J.J. College of Arts and Science(Autonomous)

J.J.Nagar, Sivapuram Post, Pudukkottai - 622 422

NAAC Accredited with 'A' Grade

UG - Programme **- B.Sc. MATHEMATICS - Under Choice Based Credit System**

For the candidates admitted from the academic year 2019-2020 onwards

Sem.	Part	Course Code	Course Title	Hrs/ week	Credit	Exam Hr	Marks		Total Marks
							Int.	Ext.	
I	I	U1R1TL1	Language Course – I	6	3	3	25	75	100
	II	U1R1EL1	English Language Course - I	6	3	3	25	75	100
	III	U1R1MTCC1	Differential Calculus and Trigonometry	8	5	3	25	75	100
		U1R1RSTAC1	Mathematical Statistics – I	6	3	3	25	75	100
		*	SPSS lab – Practical	4	*	-	-	-	-
Total				**30**	**14**	**-**	**-**	**-**	**400**
II	I	U2R1TL2	Language Course – II	5	3	3	25	75	100
	II	U2R1EL2	English Language Course - II	5	3	3	25	75	100
	III	U1R1MTCC2	Probability & Statistics	5	5	3	25	75	100
		U2R1MTCC3	Analytical Geometry(3D)and Integral Calculus	5	5	3	25	75	100
		U2R1STAC2P	SPSS - Practical	3	3	3	40	60	100
		U2R1STAC3	Mathematical Statistics – II	5	3	3	25	75	100
	IV	U2R1ES	Environmental Studies	2	2	3	25	75	100
Total				**30**	**24**	**-**	**-**	**-**	**700**
III	I	U3R1TL3	Language Course – III	5	3	3	25	75	100
	II	U3R1EL3	English Language Course - III	5	3	3	25	75	100
	III	U3R1MTCC4	Number Theory	5	5	3	25	75	100
		U3R1MTCC5	Sequences and Series	6	5	3	25	75	100
		U3R1PHAC4	Allied Physics – I	4	3	3	25	75	100
		*	Allied Physics – II Practical	3	-	-	-	-	-
	IV	U3R1VE	Value Education	2	2	3	25	75	100
Total				**30**	**21**	**-**	**-**	**-**	**600**
IV	I	U4R1TL4	Language Course – IV	5	3	3	25	75	100
	II	U4R1EL4	English Course – IV	5	3	3	25	75	100
	III	U4R1MTCC6	Vector Calculus and Fourier Series	5	5	3	25	75	100
		U4R1MTCC7	Differential Equations & Laplace Transforms	5	5	3	25	75	100
		U4R1PHAC5P	Allied Physics – II– Practical	3	3	3	40	60	100
		U4R1PHAC6	Allied Physics – III	4	3	3	25	75	100
	IV	U4R1MTSBE1	Skill based Elective Course – I	3	2	3	25	75	100
Total				**30**	**24**	**-**	**-**	**-**	**700**

Sem.	Part	Course Code	Course Title	Hrs/ week	Credit	Exam Hr	Marks		Total Marks
							Int.	Ext.	
V	III	**U5R1MTCC8**	Mechanics	5	5	3	25	75	100
		U5R1MTCC9	Modern Algebra	5	5	3	25	75	100
		U5R1MTCC10	Real Analysis	5	5	3	25	75	100
		U5R1MTCC11	Numerical Methods	5	4	3	25	75	100
		U5R1MTMBE1	Major Based Elective Course – I	5	5	3	25	75	100
	IV	**U5R1MTSBE2**	Skill Based Elective Course – II	3	2	3	25	75	100
		U5R1MTIDC1	Inter disciplinary Course – I	2	2	3	25	75	100
Total				**30**	**28**	**-**	**-**	**-**	**700**
VI	III	**U6R1MTCC12P**	Numerical Methods with MATLAB	4	3	3	40	60	100
		U6R1MTCC13	Complex Analysis	5	5	3	25	75	100
		U6R1MTCC14	Linear Algebra	5	5	3	25	75	100
		U6R1MTMBE2	Major Based Elective Course- II	5	5	3	25	75	100
		U6R1MTMBE3	Major Based Elective Course-III	5	5	3	25	75	100
	IV	**U6R1MTSBE3**	Skill Based Elective Course- III	3	2	3	25	75	100
		U6R1MTIDC2	Inter Disciplinary Course – II	2	2	3	25	75	100
	V	**U6R1GS**	Gender studies	1	1	3	25	75	100
			Extension Activities	-	1				
Total				**30**	**29**	**-**	**-**	**-**	**800**
Grand Total					**140**				**3900**

