minutes
Section A: 5 × 2 = 10 marks (Choose five from six questions)
Section B: 3 × 5 = 15 marks (Choose three from five questions)

Other Components: Total marks: 25
Quiz/Assignment/Problem Solving

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SYLLABUS

(Effective from the academic year 2019-2020)

CELESTIAL WONDERS

CODE:19MT/GE/CW22 **CREDITS : 2**

L T P : 2 0 0

TOTAL TEACHING HOURS : 26

OBJECTIVES OF THE COURSE

- To give insight into astronomy and familiarize with the recent events in space
- To introduce feature of planet, sun, moon and stellar universe

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- acquire some basic knowledge in astronomy
- have understood feature of planet, sun, moon and stellar universe
- explore and study the recent events in space

Unit 1 **(9 Hours)**

Celestial Sphere and Diurnal Motion

1.1 Celestial Sphere
1.2 Diurnal Motion – Celestial Axis and Equator
1.3 Celestial Horizon
1.4 Zenith and Nadir - Celestial Meridian
1.5 Cardinal Points - Different Hemispheres
1.6 Visible and Invisible Hemispheres
1.7 Declination Circles, Verticals
1.8 Rising and Setting
1.9 Transit or Culmination
1.10 Annual Motion of the Sun – First point of Aries, First point of Libra, Equinoxes and solstices
1.11 Circumpolar Stars

Unit 2 **(9 Hours)**

The Stellar Universe

2.1 The Milky Way Galaxy
2.2 Zodiacal Constellations
2.3 Stars – Double Stars, Multiple Stars and Variable Stars

Planetary Phenomena

2.4 Direct Motion and Retrograde Motion
2.5 Stationary Points

The Solar System

2.6 Sun, Planets, Comets, Meteors and Meteoroids

2.7 Astronomical Seasons on Earth
2.8 Celestial Calendar
2.9 Space Probes

Unit 3 **(8 Hours)**

Moon and Eclipses

3.1 Elongation - Conjunction, Opposition, Quadratures.
3.2 Daily Motion of the Moon - Age of Moon
3.3 Phase of Moon (definition only) - Successive Phases of Moon
3.4 Moon Exhibits the Same Side to the Earth
3.5 Surface Structure of Moon
3.6 The Tides - Tsunami.
3.7 Types of Eclipses – Lunar and Solar Eclipse (no derivations), Duration of a Solar Eclipse
3.8 Importance of Total Solar Eclipses
3.9 Comparison of Solar and Lunar Eclipses

Observation and Visit to Planetarium

Observation in College: Sun spots, planets, meteors, constellations, moon and its craters, comets and eclipses

BOOKS FOR STUDY AND REFERENCE

Kumaravelu S., Susheela Kumaravelu, *Astronomy*. Sivakasi: A.Bhaskara Selvan, Revised and Enlarged Edition 2005, Reprint 2009.

Bhatia, V.B, *Text Book of Astronomy and Astrophysics with elements of Cosmology***.** New Delhi: Narosa, 2001.

WEB RESOURCES

Newsletter: http://www.skyandtelescope.com & https://twitter.com/skyandtelescope
National Aeronautics and Space administration. News and features about NASA research. Newsletter
http://www.ndtv.com/topic/national-aeronautics-and-space-administration.
http://www.nasa.gov/news/index.html
http://www.livescience.com/space/
http://www.universetoday.com/
http://abcnews.go.com/Technology/Space
http://www.sciencedaily.com/news/space_time/astronomy/

PATTERN OF ASSESSMENT: (Totally Internal)
Theory: 20%; Problem: 80%
Continuous Assessment Test: **Total Marks: 25 marks** **Duration: 40 minutes**
Section A : 5 × 2 = 10 marks (Choose five from six questions)
Section B : 3 × 5 = 15 marks (Choose three from five questions)

Other Components: **Total marks: 25**
Quiz/Assignment/Problem Solving

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SYLLABUS
(Effective from the academic year 2019-2020)

AUTOMATA

CODE : 19MT/GE/AM22 **CREDITS : 2**
L T P : 2 0 0
TOTAL TEACHING HOURS:26

OBJECTIVES OF THE COURSE

- To familiarize students with the foundations and principles of theory of computations
- To introduce an abstract model of a computer with an exposure to applications of Automata theory

