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**II SEMESTER**

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(From 2012 – 2013 onwards)

### III SEMESTER

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### IV SEMESTER

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<td>SBE – 2 Programming in Visual Basic</td>
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### V SEMESTER

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**TOTAL** 30 25

### VI SEMESTER

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<td>Core – 13</td>
<td>Numerical Methods and Discrete Mathematics</td>
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**TOTAL** 30 25

**Self Learning Courses:**

- **III Semester**: Solar System
- **IV Semester**: Stellar Universe
- **V Semester**: Statistical Methods in Social Sciences
- **VI Semester**: Mathematical Methods in Business
Objective: To appreciate the fundamental principles and to understand the different concepts and methods in Algebra and Trigonometry and to utilize them in solving problems.

Course Outline:

Unit 1: Summation of series using – Binomial, Exponential and Logarithmic series (21 hours)


Unit 3: Newton’s and Horner’s methods of finding roots up to two decimal places – inequalities – elementary methods – arithmetic, geometric and harmonic mean – some well-known inequalities (21 hours)

Unit 4: Expansion for \( \sin \theta, \cos \theta, \tan \theta, \sin n \theta, \cos n \theta \) and \( \tan n \theta \) - hyperbolic functions – inverse hyperbolic functions – logarithm of complex numbers (21 hours)

Unit 5: Summation of trigonometric series – difference method, angles in A.P method and C + iS method – Gregory series (21 hours)

Books for Study:

   Unit 1: Chapters 1.1, 1.2, 1.3

   Unit 2: Chapters 5.2, 5.3, 5.4, 5.5
   Unit 3: Chapter 5.10 and
   Chapter 4.1, 4.2, 4.3, 4.4, 4.5, 4.6
   Unit 4: Chapter 6.1, 6.2, and
   Chapter 7.1, 7.2 and
   Chapter 8.1
   Unit 5: Chapter 9.1, 9.2, 9.3, 9.4

Books for Reference:

Objective: To help the students to develop statistical skills so as to apply methods in solving real life problems

Course Outline:

Unit 1: Curve fitting – principle of least squares – straight line – second degree parabola – curves of the form \( y = ae^{bx} \) and \( y = ax^b \) – index numbers – simple index number – weighted index number – consumer price index numbers – conversion of chain base index into fixed base index and conversely (15 hours)

Unit 2: Correlation – Karl Pearson’s coefficient of correlation – rank correlation regression – regression lines – regression coefficients (15 hours)


Unit 4: Poisson distribution – moments of a Poisson distribution – fitting a Poisson distribution – Normal distribution – odd and even moments – fitting normal distribution using area and ordinate methods (15 hours)

Unit 5: Theory of attributes – consistency of data – independence and association of data (15 hours)

Text Book:
Unit 1: Chapters 5, 9
Unit 2: Chapter 6 (Except 6.4)
Unit 3: Chapter 12, 13.1
Unit 4: Chapter 13.2, 13.3
Unit 5: Chapter 8

Reference Books :
Allied Mathematics – I
(From 2015-16 onwards)
(A two-semester course for Physics and Chemistry Major Students)

Class : B.Sc. Physics & Chemistry  Part : III/Allied-1
Semester : 1  Hours : 75
Subject Code: 15UMAB11  Credits : 4

Objective : To give the basic concepts in differential calculus, trigonometry and algebra.

Course Outline:

Unit 1: Successive differentiation – Leibnitz’s theorem  (15 hours)
Unit 2: Curvature – radius of curvature – centre of curvature – radius of curvatures in polar coordinates – evolutes  (15 hours)
Unit 3: Trigonometry – expansions – hyperbolic functions – logarithm of complex numbers.  (15 hours)
Unit 4: Theory of equations – formations of equations - relation between the roots and the co-efficients – sum of the powers of the roots - Reciprocal equations – transformation of equations  (15 hours)
Unit 5: Groups – subgroups – cyclic groups – order of a group – order of an element  (15 hours)

Book for Study:

Books for Reference:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Calculus
(From 2015-2016 onwards)

Class : B.Sc. Mathematics Part : III/Core - 3
Semester : II Hours : 105
Subject Code : 15UMAC32 Credits : 6

Objective : To help the students to know the basic concepts in differentiation, integration and vector calculus and to use them to solve the real life problems

Course Outline:

Unit 1: Higher Derivatives - Leibinitz’s theorem and its applications - curvature – radius of curvature – centre of curvature – radius of curvature in polar coordinates – evolutes (21 hours)
Unit 2: Reduction formulae - double and triple integrals - Change of variables (21 hours)
Unit 3: Evaluation of improper integrals – Beta and Gamma functions - Fourier series (21 hours)
Unit 4: Vector calculus – vector differentiation – vector differential operator – gradient, divergence and curl and their properties – directional derivatives – solenoidal and irrotational fields (21 hours)
Unit 5: Vector integration – line, surface and volume integrals – Green’s, Stokes and Gauss theorems (no proof) and their applications (21 hours)

Books for Study:
   Unit 1  Chapter  2.11, 2.12(part-1) and  
   Chapter  3.4, 3.5(part-1)
   Unit 2  Chapter  2.8, 3.1-3.4(part-2)
   Unit 3  Chapter  4(part-1) and  
   Chapter  5(part-1)
   Unit 4  Chapter  5
   Unit 5  Chapter  7

Books for Reference :
Class : B.Sc. Mathematics
Semester : II
Subject Code : 15UMAC42

Objective : To help the students to develop Statistical skills so as to apply statistical methods in solving real life problems.

Course Outline:

Unit 1: Tests of significance (large samples) – sampling – sampling distribution – testing of hypothesis for large samples – tests of significance – proportions – means – standard deviation – correlation coefficient (15 hours)

Unit 2: Tests of significance (small samples) – tests based on t-distribution – tests based on F-distribution – tests for significance of an observed sample correlation (15 hours)

Unit 3: Tests based on $\chi^2$-distribution – population variance – goodness of fit – independence of attributes (15 hours)

Unit 4: Analysis of variance – one way classification – two way classification – Latin square design (15 hours)


Text Books:


Unit 1: Chapter 14
Unit 2: Chapter 15
Unit 3: Chapter 16
Unit 4: Chapter 17


Unit 5: Chapter 17.6

Reference Books


ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Allied Mathematics – II
(From 2015-2016 onwards)
(A two-semester course for Physics and Chemistry Major Students)

Semester : II  Hours : 75
Subject Code : 15UMAB22  Credits : 4

Objective : To introduce the basic concepts in integral calculus, vector calculus, and methods to solve differential equations

Course Outline:

Unit 1: Reduction formulae – Beta and Gamma functions – Fourier series (15 hours)
Unit 2: Vector calculus – differentiation of vectors – directional derivatives – gradient, divergence and curl and their simple properties – directional derivatives – solenoidal and irrotational fields (15 hours)
Unit 3: Vector integration – line, surface and volume integrals – Green’s, Stoke’s and Gauss theorems (Statements only) and their simple applications (15 hours)
Unit 4: Exact differential equations – equations of first order but of higher degree – solvable for p, y and x – Clairaut’s equations (15 hours)
Unit 5: Laplace transforms – solving differential equations using Laplace transforms (15 hours)

Text Books:

Reference Books:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Semester Examination Question Paper Pattern for Core, Core Electives,
Allied and Non-Major Electives

(To be implemented for students joined from 2013 onwards)

Note: Symbols, notations and treatment as in the text book

SECTION – A (5 x 1 = 5 marks)
All the FIVE questions have to be answered; one question from each unit
This section includes multiple choice questions, fill-ups and true or false.