* Carried over Paper

Major Based Elective Courses (any Three)

- Operations Research
- Stochastic Processes
- Graph Theory
- Astronomy
- Discrete Mathematics

Inter Discipilinary Courses (any Two)

- Computer Skill Development Course
- Introduction to Internet Concepts
- Introduction to Photoshop and Pagemaker

Skill Based Elective Courses (any Three)

- A Primer on Divisibility and Number Sequences
- Quantitative Mathematics for Competitive Examinations
- Foundation Mathematics for Competitive Examinations
- Theory of Games and Decision Theory
- Mathematical Modeling

SEM: I **B.Sc. MATHEMATICS** **CORE COURSE:1**
Credit:5 **Differential Calculus and Trigonometry** **Int.Marks:25**
Hours/Week:7 **CODE: U1R1MTCC1** **Ext.Marks:75**
Total Hours:84 **Max.Marks:100**

Objectives:

- *To study the fundamental concepts of Derivatives.*
- *To understand the concept of Curvature of Plane curve.*
- *To develop and strengthen the student problem- solving skills in Partial Differentiation. .*
- *To review and extend knowledge of trigonometry.*
- *To evaluate problems on Hyperbolic functions.*

UNIT-I: Differentiation and Meaning of the Derivative [16 HOURS]

Successive Differentiation – the n^{th} derivative – Standard Results – Trigonometrical transformations- Formation of equations involving derivatives- Leibnitz's formula for the n^{th} derivative of a product- Geometrical interpretation – Meaning of the sign of the differential coefficient.

UNIT-II: Curvature [16 HOURS]

Curvature- Circle, radius and centre of curvature- Cartesian formula for the radius of the Curvature- The co-ordinate of the centre of curvature- Evolute and Involute - Radius of curvature when the curve is given in polar co-ordinates- P-R equations: Pedal equations of curve.

UNIT-III: Partial Differentiation [16 HOURS]

Successive Partial derivatives, function of a function rule, Total differential coefficients- A special case- implicit Functions- homogeneous functions- Euler's theorem- Partial derivatives of a functions of two functions- Maxima and minima of functions two variables.

UNIT- IV: Trigonometrical Expansions [16 HOURS]

Expansion: Power of $\sin\theta$ and $\cos\theta$ in terms of powers of θ- Expansion of $\sin^n\theta$, $\cos^n\theta$, $\sin^n\theta\cos^m\theta$- Expansions of $\sin\theta$, $\cos\theta$ in a series of ascending power of θ.

UNIT- V Hyperbolic Functions [16 HOURS]

Definition of Hyperbolic functions- formulae involving Hyperbolic functions- Relations between hyperbolic & circular functions- Expansion of sinh x, cosh x, tanh x in powersof x- Expansion of inverse hyperbolic functions $\sinh^{-1} x$, $\cosh^{-1} x$, $\tanh^{-1} x$.

UNIT –VI: [04 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] "Calculus vol. I ", T.K Manichavasagampillai and others S.V Publications 2011.
[2] " Trigonometry" T.K Manichavasagampillai and others S.V Publications 2011.
Unit I :Chapter 3, sec 1.1 to 2.1 and Chapter 4, sec 2, 2.1, 2.2 [1]
Unit II :Chapter 10, sec 2.1 to 2.7 [1]
Unit III: Chapter 8, sec 1.2 to 1.7 and sec 4 [1]
Unit IV: Chapter 3 Sec 4 & 5 [2]
Unit V : Chapter 4 full [2]

Reference Books:

1) Calculus vol.I, S.Arumugam and Issac, New Gamma Publications.
2) Trigonometry, S.Arumugam and Issac, New Gamma Publications.
3) Differential calculus, Shanthi Narayanan, S.Chand & Co.