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- understand the connection between language and computations
- analyze the computational strength of machines
- recognize applications of Automaton

Unit 1 **(10 Hours)**

Introduction to the Theory of Computation

1.1 Mathematical preliminaries and notations, Sets, Functions and Relations
1.2 Graphs and Trees, Proof Techniques
1.3 Three Basic Concepts
1.4 Languages, Grammars and Automata
1.5 Some Applications

Finite Automata

1.6 Deterministic Finite Accepters
1.7 Deterministic Accepters and Transition Graphs
1.8 Languages and Dfas, Regular Languages
1.9 Nondeterministic Finite Accepters, Definition of a NDA
1.10 Why Nondeterminism?

Unit 2 **(8 Hours)**

Regular Languages and Regular Grammars

2.1 Regular Expressions
2.2 Languages Associated with RE
2.3 RE Denote RL , RE for RL
2.4 RG, Right- and Left-Linear Grammars

Context Free Languages

2.5 Context Free Grammar
2.6 Left Most and Right Most Derivations

Unit 3 **(8 Hours)**

Project

3.1 Application of Finite Automata and Formal Language
3.2 Design of Vending Machine
3.3 Document Language Design
3.4 Cryptography
3.5 DNA Computing

BOOK FOR STUDY

Peter Linz, *An Introduction to Formal Languages and Automata*, 3rd Edition. New Delhi: Narosa Publishing House, 2005.

BOOKS FOR REFERENCE

Rani Siromoney, *Formal Languages and Automata*. Madras: The Christian Literature Society, 1974.

Behera, Nayak and Pallnayak, *Formal Languages and Automata Theory.* New Delhi: Vikas, 2014.

Kamala Krithivasan and Rama. R., *Introduction to Formal Languages, Automata Theory and Computation*, Chennai: Pearson, 2009.

WEB RESOURCE

http://www.iitg.ernet.in/dgoswami/Flat-Notes.pdf
https://www.ics.uci.edu/~goodrich/teach/cs162/notes/
https://cs.stanford.edu/people/eroberts/courses/soco/projects/2004-05/automata-theory/apps.html
http://www.sti.uniurb.it/aldini/publications/lfga.pdf

PATTERN OF ASSESSMENT: (Totally Internal)

Theory 20%; Problem 80%

Continuous Assessment Test: **Total Marks: 25 marks** **Duration:40 minutes**
Section A : 5 × 2 = 10 marks (Choose five from six questions)
Section B : 3 × 5 = 15 marks (Choose three from five questions)

Other Components: **Total marks: 25**
Quiz/Assignment/Problem Solving

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

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SYLLABUS

(Effective from the academic year 2019-2020)

BASIC MATHEMATICS

CODE : 19MT/GE/BM22 **CREDITS: 2**

L T P: 2 0 0

TOTAL TEACHING HOURS: 26

ELGIBILTY CRITERION

Offered to those who had not studied Mathematics or Business Mathematics in their secondary level of education

OBJECTIVES OF THE COURSE

- understand some advances in Matrices
- familiarize the basics of Differentiation and Integration
- learn further theory of equations

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- have acquired some advanced knowledge in Matrices
- have understood basics of Differentiation and Integration
- explore further in the theory of equations

Unit 1 **(8 Hours)**

Matrices

1.1 Matrices-Elementary Concepts
1.2 Evaluation of Determinant of a square matrix
1.3 Types of Matrices-Sum and product of Matrices
1.4 Inverse of a square matrix of order 2 and order 3
1.5 Rank of Matrix

Unit 2 **(10 Hours)**

Theory of Equations

2.1 Relation between roots and coefficients
2.2 Solution of equations under simple given conditions
2.3 Formation and solution of equations with imaginary and surd roots

Unit 3 **(8 Hours)**

Differential and Integral Calculus

3.1 Differential coefficient of $f(x)$ with respect to x - rules for differentiation
3.2 Differential coefficient of standard functions
3.3 Integration as the inverse process of differentiation
3.4 Integration of standard functions

BOOKS FOR STUDY AND REFERENCE

Manicavachgam Pillay, T.K., T. Natarajan, and K.S. Ganapathy. *Algebra Vol. II***.** Chennai : S. Vishwanthan printers and publishers Pvt. Ltd., 2006.