SECTION – B (5 x 2 = 10 marks)
All the FIVE questions have to be answered; one question from each unit.
This section includes very short answer question.

SECTION – C (5 x 8 = 40 marks)
FIVE questions with internal choice, one question from each unit

SECTION – D (3 x 15 = 45 marks)
THREE questions have to be answered out of five questions. One question from each unit.
**Class**: B.Sc. Mathematics  
**Part**: III/Core-5  
**Semester**: III  
**Hours**: 75  
**Subject Code**: 12MAC135  
**Credits**: 5

**Objectives**: To appreciate the fundamental principles and to understand the basic concepts in sequences and series

**Course Outline**:

**Unit 1**: Limit of a sequence – convergence, divergence and oscillation – bounded sequences - monotonic sequences – algebra of sequences – Cauchy’s first limit theorem – Cesaro’s theorem – Cauchy’s second limit theorem

**Unit 2**: Subsequences – limit points – Cauchy sequences – Cauchy’s general principle of convergence for sequences

**Unit 3**: Convergence, divergence and oscillation of series – Cauchy’s general principle of convergence for series – tests for convergence of series of positive terms – comparison test

**Unit 4**: Kummer’s test (No Proof) – D’Alembert’s ratio test – Raabe’s test and Cauchy’s root test and condensation test

**Unit 5**: Alternating series – Leibnitz’s test – absolute convergence – Dirichlet’s test – Abel’s test

**Text Book**:


**Reference Book**:

ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514  
DEPARTMENT OF MATHEMATICS

Applications of Mathematics – Astronomy  
(From 2012-2013 onwards)

Class : B.Sc. Mathematics  
Semester : III  
Subject Code : 12MAA234

Part : III/Allied-3  
Hours : 75  
Credits : 4

Objectives: To introduce the basic concepts about celestial bodies and to impart the knowledge on duration of day and night and solar and lunar eclipses.

Course Outline:

Unit 1: Spherical trigonometry (formulae only) – celestial sphere – diurnal motion – sidereal day – different systems of coordinates – equinoxes, solstices, apparent annual motion of the sun – ecliptic – latitude of a place – hour angle of a star at rising – circumpolar star (15 hours)

Unit 2: Earth – dip – definition and effects – twilight – duration (15 hours)

Unit 3: Refraction – tangent and Cassini’s formula – effects of refraction on right ascension, declination, small vertical and horizontal arcs and on dip (15 hours)

Unit 4: Moon – phases of moon – sidereal and synodic month - eclipses – solar and lunar – occurrences – conditions for the occurrences – ecliptic limits – maximum and minimum number of eclipses in a year (15 hours)

Unit 5: Planetary motion – Bodes law – motion of inferior and superior planets – direct and retrograde motion – period of retrograde motion (15 hours)

Text Book:


Unit 1 : Chapter 2  
Unit 2 : Chapter 3  
Unit 3 : Chapter 4  
Unit 4 : Chapter 12, 13  
Unit 5 : Chapter 14
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Mathematics for Competitive Examinations
(From 2012-2013 onwards)
(This Course is meant for Economics, History, Philosophy and English Literature Major Students)

Class : B.A. (Other Arts)  Part : IV/NME-1
 Semester : III  Hours : 45
 Subject Code : 12MNEA32  Credits : 2

Objectives : To develop confidence among the arts students so as to enable them to appear any competitive examination.

Course Outline:

Unit 1: Highest common factor and least common multiple (9 hours)

Unit 2: Algebra (9 hours)

Unit 3: Ratio and proportions and partnership (9 hours)

Unit 4: Percentages (9 hours)

Unit 5: Simple interest – time and work (9 hours)

Text Book
Unit 1: Chapter 5
Unit 2: Chapter 9
Unit 3: Chapter 11
Unit 4: Chapter 13
Unit 5: Chapter 18, 21

Reference Book:
Solar System
(From 2012-2013 onwards)
(For all UG Programmes)

Objectives: To help the learner to understand the facts about the Sun and the planets and their surface structure.
To help the learner to understand the minor planets and to know the difference between planets and comets

Course Outline:

Unit 1: Introduction – planetesimal hypothesis – surface structure of the sun – solar constant

Unit 2: Surface structure of mercury - Venus and Mars

Unit 3: Discovery of the minor planets – Asteroids – surface structure of Jupiter and Saturn.

Unit 4: Discoveries of Uranus, Neptune and Pluto

Unit 5: Meteors – zodiacal light – difference between the planets and comets

Text Book:

Unit 1 : Chapters 14 sec 321, 322
Unit 2 : Chapters 14 sec 323 - 325
Unit 3 : Chapters 14 sec 326 - 328
Unit 4 : Chapters 14 sec 329 - 331
Unit 5 : Chapters 14 sec 332 - 334
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Mechanics
(From 2012-2013 onwards)

Class : B.Sc. Mathematics Part : III/Core-6
Semester : IV Hours : 75
Subject Code : 12MAC145 Credits : 5

Objectives : To help the learner to understand the fundamental concepts of mechanics and to introduce the applications of dynamics and statics

Course Outline:
Unit 1: Forces acting at a point – resultant and components – parallelogram law, triangle law and converse of triangle law – Lami’s theorem – resolution of a force – theorems on resolved parts (15 Hours)

Unit 2: Forces acting on a rigid body – parallel forces – resultant of two like and unlike parallel forces – moment of a force – Varignon’s theorem (15 Hours)

Unit 3: Equilibrium of strings – common catenary – shape of the catenary – parabolic catenary – simple problems (15 Hours)

Unit 4: Projectiles – path of a projectile is a parabola – range – range on an inclined plane (15 Hours)

Unit 5: Central orbits – differential equation of a central orbit – pedal equation – simple problems (15 Hours)

Text Books:
   Unit 1 : Chapter 2 Sections 1 – 16
   Unit 2 : Chapter 3 Sections 1 – 13
   Unit 3 : Chapter 11 Sections 1 – 9

   Unit 4 : Chapter 6 Sections 6.1 – 6.16
   Unit 5 : Chapter 11 Sections 11.5 – 11.13

Questions may be asked equally both in Theory and Problems

Reference Books:
Class : B.Sc. Mathematics  
Semester : IV  
Subject Code : 12MAA144 

Part : III/Allied-4  
Hours : 75  
Credits : 4

Objectives : To help the learners to solve standard types of ordinary and partial differential equations 

Course Outline: 
Unit 1: Exact differential equations – equations of first order but of higher degree – equations solvable for p, y and x – Clairuts’ equation (15 Hours) 
Unit 2: Linear equations of higher degree with constant coefficients – homogeneous linear equations – variation of parameters – simultaneous linear differential equations (15 Hours) 
Unit 3: Laplace transforms – solution of differential equations using Laplace transforms. (15 Hours) 
Unit 4: Partial differential equations – formation – solution – Lagrange’s method – standard forms – Charpits method (15 Hours) 
Unit 5: Applications – growth and decay – simple electric circuits – central forces – planetary motion – dynamical problems with variable mass (15 Hours)

Unit 1 : Chapters 1.3, 1.4, 1.7 
Unit 2 : Chapters 2.0 – 2.4, Type D in 2.5, 2.6 
Unit 3 : Chapters 3.0 – 3.3 
Unit 4 : Chapters 4.0 – 4.5 
Unit 5 : Chapters 5.2, 5.6, 5.10 – 5.12
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

O.R. Techniques
(From 2012-2013 onwards)

(This Course is meant for Physics, Chemistry, RDS and Computer Science Major Students)

Class: B.Sc., (Other Science)  Part: IV/NME-2
Semester: IV  Hours: 45
Subject Code: 12MNES42  Credits: 02