Outcomes: The learners would have the ability

- *To solve problems on successive differentiation and Leibnitz theorem.*
- *To understand and apply the concepts on envelopes using Cartesian formula for radius of curvature.*
- *To find partial derivative of a function of two functions and realize the maxima and minima of function of two variables.*
- *To expand $\cos^n\theta, \sin^n\theta, \cos^m\theta\sin^n\theta$ for different values of n and m .*
- *To obtain and use Hyperbolic function identities.*

SEM: I **B.Sc. MATHEMATICS** **ALLIED COURSE:1**
Credit:3 **Mathematical Statistics – I** **Int.Marks:25**
Hours/Week:7 **CODE: U1R1STAC1** **Ext.Marks:75**
Total Hours:84 **Max.Marks:100**

Objectives:

- *Provide some basic statistical tools and Graphical representation useful for the future research.*
- *To explain the fundamental concepts of measures of Average sand dispersion.*
- *To compute the results for Correlation analysis and Regression analysis.*
- *To specify and compute Theory of Attributes.*
- *To test the fit of multiple time series model.*

Unit I – Statistics - Introduction and Presentation of Data [16 HOURS]

Definition of statistics - Importance and scope of statistics - Limitations of statistics - Frequency distribution – Graphic representation of a frequency Distribution.

Unit II - Measures of Averages and Dispersion [16 HOURS]

Definition - Arithmetic Mean - Geometric Mean - Harmonic Mean -Median - Mode (definition, merits & demerits, graphical location, problems based on raw, discrete and continuous frequency distributions)

Measures of Dispersion : Definition - range - Quartile Deviation - Mean Deviation - Standard Deviation and Coefficient of Variation (Definition, Merits and Demerits, problems based on Raw, Discrete and Continuous Frequency Distributions)-Concept of Skewness and Kurtosis.

Unit III – Correlation and Regression [16 HOURS]

Correlation : scatter diagram - correlation coefficient - Karl Pearson - limits for correlation coefficients - probable error - properties of correlation - Rank correlation - limits for rank correlation coefficient spearman rank correlation coefficient (Related Problems).

Regression : Lines of regression - regression curves - regression coefficients - properties of regression coefficients (Related Problems).

Unit IV – Theory of Attributes [16 HOURS]

Introduction – Notations – Dichotomy – Classes and class frequencies – Consistency of data – Independence of attributes – Association of Attributes.

Unit V - Time series [16 HOURS]

Concept - components of a time series - trend - periodic changes - irregular component - analysis of time series - additive and multiplicative models - uses of times series - measurement of trend - graphical method - semi average - methods of curve fitting by principles of least squares - growth curves and fitting - moving averages - measurement of seasonal fluctuations - simple averages - ratio to trend - ratio to moving average - link relative methods - related problems.

Unit –VI: [04 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] "Fundamentals of Mathematical Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & sons - New Delhi,2007.

[2] "Bussiness Mathematics and Statitisics" – P.A. Navanithan, Jai Publishers, 2014.

Unit I : Chapter 1 : Sec. 1.2 to 1.4 [1] & Chapter 2 : Sec. 2.1 to 2.3 [1]
Unit II : Chapter 2 : Sec. 2.4 - 2.5 (except 2.5.3) ,2.6 to 2.11.1, 2.12 to 2.14.1 , 2.16 to 2.17 [1]
Unit III : Chapter 10 : Sec. 10.1 to 10.4.1 , 10.6 to 10.7.4, Chapter 11 - 11.1 to 11.2.2 [1]
Unit IV : Chapter 13 [1]
Unit V : Page no. 579 to 620 - Part – II [2]

Reference Books:

[1] "Fundamentals of Mathematical Statistics" by S.C Gupta and V.K Kapoor.

[2] "Fundamentals of Applied Mathematical Statistics" by S.C. Gupta and V.K. Kapoor - Sultan Chand & Sons - New Delhi,2007.