Manicavachgam Pillay, T.K., T. Natarajan, and K.S. Ganapathy. *Algebra Vol. I***.** Chennai : S. Vishwanthan printers and publishers Pvt. Ltd., 2006.

Venkataraman M.K., Manorama Sridhar, *Classical Algebra and Trigonometry*. Chennai: Sivasankar, 2001

Narayanan S., and T.K. Manicavachgam Pillay, *Ancillary Mathematics: Book II.* Chennai: S. Vishwanthan printers and publishers Pvt. Ltd., 2004 .

Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy. *Ancillary Mathematics Vol. I* Chennai : S.Vishwanthan printers and publishers Pvt. Ltd., 2007.

PATTERN OF ASSESSMENT: (Totally Internal)

Theory 20%; Problem 80%

Continuous Assessment Test: Total Marks: 25 Duration:40 minutes
Section A : 5 × 2 = 10 marks (Choose five from six questions)
Section B : 3 × 5 = 15 marks (Choose three from five questions)

Other Components: Total marks: 25
Quiz/Assignment/Problem Solving

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

B.Sc. DEGREE: BRANCH – I – MATHEMATICS

SYLLABUS
(Effective from the academic year 2019 -2020)

COMBINATORICS

CODE: 19MT/UI/CO23 **CREDITS: 3**

OBJECTIVES OF THE COURSE

- To introduce the concepts of permutations and combinations
- To introduce the notion of ordinary and exponential generating functions and to study recurrence relations

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- apply diverse counting strategies to solve varied problems involving combinations and permutations
- compute a generating function and apply them to combinatorial problems
- demonstrate competence to set up and solve recurrence relation

Unit 1

Basic Tools

1.1 The Sum Rule and the Product Rule
1.2 Permutations and Combinations
1.3 The Pigeonhole Principle
1.4 Solved Problems
- 1.4.1 The Sum Rule and Product Rule
- 1.4.2 Permutations and Combinations
- 1.4.3 The Pigeonhole Principle
- 1.4.4 Ramsey Numbers

Unit 2

Further Basic Tools

2.1 Generalized Permutations and Combinations
2.2 Sequence and Selections
2.3 The Inclusion – Exclusion Principle

Unit 3

Further Basic Tools (contd.)

3.1 Solved Problems
- 3.1.1 Generalized Permutations and Combinations
- 3.1.2 Sequence and Selections
- 3.1.3 The Inclusion – Exclusion Principle

Unit 4

Generating Functions and Recurrence Relations

4.1 Ordinary and Exponential Generating Functions

4.2 Partitions of a Positive Integer
4.3 Recurrence Relations

Unit 5

Generating Functions and Recurrence Relations (contd.)

5.1 Solved Problems

5.1.1 Ordinary Generating Functions

5.1.2 Partitions of Integer and Their Generating Functions

5.1.3 Exponential Generating Functions

BOOKS FOR STUDY

Balakrishnan V.K., *Schaum's Outlines COMBINATORICS including concepts of Graph Theory*, New Delhi: Tata McGraw-Hill, 2005.

BOOKS FOR REFERENCE

Cohen Daniel J.A. *Basic Techniques of Combinatorial Theory*, New York : North-eastern University. John Wiley, 1978

Krishnamurthy. V., *Combinatorics – Theory and Applications***,** New Delhi: Affiliated East West Press, 1989.

Chandrasekharaiah D.S., *Graph Theory and Combinatorics*, Chennai: Prism, 2005

WEB RESOURCE

https://mathigon.org/world/Combinatorics
https://brilliant.org/wiki/ramsey-theory/
https://www.whitman.edu/mathematics/cgt_online/book/section03.02.html
https://www.coursera.org/lecture/analysis-of-algorithms/exponential-generating-functions-WpbNx

PATTERN OF ASSESSMENT

Theory: 40% ; Problems: 60%

End-Semester Examination: Total Marks: 100 Duration: 3 hours

Section A: 10×2 = 20 (Twelve questions to be set selecting atleast two from each unit)
Section B: 5×8 = 40 (Seven questions to be set without omitting any unit)
Section C: 2×20= 40 (Three questions to be set without omitting any unit)