Objectives: To help the learner to convert real life problem in to mathematical models
            To help the learners to get mathematical solutions for the real life problems

Course Outline:

Unit 1: Linear programming problem – introduction – mathematical formulation of the problem – graphical solution  (9 Hours)

Unit 2: Simplex method – using slack variables only  (9 Hours)

Unit 3: Transportation problem – balanced and unbalanced – initial basic feasible solutions  (9 Hours)

Unit 4: Assignment problem – assignment algorithm – unbalanced assignment problem  (9 Hours)

Unit 5: Sequencing problems – problems with n jobs and two machines – problems with n jobs and three machines  (9 Hours)

Text Book:

Unit 1 : Chapters 2.1, 2.2, 3.1, 3.2
Unit 2 : Chapters 4.1, 4.3
Unit 3 : Chapters 10.1 – 10.8
Unit 4 : Chapters 11.1 – 11.3
Unit 5 : Chapters 12.1 – 12.3
In all units, no derivations; only problems

Reference Books:
Stellar Universe

(From 2012-2013 onwards)

Objectives: To help the learners to understand the stars and their motion
           To help the learners to know about double and multiple stars

Course outline:
Unit 1: Introduction – stellar motion – solar motion - distance of stars – magnitudes of stars

Unit 2: Apparent visual and photo visual magnitude/absolute magnitude

Unit 3: Colour and size of stars – dwarfs – main sequence stars – giants

Unit 4: Double and multiple stars – variable stars – novae – nebulae

Unit 5: Zodiacal constellations – winter, spring, summer, autumn constellations

Text Book:
Unit 1 : Chapters 17 sec 335 - 339
Unit 2 : Chapters 17 sec 340 - 342
Unit 3 : Chapters 17 sec 343
Unit 4 : Chapters 17 sec 344 - 348
Unit 5 : Chapters 17 sec 349 - 352
Graph Theory

(From 2012-2013 onwards)

Class : B.Sc. Mathematics
Semester : V
Subject Code: 12MAC155

Part : III/Core-7
Hours : 90
Credits : 5

Objectives : To provide a basic knowledge of fundamental concepts in Graph Theory

Course Outline:

Unit 1: Graphs – definition and examples – degrees – sub graphs – isomorphism – Ramsey numbers – independent sets and coverings – matrix representation of graphs

(Unit 1: 18 hours)

Unit 2: Connectedness – walks, trails and paths – connectedness and components – cutpoint – bridge – blocks – connectivity

(Unit 2: 18 hours)

Unit 3: Degree sequences – graphic sequences – trees – characterization of trees – centre of a tree

(Unit 3: 18 hours)

Unit 4: Eulerian graphs – definition and examples characterization of Eulerian graphs – Hamiltonian graphs – definition and examples

(Unit 4: 18 hours)

Unit 5: Planar graphs – definition and properties - characterization of planar graphs

(Unit 5: 18 hours)

Text Book
Arumugam S., Ramachandran S., “Invitation to Graph Theory”, SCITECH Publications(India) Pvt Ltd., Chennai 2001

Unit 1 : Chapter 2.1 – 2.6, 2.8
Unit 2 : Chapter 4
Unit 3 : Chapter 3, 6
Unit 4 : Chapter 5
Unit 5 : Chapter 8.0 – 8.2

Reference Books:
2. Narasingh Deo, “Graph Theory with Applications to Engineering and Computer Science”, Prentice Hall of India Private Limited, New Delhi, 2007
C++ Programming

(From 2012-2013 onwards)

Class : B.Sc. Mathematics  Part : III/Core-8
Semester : V  Hours : 60
Subject Code: 12MAC254  Credits : 4

Objectives: To help the learner to acquire a basic knowledge of object oriented programming through C++

Course Outline:

Unit 1: Principles of object oriented programming – introduction to C++ – token – keywords – identifiers and constants – data types – expressions and control structures (12 hours)

Unit 2: Functions – function prototyping – call by reference – return by reference – function overloading (12 hours)

Unit 3: Classes and objects – arrays within a class – memory allocation for objects – arrays of objects – friendly functions (12 hours)

Unit 4: Constructors and destructors – copy constructor – dynamic constructors – destructors (12 hours)

Unit 5: Operator overloading – overloading unary operators – overloading binary operators – rules for overloading operators (12 hours)

Note: Symbols, notations and treatment as in the text book

Text Book:
Unit 1 : Chapter1, 3
Unit 2 : Chapter 4
Unit 3 : Chapter 5.1 to 5.15
Unit 4 : Chapter 6
Unit 5 : Chapter 7.1 to 7.7

Reference Books:
Objectives: To help the learners to understand the basic concepts of abstract algebra and thereby inculcate in them the skill of abstract thinking.

Course Outline:

<table>
<thead>
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<th>Unit</th>
<th>Chapter(s)</th>
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<tr>
<td>Unit 1</td>
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<td>3.8 to 3.11</td>
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<td>4.1 to 4.5</td>
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<td>4.6 to 4.11</td>
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<td>Unit 5</td>
<td>4.12 to 4.16</td>
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Note: Symbols, notations and treatment as in the text book.

Text Book:

Reference Books:
**Class** | B.Sc. Mathematics  
**Semester** | V  
**Subject Code** | 12MAC556  
**Part** | III/Core-10  
**Hours** | 105  
**Credits** | 6

**Objectives**: To motivate the learners on analysis thereby to lay foundation for future studies.

**Course Outline**:

- **Unit 1**: Definition and examples of metric spaces – bounded sets – open ball – open sets – subspaces – equivalent metrics.  
  **(21 hours)**

- **Unit 2**: Interior of a set – closed sets – closure – limit points – dense sets  
  **(21 hours)**

- **Unit 3**: Completeness – definition and examples – Cantor’s intersection theorem – Baire category theorem  
  **(21 hours)**

- **Unit 4**: Continuity – homeomorphisms – uniform continuity - connectedness – connected subsets of R - connectedness and continuity and discontinuity  
  **(21 hours)**

- **Unit 5**: Compactness – compact subsets of R – equivalent characterizations for compactness – compactness and continuity  
  **(21 hours)**

**Note: Symbols, notations and treatment as in the text book**

**Text Book**

**Unit 1**: Chapters 2.1 – 2.5  
**Unit 2**: Chapters 2.6 – 2.10  
**Unit 3**: Chapters 3.1 – 3.2  
**Unit 4**: Chapters 4.1 - 4.4, 5.1 – 5.3  
**Unit 5**: Chapters 6.1 – 6.4

**Reference Books**:

Programming Lab in C++
(From 2012-2013 onwards)

Class : B.Sc. Mathematics
Semester : V
Subject Code: 12MAP351

Part : III/Core-11
Hours : 30
Credits : 1

Objectives: To help the learners to develop basic programming skills and to get practical knowledge in the object oriented programming concepts

Course Outline:

List of Practical

01. Program for temperature conversion
02. Program to demonstrate the use of manipulators
03. Program using operator overloading
04. Program to swap two integers using reference variables in a function
05. Program to print Floyd triangle
06. Program to print the following output

1
2 2
3 3 3 and so on
07. Programs to evaluate sin x and cos x
08. Ascending/Descending order using bubble sort
09. Program to find variance for a given set of values
10. Program using inline function
11. Program using copy constructors
12. Program to overload unary and binary operators
13. Program for prime number checking
14. Program to find Armstrong numbers
15. Program to find perfect numbers
16. Program to find palindromes
17. Matrix addition and multiplication

Text Book:

Reference Books:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Linear Programming
(From 2012-2013 onwards)