Outcomes:

The learners would have the ability

- *To calculate and apply measures of location and measures of dispersion for grouped & ungrouped data.*
- *To calculate and apply the measures of Averages and Dispersion.*
- *To compute Correlation coefficients and to estimate Regression Analysis.*
- *To deals with consistency of data and independence of Attributes.*
- *To use the variation in Time series.*

SEM: II **B.Sc. MATHEMATICS** **CORE COURSE:2**
Credit:5 **Probability and Statistics** **Int.Marks:25**
Hours/Week:5 **CODE: U2R1MTCC2** **Ext.Marks:75**
Total Hours:60 **Max.Marks:100**

Objectives:

- *To create and analyze the elementary Probability models.*
- *To understand the concepts of Random variable with its properties.*
- *To review the basic concepts and knowledge in Mathematical expectation and Generating functions.*
- *To know the limitations of Discrete distributions*
- *To know the limitations of Continuous distributions*

Unit I - Theory of Probability [12 HOURS]

Concept of probability - definition of various terms - classical probability - empirical probability - Axiomatic Probability - Definition of probability sample space - Probability of an event - Addition theorem - Multiplication theorem - Conditional probability - Independence of events - Baye's theorem (related problems).

Unit II - Random Variables [12 HOURS]

Introduction of random variables - Distribution function and its properties - Discrete random variables - Probability mass function - Discrete distribution function - Continuous random variables - Probability density function - Joint probability law - Joint probability mass function - Joint probability distribution function - Marginal distribution function - Joint probability density function - Conditional distribution function - Conditional probability density function (Related Problems).

Unit III - Mathematical Expectation and Generating Function [12 HOURS]

Mathematical expectation *:* Expectation of a function of a random variable - Addition and Multiplication theorem of expectation - Expectation of a linear combination of random variables - Variance - Variance of linear combination of random variables – covariance. Generating Functions: Moment generating function - Theorems on moment generating function (Simple Problems).

Unit IV - Discrete Distributions [12 HOURS]

*Binomial Distribution :*Moments - Recurrence relation - Mean deviation about mean - Median - Mode - Moment generating function - Additive property - Characteristic function - Recurrence relation for cumulants - Fitting of binomial distribution.

*Poisson Distribution :*Moments - Mode - Recurrence relation - Moment generating function - Characteristic function - Additive property - Fitting of poisson distribution.

Unit V: Continuous Distribution [10 HOURS]

Normal distribution : A limiting form of binomial - Characteristics of normal - Mode - Median - Moment generating function - Cumulants generating function - Moments – Importance of Normal Distribution - Fitting of normal.

*Rectangular distribution :*Moments - Moment generating function - Characteristic function

*Exponential distribution :*Moment generating function - Moments lack of memory property.

Unit –VI: [02 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] "Fundamental of Mathematical Statistics"- S.C.Gupta and V.K.Kapoor,Sultan Chand & Sons (2002).
Unit I : Chapter 3, Sec. 3.1 to 3.5, 3.8.5 , 3.9,3.9.1,3.10 to 3.13 and Chapter 4, Sec. 4.2
Unit II : Chapter 5, Sec. 5.1 to 5.4.3, 5.5 to 5.5.5
Unit III: Chapter 6, Sec. 6.1 to 6.6.1 , Chapter 7- sec 7.1 to 7.1.3
Unit IV: Chapter 8, Sec. 8.4 to 8.4.12, 8.5 to 8.5.9
Unit V : Chapter 9, Sec. 9.2 – 9.2.7, 9.2.13 – 9.2.14, 9.3 – 9.3.4, 9.8 – 9.8.1

Reference Books:

[1]"Mathematical Statistics" - J.N. Kapur, H.C.Saxena - S.Chand& Company Ltd - New Delhi(2011)
[2] " Statistical and Numerical Methods", by P.R. Vittal and V. Malini, Margham Publications

Outcomes:

The Learners would have the ability to

- *Appreciate the importance of probability and statistics in computing.*
- *Use appropriate statistical methods in Random variables.*
- *Calculate mathematical expectation and derive the Moment Generating Function.*
- *Derive mathematical expectation, binomial, poisson distribution.*
- *Use continuous distribution develop the Normal distribution and Exponential distribution.*

SEM: II	**B.Sc. MATHEMATICS**	**CORE COURSE:3**
Credit:5	**Analytical Geometry (3D) and Integral Calculus**	**Int.Marks:25**
Hours/Week:5	**CODE: U2R1MTCC3**	**Ext.Marks:75**
Total Hours:60		**Max.Marks:100**

Objectives:

- *To understand fundamental aspects of two and three Dimensional Analytical Geometry.*
- *To introduce the fundamental principles of Integral calculus.*
- *To learn the properties of Definite Integrals.*
- *To evaluate double and triple integrals.*
- *To develop logical and systematic computational Beta and Gamma functions.*

Unit I: Plane [12 HOURS]

Standard equation of a plane - intercept form - normal form - plane passing through given points - angle between planes - plane through the line of intersection of two planes - equation of the straight line - shortest distance between two skew lines - equation of the line of shortest distance.