Class : B.Sc. Mathematics
Semester : V
Subject Code: 12MAC153

Part : III/Core Elective-1
Hours : 60
Credits : 3

Objectives : To develop the problem solving skill in linear programming

Course Outline:
Unit 2: Artificial variables – Big-M method – two-phase simplex method – degeneracy and cycling (12 hours)
Unit 3: Duality – properties – fundamental theorems of duality(statements only) – principle of duality – dual simplex method (12 hours)
Unit 4: Transportation problems – initial basic feasible solution using north-west corner rule, matrix minima and Vogel’s approximation methods – optimum solution using MODI method – unbalanced transportation problems (12 hours)
Unit 5: Assignment problem – traveling salesman problem (12 hours)

Note: Symbols, notations and treatment as in the text book

Text Book:

Unit 1 : Chapter 2.1, 2.2, 3.2 – 3.5, 4.1 – 4.3
Unit 2 : Chapter 4.4 – 4.6
Unit 3 : Chapter 5.1 – 5.9
Unit 4 : Chapter 10.1 – 10.14
Unit 5 : Chapter 11.1 – 11.3, 11.6

In all units, no derivations, only problems

Reference Books:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Class : B.A./B.Sc., Part : Self Learning Course
Semester : V Hours :
Subject Code : 12MSL153 Credits : 03

(From 2012-2013 onwards)

Statistical Methods in Social Sciences

Objectives : To help the learners to understand the basic concepts in statistics and to enable them to know the applications

Course Outline:

Unit 1: Arithmetic mean – measures of dispersion – standard deviation – mean square deviation – coefficient of variation – variance

Unit 2: Correlation coefficient for two variables – rank correlation

Unit 3: Sampling – different kinds of samples

Unit 4: Small samples – t-distribution – F-distribution

Unit 5: Analysis of variance – one criterion and two criterion of classifications

Note: Symbols, notations and treatment as in the text book

Text Book

Unit 1 : Chapter 2.1, 3.1
Unit 2 : Chapter 6.0 – 6.2
Unit 3 : Chapter 14.1
Unit 4 : Chapter 15
Unit 5 : Chapter 17.1, 17.2

In all units, no derivations, only problems

Reference Books:
Class : B.Sc. Mathematics
Semester : VI
Subject Code: 12MAC164

Objective: To learn the language features of Java and to program in java

Course Outline:

Unit 1: Fundamentals of Object Oriented Programming – basic concepts of OOP – benefits and applications of OOP – evolution of Java – Java tokens and statements – command line arguments – Java constants, variables and data types (12 hours)

Unit 2: Operators and expressions – decision making and branching – if and switch statements - ?: operator (12 hours)

Unit 3: Decision making and looping – while, do and for statements – labeled loops (12 hours)

Unit 4: Classes, objects and methods – constructors – methods overloading – static members (12 hours)

Unit 5: Arrays – one dimensional and two dimensional arrays (12 hours)

Note: Symbols, notations and treatment as in the text book

Text Book:
Unit 1 : Chapter 1, 2.1 to 2.6, 3.0 – 3.8, 3.10 – 3.11, 4.1 – 4.11
Unit 2 : Chapter 5, 6
Unit 3 : Chapter 7
Unit 4 : Chapter 8.1 – 8.9
Unit 5 : Chapter 9.1 – 9.5

Reference Books:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS
Numerical Methods and Discrete Mathematics
(For those who have joined in June 2012 or later under new CBCS pattern)

Semester : VI  Hours : 90
Subject Code: 12MAC365  Credits : 5

Objectives: To develop the skill of solving problems in numerical differentiation and numerical integration
To introduce Boolean algebra and simplification of Boolean polynomials

Course Outline:
Unit 2: Numerical differentiation – differentiation using Newton’s formulae and Stirling’s central difference formula – maxima and minima – numerical differentiation – Trapezoidal rule – Simpson’s one-third and three-eight rules  (18 hours)
Unit 4: Lattices – properties – new lattices – modular and distributive lattices  (18 hours)
Unit 5: Boolean algebra – Boolean polynomials – Karnaugh maps (up to 4 variables only)  (18 hours)

Note: Symbols, notations and treatment as in the text book

Unit 1 : Chapter 4.0
Unit 2 : Chapter 8
Unit 3 : Chapter 10.0, 10.6
Unit 4 : Chapter 10.1 – 10.4
Unit 5 : Chapter 10.5 – 10.7

Reference Books:
Objectives: To enable the learners to understand the basic concepts of vector spaces and bilinear forms

Course Outline:
Unit 1: Vector spaces – definition and examples – subspaces – linear transformations – fundamental theorem of homomorphism – span of a set (21 hours)
Unit 2: Linear independence – basis and dimension – rank and nullity – matrix of a linear transformation – maximal linearly independent set – minimal generating set (21 hours)
Unit 3: Inner product spaces – definition and examples – Schwartz inequality – orthogonality – Gram-Schmidt orthogonalization process – orthogonal complement (21 hours)
Unit 5: Characteristic equation of a matrix – Cayley-Hamilton theorem – eigen values and eigen vectors (21 hours)

Note: Symbols, notations and treatment as in the text book

Text Book
Unit 1 : Chapter 5.0 – 5.4
Unit 2 : Chapter 5.5 – 5.8
Unit 3 : Chapter 6.0 – 6.3
Unit 4 : Chapter 7.0 – 7.6
Unit 5 : Chapter 7.7, 7.8

Reference Books:
Class: III B.Sc. Mathematics  Part: III/Core-15
Semester: VI  Hours: 105
Subject Code: 12MAC566  Credits: 6

Objectives: To help the learners to have a basic knowledge of various dimensions of complex analysis

Course Outline:
Unit 1: Complex numbers – inequalities – square root – nth roots of a complex number – circles and straight lines – bilinear transformations – cross ratio (21 hours)
Unit 2: Analytic functions – limit and continuity – differentiability – C-R equations – harmonic functions – conformal mapping (21 hours)
Unit 3: Complex integration – definite integrals – Cauchy’s theorem – Cauchy integral formula – higher derivatives (21 hours)
Unit 4: Series expansions – Taylor’s series – Laurent’s series – zeros of an analytic function – singularities (21 hours)
Unit 5: Calculus of residues – residues – Cauchy’s residue theorem – evaluation of definite integrals (21 hours)

Note: Symbols, notations and treatment as in the text book

Text Book:
Unit 1: Chapters 1.0 to 1.9 and 3.1 to 3.5
Unit 2: Chapters 2.0 to 2.9
Unit 3: Chapters 6.0 to 6.4
Unit 4: Chapters 7.0 to 7.4
Unit 5: Chapters 8.0 to 8.3

Reference Book:
Class : III B.Sc. Mathematics  Part : III/Core-16
Semester : VI  No of hours : 30
Subject Code : Credits : 1

Objectives : To give practical training in writing Java program and running on the system

Course Outline:

List of Practical

01. Program using command line arguments
02. Program using more than one class
03. Program to add the digits of an integer
04. Program for palindrome checking
05. Program to find Fibonacci numbers
06. Program to find nCr
07. Program for the use of ?: operator
08. Program to print pyramid of digits
09. Program to print Floyd triangle
10. Program to print the following
    1
    2  2
    3  3  3 and so on
11. Program for prime number checking
12. Program for perfect number checking
13. Program to generate Fibonacci numbers
14. Program to sort a set of numbers using bubble sort
15. Program to add and multiply two matrices

Text Book:

Reference Books:
Class : B.Sc. Mathematics
Semester : VI
Subject Code : 12MAE163

Part : III/Core Elective-2
Hours : 60
Credits : 3

Objectives : To help the learners to solve problems in inventory control, queuing theory and sequencing

Course Outline:

Unit 2: Sequencing problems – problems with n jobs and two machines – n jobs with three machines – replacement problems (12 hours)

Unit 3: Inventory control – economic order quantity – deterministic inventory problems with no shortage – the fundamental EOQ problem with several production runs of unequal length – EOQ problem with finite replenishment (12 hours)

Unit 4: Deterministic inventory problems with shortages – EOQ problem with instantaneous production and variable cycle time – EOQ problem with instantaneous production and fixed order cycle – EOQ problem with finite replenishment (12 hours)

Unit 5: Queuing theory – characteristics – Poisson and Exponential distributions – transient and steady state – Poisson process – finite and infinite queues – M/M/1 and M/M/C models – (12 hours)

Note: Symbols, notations and treatment as in the text book

Text Book
Unit 1 : Chapter 1, 17.1 – 17.7, 17.9
Unit 2 : Chapter 12.1 – 12.4, 18.1 – 18.3
Unit 3 : Chapter 19.1 – 19.6
Unit 4 : Chapter 19.7
Unit 5 : Chapter 20.1 – 20.4, 20.6 – 20.8(up to model V)

Reference Books:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Self Learning Course
(From 2012-2013 onwards)
(For all Non - Mathematics UG Programmes)

Class : III  Part : Self Learning Course
Semester : VI  Hours :
Subject Code :  Credits : 03

Mathematical Methods in Business

Objectives : To help the learners to understand and to implement mathematical concepts in business

Course Outline:
Unit 1: Powers – roots – indices
Unit 2: Ratio and proportions
Unit 3: Discount
Unit 4: Profit and loss
Unit 5: Mensuration – three dimensional

Note: Symbols, notations and treatment as in the text book

Text Book
Unit 1 : Chapter 13, 14
Unit 2 : Chapter 15, 16
Unit 3 : Chapter 20
Unit 4 : Chapter 21
Unit 5 : Chapter 33

Reference Books:
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<td>06</td>
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(From the academic year 2012-2013)

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Elective for MCA students: Mathematics for Life
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Modern Algebra
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics  Part : Core-1
Semester : I  Hours : 90
Subject Code : 15PMAC11  Credits : 5

Objective : To introduce the concepts and working knowledge of counting principle, Sylow’s theorem, finite Abelian groups, Eucliedian ring, polynomial rings and extension fields

Course Outline:

Unit 1: Elementary basic concepts of groups (not for examinations) –conjugate – conjugate class – normalizer – counting principle – Cauchy Theorem  (18 hours)

Unit 2: Sylow’s theorem – 1st, 2nd, 3rd proofs – p-Sylow subgroup direct products finite abelian groups  (18 hours)


Unit 4: Polynomial rings – division algorithm – irreducible polynomials polynomials over the rational field Eisenstein criterion  (18 hours)

Unit 5: Fields – extension fields – algebraic extension – roots of polynomials remainder theorem – splitting field – isomorphism between fields  (18 hours)

Book for Study:

Unit 1: Chapter 2.11
Unit 2: Chapter 2.12, 2.13, 2.14
Unit 3: Chapter 3.7, 3.8
Unit 4: Chapter 3.9, 3.10
Unit 5: Chapter 5.1, 5.3

Books for References :
Class : I M.Sc. Mathematics  
Semester : I  
Subject Code : 15PMAC21  
Part : Core-2  
Hours : 90  
Credits : 5

Objective : To give a comprehensive idea about the underlying principles of Mathematical Analysis.

Course Outline:

Unit 1: Finite, countable and uncountable sets – metric spaces – compact sets – perfect sets – connected sets  
(18 hours)

Unit 2: Convergent sequences – subsequences – Cauchy sequences – upper and lower limits – some special sequences  
(18 hours)

Unit 3: Series – series of non-negative terms – number e – the root and ratio tests – power series – Summation by parts – absolute convergence – addition and multiplication of series – rearrangements  
(18 hours)

Unit 4: Limits of functions – continuous function – continuity and compactness – continuity and connectedness – discontinuities – monotonic functions – infinite limits and limits at infinity  
(18 hours)

Unit 5: Derivative of a real function – mean value theorem – continuity of derivatives – L’Hospital’s Rule – derivatives of higher order – Taylor’s theorem  
(18 hours)

Book for Study:


Unit 1 : Chapter 2  
Unit 2 and 3 : Chapter 3  
Unit 4 : Chapter 4  
Unit 5 : Chapter 5

Books for References:

**ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514**  
**DEPARTMENT OF MATHEMATICS**

**Numerical Analysis**  
(For those who join in June 2015 or later)

<table>
<thead>
<tr>
<th>Class</th>
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**Objective**: To help the students to apply numerical method techniques to solve real life problems

**Course Outline:**


**(18 hours)**

**Unit 2**: System of linear algebraic equations and eigen value problem – direct methods – iteration methods – Jacobi-iteration method, Gauss-Seidel iteration method

**(18 hours)**

**Unit 3**: Interpolation and approximation – Taylor series – Lagrange and Newton interpolations – finite difference operators – Hermite interpolation

**(18 hours)**


**(18 hours)**

**Unit 5**: Ordinary differential equation – initial value problem – difference equation – numerical methods – Euler method – backward Euler – mid-point method

**(18 hours)**

**Book for Study**:


- **Unit 1**: Chapter 2.1 to 2.4, 2.7, 2.8
- **Unit 2**: Chapter 3.1, 3.2, 3.4 (Relevant subsections only)
- **Unit 3**: Chapter 4.1 to 4.5
- **Unit 4**: Chapter 5.2, 5.4 to 5.7, 5.9 to 5.11
- **Unit 5**: Chapter 6.1 to 6.3

**Books for References**:

1. Numerical methods, Dr.N.V.Vedamurthy and Dr.N.ch.S.n.Iyengar, Vikas publication house pvt.ltd, 2005.
Relational Database Management System
(For those who join in June 2015 or later)

Class: I M.Sc. Mathematics  Part: Core-4
Semester: I  Hours: 60
Subject Code: 15PMAC41  Credits: 4

Objective: To enable the student to understand the, Relational Database concepts, Query processing and PL/SQL


UNIT 4: Introduction to PL/SQL – control structures – concepts of error handling.  (12 hours)

UNIT 5: Cursors and database triggers – cursor management – PL/SQL composite data types – subprograms and packages.  (12 hours)

Book for Study:

Books for References:
1. ORACLE: The Complete Reference, Bayross BPB
2. Understanding ORACLE, Perry / Lateer, BPB.
RDBMS LAB
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics
Semester : I
Subject Code : 15PMAP11

Part : Core Lab-1
Hours : 30
Credits : 1

Objectives: To help the students to be familiar with the programming concepts in RDBMS.

Course outline:

RDBMS LAB MANUAL

1. Create, Insert operations
2. Select operations with where and order by clause
3. Update operations with where clause
4. Delete and truncate operations
5. Alter and Modify operations
6. Rename and Drop Operations
7. Set Operations
8. Aggregate functions, GROUP BY and HAVING clauses
9. Conversion and String functions
10. Date Functions
11. Join Operations
12. Nested Queries
13. TCL & DCL commands
14. Constraints
15. View operations
16. Synonym Operations
17. Index operations
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Graph Theory
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics Part : Core Elective 1
Semester : I Hours : 90
Subject Code : 15PMAE11(A) Credits : 4

Objectives: To study the concepts of various graphs, matching and vertex coloring.

Course outline:

Unit 1: Basic definitions of graph theory(not for exam) – Trees and connectivity- Definition and simple properties – Bridges- Spanning trees – Connector problems- Shortest path problems – Cut vertices and connectivity. (18 hours)

Unit 2: Euler tours and Hamiltonian cycles- Euler tours- The Chinese postman problem-Hamiltonian graphs- The travelling salesman problem - Matchings–Matchings and augmenting paths- The marriage problem. (18 hours)

Unit 3: Planar graphs- Plane and planar graphs- Euler’s formula- Theplatonic bodies-Kuratowski’s theorem- Non – Hamiltonian planegraphs- The dual of a plane graphs. (18 hours)

Unit 4: Colouring- Vertex coloring- Vertex coloring algorithms- Critical graphs- Cliques-Edge colouring – Map colouring. (18 hours)

Unit 5: Directed graphs- Definitions and more definitions- In degree andout degree – Tournaments – Networks – Flows and cuts – The Ford and Fulkerson algorithm. (18 hours)

Book for Study:
Unit 1 : Chapter 2
Unit 2 : Chapter 3(3.1 to 3.4),4 (4.1,4.2)
Unit 3 : Chapter 5
Unit 4 : Chapter 6
Unit 5: Chapter 7(7.1-7.3) ,8 (8.1,8.2)

Books for References:
Differential Geometry
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics  Part : Core Elective 1
Semester : I  Hours : 90
Subject Code : 15PMAE11(B)  Credits : 4

Objectives: To introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surfaces are explored.

Course outline:

UNIT 1 : Space curves-Definition of a space curve - Arc length - tangent - normal and binormal - curvature and torsion - contact between curves and surfaces  
(18 hours)

UNIT 2 : Tangent surface - Involutes and evolutes - Intrinsic equations - Fundamental Existence Theorem for space curves - Helices.  
(18 hours)

(18 hours)

UNIT 4 : Geodesics - Canonical geodesic equations - Normal property of geodesics - Geodesics curvature - Gauss - Bonnet Theorem - Gaussian curvature.  
(18 hours)

UNIT 5 : Local non-intrinsic properties of a surface-Principal curvature - Lines of curvature - Developable - Developable associated with space curves and with curves on surface - Minimal surfaces - Ruled surfaces.  
(18 hours)

Book for Study:

Unit 1 : Chapter I: Sections 1 to 9
Unit 2 : Chapter II: Sections 1 to 9
Unit 3 : Chapter II: Sections 10 to 14
Unit 4 : Chapter II: Sections 15 to 18
Unit 5 : Chapter III: Sections 1 to 8

Books for References:
Class: I M.Sc. Mathematics  
Part: Core-5  
Semester: II  
Hours: 90  
Subject Code: 15PMAC52  
Credits: 5

**Objective:** To study dual spaces, inner product spaces, advanced concepts of matrices and determinants and to develop computational skills in Algebra.

**Course outline:**

**Unit 1:** Elementary basic concepts of vector spaces (not for examinations), dual spaces – vector space homomorphism – dimension – dual spaces – linear functional – dual basis and annihilator  
(18 hours)

**Unit 2:** Inner product spaces – definition – norm – Schwarz-inequality – orthogonal compliment – orthonormal set and Gram–Schmidt orthogonalization process  
(18 hours)

**Unit 3:** Linear transformation – algebra of linear transformations – characteristic roots and matrices  
(18 hours)

**Unit 4:** Canonical Forms – triangular form – nilpotent transformations – Jordan form – rational canonical form  
(18 hours)

**Unit 5:** Trace and transpose – determinants  
(18 hours)

**Book for Study:**

Unit 1: Chapter 4.3  
Unit 2: Chapter 4.4  
Unit 3: Chapter 6.1, 6.2, 6.3  
Unit 4: Chapter 6.4, 6.5, 6.6, 6.7  
Unit 5: Chapter 6.8, 6.9

**Books for References:**
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514  
DEPARTMENT OF MATHEMATICS

Differential Equations  
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics  Part : Core-6  
Semester : II  Hours : 90  
Subject Code : 15PMAC62  Credits : 5

Objectives : To enable the learners to have a better understanding of homogenous second order equations and the convergence of successive approximations.

Course Outline:

Unit 1: Initial value problems for the homogeneous equation – solutions of the homogeneous equation – Wronskian and linear independence – reduction of the order of a homogeneous equation – non-homogeneous equation  
(18 hours)

Unit 2: Homogeneous equations with analytic coefficients – the Legendre equation – the Euler equation – second order equation with regular singular points  
(18 hours)

Unit 3: The Bessel’s equation – regular singular points at infinity – equations with variables separated – exact equations – the method of successive approximations – Lipschitz condition  
(18 hours)

(18 hours)

Unit 5: Integral surfaces passing through a given curve – surfaces orthogonal to a given system of surfaces – non-linear partial differential equations of the first order – Cauchy’s method of characteristics – compatible systems of first order equations – Charpit’s method – special types of first order equations  
(18 hours)

Book for Study:
Unit 1 : Chapter 3.1 – 3.6  
Unit 2 : Chapter 3.7, 3.8, 4.1 – 4.4  
Unit 3 : Chapter 4.7 to 4.9, 5.1 to 5.5  
Unit 4 : Chapter 5.6 to 5.9

Unit 4 : Chapter 2.1 – 2.4  
Unit 5 : Chapter 2.5 to 2.11

Books for References:
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS

Fuzzy Sets and Fuzzy Logic
(For those who join in June 2015 or later)

Class : I M.Sc. Mathematics
Semester : II
Subject Code : 15PMAC72

Part : Core-7
Hours : 90
Credits : 5

Objectives: To enable the students to understand the basic ideas of fuzzy sets and fuzzy logic.

Course outline:

Unit 1: An overview of crisp sets (not for examinations) – fuzzy sets – basic types – basic concepts – Properties of α-cuts - representation of fuzzy sets–extension principle (18 hours)

Unit 2: Operation on fuzzy sets – types – fuzzy compliments – fuzzy intersections: t-norms – fuzzy union: t-conorms - Combination of operations. (18 hours)

Unit 3: Fuzzy arithmetic – fuzzy number – linguistic variables – arithmetic operation on intervals – arithmetic operations on fuzzy numbers - lattice of fuzzy numbers-fuzzy equation. (18 hours)

Unit 4: Crisp versus fuzzy relations – binary fuzzy relations – binary relations on a single set – fuzzy equivalence relations-fuzzy compatibility relations. (18 hours)


Book for Study :

Unit 1 : Chapter 1, 2
Unit 2 : Chapter 3(3.1 to 3.5)
Unit 3 : Chapter 4
Unit 4 : Chapter 5(5.1, 5.3, 5.4, 5.5, 5.6)
Unit 5 : Chapter 8

Books for References :
Class : I M.Sc. Mathematics  
Semester : II  
Subject Code: 15PMAE22(A)  

Part : Core Elective-2  
Hours : 90  
Credits : 4  

Objective : To introduce the basic concepts of measure and integration  

Course Outline:  


(18 hours)  

Unit 2: Sequences and series of functions: uniform convergence – uniform convergence and continuity – uniform convergence and integration – uniform convergence and differentiation - Equicontinuous families of functions – Stone-Weierstrass theorem  

(18 hours)  

Unit 3: Measure on the real line – Lebesgue outer measure – measurable sets and functions  

(18 hours)  


(18 hours)  

Unit 5: Measure spaces – integration with respect to a measure – $L^p$ spaces – convex functions – Jensen’s inequality  

(18 hours)  

Book for Study:  

Unit 1, 2: Chapters 6, 7.  

Eastern Limited, New Delhi, 1987 
Unit 3: chapters 2.1, 2.2, 2.4 
Unit 4: Chapters 3.1, 3.2, 3.3, 3.4. 
Unit 5: Chapters 5.5, 5.6, 6.1, 6.2, 6.3  

Books for References:  

2. Munroe,M.E. Measure and Integration. Addison-Wesley, Mass.1971
Stochastic Process
(For those who join in June 2015 or later)

Semester: II Hours: 90
Subject Code: 15PMAE22(B) Credits: 4

Objectives: To introduce advanced topics in Markov process, Markov chains and Renewal theory.

Course Outline:

UNIT 1: Stochastic Processes - Specification of stochastic processes – stationary processes
- Markov Chains: Definitions and Examples – Higher transition probabilities –
  Generalization of independent Bernoulli trials. (18 hours)

UNIT 2: Markov Chains-Stability of Markov system – Graph theoretic approach – Markov
  chain with denumerable number of state – Reducible chains – Statistical inference
  Markov Chains: Definitions and Examples – Higher transition probabilities –
  Generalization of independent Bernoulli trials. (18 hours)

UNIT 3: Poisson process: Poisson process and related distributions – Generalizations of
  Poisson process – Birth and death process – Markov process with discrete state
  space (Continuous time Markov chain). (18 hours)

UNIT 4: Markov Process with continuous state space -Brownian motion – Weiner process
  – Differential equations for Weiner Process – Kolmogorov equations – First
  passage time distribution for Weiner process. (18 hours)

UNIT 5: Renewal process and renewal equation – Stopping time – Wald’s equation –
  Renewal theorem – Delayed and equilibrium renewal process. (18 hours)

Book for Study:

Unit 1: Chapter 2: 2.1 to 2.4; Chapter 3: 3.1 to 3.1
Unit 2: Chapter 3: 3.6 to 3.10
Unit 3: Chapter 4: 4.1 to 4.5
Unit 4: Chapter 5: 5.1 to 5.5
Unit 5: Chapter 6: 6.1 to 6.6

Books for References:

Mathematics for Life
(For those who join in June 2015 or later)

Class: I M.Sc.(Phy)/MCA  Part: NME-1
Semester: II  Hours: 90
Subject Code: 15PMAN12  Credits: 4

Objectives:
To introduce mathematical, statistical and space science concepts in an intuitive way.
To help the students to understand the basic mathematical operations and techniques of computations so as to develop effective communication in mathematics.

Course Outline:

Unit 1: Differentiation – laws of differentiation – second order derivatives (concepts only) – applications – economic analysis – rates of growth – price elasticity – maxima and minima (18 hours)

Unit 2: Integration – techniques of integration (concepts only) – applications – cost-revenue – profit function – investment and capital formation rate of sales (18 hours)

Unit 3: Correlation analysis: correlation and their calculation (positive, negative and simple) – Karl Pearson’s correlation coefficient and rank correlation – merits and demerits – Regression analysis: simple, linear and their properties and their computations – applications to life and social science problems (no derivations) (18 hours)

Unit 4: Chi square test: degrees of freedom – uses of Chi square test – conditions for using chi square test – testing the independence of attributes – goodness of fit – F test: assumptions – test of hypothesis – variance of two populations – ANVOA: assumptions – one way and two way classifications – applications to life and social science problems (no derivations) (18 hours)

Unit 5: Solar System – study about the sun – planets – Asteroids – Comets – Meteors (18 hours)

Books for Study:
    Unit 1:  Chapter 9
    Unit 2:  Chapter 11
    Unit 3: Volume – I  Chapter:10 (pages 378-394;399-412)
            Volume – I  Chapter:11 (pages 436 – 451)
03. Kumaravelu and Susheela Kumaravelu, “Astronomy”, Sree Vishnu Arts, Sivakasi
    Unit 5: Chapter 15 (pages 454 – 487)
Continuous Internal Assessment

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Semester Examinations 50 Marks

A candidate must score a minimum of 23 marks out of 50 in the semester examination and an overall aggregate minimum of 50 percent for a pass.

**Internal Test Question Paper Pattern for Core, Core Elective and Non-Major Elective**

**SECTION – A (5 x 3 = 15)**

**FIVE questions without choice; each question carries 3 marks.**

**SECTION – B (5 x 5 = 25)**

**FIVE questions have to be answered out of eight questions; each question carries 5 marks.**
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATHUR – 625 514
DEPARTMENT OF MATHEMATICS
M.Sc.

Semester Examination Question Paper Pattern for Core, Core Elective and Non-Major Elective
(For those who join in June 2015 or later)

SECTION – A (5 x 2 = 10)
FIVE questions without choice; each question carries 2 marks; one question from each unit.

SECTION – B (5 x 9 = 45)
FIVE questions have to be answered with internal choice; each question carries 9 marks; one question from each unit.

SECTION – C (3 x 15 = 45)
THREE questions have to be answered out of five questions; each question carries 15 marks; one question from each unit.
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS (SF)

Class : II M.Sc. Mathematics  Part : Core-8
Semester : III  No of hours : 90
Subject Code : 12PMC135  Credits : 5

TOPOLOGY

(For those who have joined in June 2012 or later under new CBCS pattern)

Objectives : To introduce advanced concepts in topology

Course Outline:


Unit 2: Closed sets and limit points – continuous functions – product topology – metric topology – quotient topology.  (18 hours)

Unit 3: Connected spaces – connected sets in the real line – components and path components – local connectedness.  (18 hours)

Unit 4: Compact spaces – compact sets in the real lines – limit point compactness – local compactness.  (18 hours)

Unit 5: The countability axioms – the separation axioms – Urysohn’s lemma – Urysohn’s metrization theorem.  (18 hours)

Reference Book:
Unit :1 Chapters 1.1, 1.2, 2.1 – 2.5
Unit :2 Chapter 2.6 – 2.11
Unit :3 Chapter 3.1 – 3.4
Unit :4 Chapter 3.5 – 3.8
Unit :5 Chapter 4.1 – 4.4
CLASSICAL MECHANICS

(For those who have joined in June 2012 or later under new CBCS pattern)

Objectives: To help the learners to have a solid better understanding classical mechanics in Lagrange-Hamiltonian formalism.
To help the students to understand the relation between symmetric and conservative laws
To help the learners to understand the motion of dynamical systems.

Course Outline:

Unit 1: D’Alembert’s principle and Lagrange’s equations – velocity dependent potentials – dissipative function – applications of Lagrangian formulation. (18 hours)

Unit 2: Hamilton’s principle – some techniques of the calculus of variations – derivation of Lagrange’s equations forms – Hamilton’s principle – Hamilton’s principle to non holonomic systems. (18 hours)

Unit 3: Conservation theorems and symmetry properties. (18 hours)

Unit 4: The two-body central force problem – classification of orbits – Virial theorem – differential equation for the orbit and integrable power – law potentials. (18 hours)

Unit 5: Betrand’s theorem – Kepler problem – Laplace – Runge – Lenz Vector. (18 hours)

Reference Book:

Unit :1 Chapters 1.4 – 1.6
Unit :2 Chapter 2.1 – 2.4
Unit :3 Chapter 2.5, 2.6
Unit :4 Chapter 3.1 – 3.5
Unit :5 Chapter 3.6 – 3.9
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS (SF)

Class : II M.Sc. Mathematics  Part : Core-10  
Semester : III  No of hours : 90  
Subject Code : 12PMC335  Credits : 5

STATISTICS
(For those who have joined in June 2012 or later under new CBCS pattern)

Objectives : To help the learners to understand the techniques of analyzing data and drawing inferences.

Course Outline:

Unit 1: Random variables – probability density function – distribution function – some probability models – mathematical expectations – Chebyshev’s inequality

(18 hours)

Unit 2: Conditional probability – marginal and conditional distributions – correlation coefficient – stochastic independence

(18 hours)

Unit 3: Binomial, trinomial and multinomial distributions – Poisson distribution – Gamma and Chi square distributions – Normal distribution – bivariate normal distribution

(18 hours)

Unit 4: Sampling theory – t and F distributions - distributions of order statistics – moment generating function technique – distributions of $\bar{X}$ and $nS^2/\sigma^2$ – expectations of functions of random variables

(18 hours)

Unit 5: Limiting distributions – stochastic convergence – limiting moment generating functions – the central limit theorem – theorems on limiting distributions

(18 hours)

Reference Book:

Unit :1 Chapter 1.5 – 1.10
Unit :2 Chapter 2.1 – 2.4
Unit :3 Chapter 3
Unit :4 Chapter 4.1, 4.4 – 4.9
Unit :5 Chapter 5
OPERATIONS RESEARCH

(For those who have joined in June 2012 or later under new CBCS pattern)

Objectives : To train the students to convert real life problems in to mathematical models
To help the students thereby to solve the real life problems

Course Outline:


Unit 2: PERT-CPM – network diagram – critical path calculations – construction of the time chart and resource leveling – probability and cost considerations in project schedule – project control. (18 hours)

Unit 3: Queuing models - definitions – Poisson and Exponential distributions – pure birth model and pure death model – generalized Poisson model – steady-state measures – (M/M/1):(GD/∞/∞), (M/M/1):(GD/∞/N), (M/M/C):(GD/∞/∞), (M/M/C):(GD/∞/N), C≤ N models. (18 hours)


Unit 5: Nonlinear programming algorithms - unconstrained nonlinear algorithms – direct search method – gradient method – constrained nonlinear algorithms – separable programming – stochastic programming – quadratic programming (18 hours)

Reference Book:
Unit :1 Chapter 8.1 – 8.5
Unit :2 Chapter 13.1 – 13.5
Unit :3 Chapter 15.1 – 15.5
Unit :4 Chapter 19.1.2 – 19.2.1
Unit :5 Chapter 20.1.1, 20.1.2, 20.2.1, 20.2.2
Combinatorics
(For those who have joined in June 2012 or later under new CBCS pattern)

Class : II M.Sc. Mathematics  Part : Core Elective-3
Semester : III  No of hours : 90
Subject Code : 12PME334  Credits : 4

Objectives : To enable the learners to have a better understanding of basic concepts and
techniques in Combinatorial Mathematics.

Course Outline:

Unit 1: Permutations and combinations – introduction – rules of sum and product – rules
of distributions of distinct and non-distinct objects

(18 Hours)

Unit 2: Generating functions – generating function for combinations – enumerators for
permutations – distribution of distinct objects into non-distinct cells – partition of
integers

(18 Hours)

Unit 3: Recurrence relations – linear recurrence relations with constant coefficients –
recurrence relation with two indices

(18 hours)

Unit 4: The principle of inclusion and exclusion – general formula – derangements –
permutations with restrictions on relative positions

(18 hours)

Unit 5: Polya’s theory of counting – equivalence classes under a permutation group –
equivalence classes of functions – weights and inventories of functions – Polya’s
fundamental theorem and its generalization

(18 hours)

Reference Books:
York, 2004
Unit 1 :Chapter 1.1 – 1.6
Unit 2 :Chapter 2.1 – 2.5
Unit 3 :Chapter 3.1 – 3.3, 3.5
Unit 4 :Chapter 4.1 – 4.5
Unit 5 :Chapter 5.1, 5.3 – 5.7
ARUL ANANDAR COLLEGE (AUTONOMOUS), KARUMATUR – 625 514
DEPARTMENT OF MATHEMATICS

Complex Analysis
(For those who have joined in June 2012 or later under new CBCS pattern)

Class : II M.Sc. Mathematics  Part : Core-12
Semester : IV  No of hours : 90
Subject Code : 12PMC145  Credits : 5

Objectives : To introduce the basic concepts in complex analysis
To develop the skill of evaluating integrals using residuals.

Course Outline:

(18 Hours)

(18 Hours)

Unit 3: Complex integration – Cauchy’s theorems – Cauchy’s integral formula – higher derivatives.  
(18 hours)

(18 hours)

Unit 5: Harmonic functions – Poisson’s formula – Schwarz’s theorem – power series expansions – Weierstrass theorem – Taylor’s series – Laurent series  
(18 hours)

Reference Book:

Unit 1: Chapter 2(1.2 – 1.4, 2.1 – 2.5)
Unit 2: Chapter 3(2.2 – 2.4, 3.1 – 3.5, 4.1 – 4.3)
Unit 3: Chapter 4(1.1, 1.3 – 1.5, 2.1 – 2.3)
Unit 4: Chapter 4(3.1 – 3.4, 4.1, 4.4 – 4.6, 5.1 – 5.3)
Unit 5: Chapter 4(6.1 – 6.4), 5(1.1 – 1.3)
Theory of Numbers
(For those who have joined in June 2012 or later under new CBCS pattern)

Class : II M.Sc. Mathematics
Semester : IV
Subject Code : 12PMC245

Part : Core-13
No of hours : 90
Credits : 5

Objectives : To enable the learners to have an understanding of theory of numbers

Course Outline:

Unit 1: Fundamental theorem of arithmetic – divisibility – greatest common divisor – prime numbers – Euclidean algorithm – gcd of more than two numbers – Mobius function \( \mu(n) \) – Euler totient function \( \phi(n) \) – product function for \( \psi(n) \)

(18 Hours)

Unit 2: Dirichlet product – Mangoldt function \( \Lambda(n) \) – multiplicative functions – inverse of a completely multiplicative function – Liouville’s function \( \lambda(n) \) – generalized convolutions – Bell series and Dirichlet multiplication – Selberg identity

(18 Hours)

Unit 3: Congruences – residue classes and complete residue systems – linear congruences – Euler – Fermat theorem – simultaneous linear congruences – polynomial congruences with prime power moduli

(18 Hours)

Unit 4: Quadratic residues – Legendre’s symbol and its properties – Gauss’s lemma – quadratic reciprocity law and its applications – Jacobi’s symbol – applications to diophantine equations

(18 Hours)

Unit 5: Partitions – geometric representation – generating functions for partitions – Euler’s pentagonal number theorem – combinatorial proof – Euler’s recursion formula for \( p(n) \)

(18 Hours)

Reference Book:

Unit 1: Chapter 1, 2.1 – 2.5
Unit 2: Chapter 2(2.6 – 2.19)
Unit 3: Chapter 5(5.1 – 5.9)
Unit 4: Chapter 9( 9.1 – 9.8)
Unit 5: Chapter 14(14.1 – 14.6)
Objectives: To enable the readers to understand the three structure of functional analysis.

Course Outline:

(18 Hours)

Unit 2: Reflexivity – some fundamental theorems – applications of the uniform boundedness principle – weak convergence – finite-dimensional spaces.
(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

Reference Book:
Unit 1: Chapters II(P23 – P48)
Unit 2: Chapter II(P49 – P73)
Unit 3: Chapter III(P88 – P111)
Unit 4: Chapter IV(P124 – P145)
Unit 5: Chapter V(P155 – P183)
At the end of the final semester, the students submit a project report.

The internal mark for the project is awarded for a maximum of 50.

The external examiner and the guide award the end semester mark for a maximum of 50.