Unit II: Sphere [12 HOURS]

Sphere - Standard equation - length of a tangent from any point - sphere passing through a given circle- intersection of two spheres - Tangent plane.

Unit III: Integration [12 HOURS]

Integration by parts - Bernoulli formula - definite integrals - properties of definite integrals - reduction formulae for i) $\int x^n e^{ax} dx$, ii) $\int x^n \cos ax dx$, iii) $\int \sin^n x\, dx$ or $\int \cos^n x dx$, iv) $\int \tan^n x dx$ v) $\int \sin^m x \cos^n x dx$

Unit IV: Multiple Integrals [12 HOURS]

Definition of Double integrals - Evaluation of double integral - change of order of integration - applications of multiple integrals - triple integrals –simple problems only.

Unit V: Beta and Gamma Functions [10 HOURS]

Beta functions - Definition - properties of Beta function - Gamma function - Definition - properties of Gamma function - relations between Beta and Gamma functions.

Unit –VI: [02 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books.

[1]T.K.Manickavasagam Pillai & Others, "**Analytical Geometry**" S.V. Publications - 2013 Revised Edition.

[2] T.K. ManickavasagamPillai& others, "C**alculus Vol. II**" S.V. Publications, 2011.

Unit I : Chapter 2, Sec. 1 to 9 & Chapter 3, Sec. 1 to 8 [1]
Unit II : Chapter 4, Sec. 1 to 8 [1]
Unit III : Chapter 1, Sec. 11, 12 & 13.1 to 13.5 [2]
Unit IV : Chapter 5, Sec. 2.1 to 2.2, 3, 4, 5, 6 [2]
Unit V : Chapter 7, Sec. 2.1 to 5 of [2]

Reference Books:

1)Duraipandian and Chatterjee, "**Analytical Geometry**" S.Chand& Co, June 1997.
2)Shanti Narayan, **"Differential & Integral Calculus"** S. Chand & company ltd Reprint 1994.

Outcomes:

The Learners would have the ability to

- *Apply the fundamental concepts of two and three dimensional.*
- *Get the knowledge in the areas of Integral Calculus.*
- *Know the concepts of Bernoulli's formula.*
- *Find the area of curved surfaces, Change the variables and integrate.*
- *Understand Beta and Gamma functions and derive their properties.*

SEM: II	**B.Sc. MATHEMATICS**	**ALLIED COURSE:2**
Credit:3	**SPSS – Practical**	**Int.Marks:40**
Hours/Week:3	**CODE: U2R1STAC2P**	**Ext.Marks:60**
Total Hours:36		**Max.Marks:100**

Objectives:

- *To provide concepts used in routines in SPSS on the following problems.*
- *To understand how to start SPSS.*
- *To enter, modify and analyze the data.*
- *To define a variety of statistical variables.*
- *To work with multiple data sources.*

List of Practical:

1. Mean, Median, Mode, Standard deviation, (pg. 49 to 53)	**[06 HOURS]**
2. Skewness and Kurtosis.(pg. 54 to 56)	**[03 HOURS]**
3. Bar diagram, Line diagram, Pie chart and Histogram. (pg.77 to 81,85 to 89, 95 to 104)	**[04 HOURS]**
4. Co efficient of correlation and Rank correlation.(pg. 187 to 188, 201 to 203)	**[04 HOURS]**
5. Regression equation of X on Y and Y on X.(pg. 211 to 214)	**[03 HOURS]**
6. Application of t-test for One sample test.(pg. 112 to 126)	**[03 HOURS]**
7. Application of t-test for Two sample test.(pg. 112 to 126)	**[04 HOURS]**
8. Application of paired t- test. (pg. 112 to 126)	**[03 HOURS]**
9. Chi-Square test for Goodness of fit. (pg. 233 to 237)	**[03 HOURS]**
10. Application of analysis of variance: One way and Two way classification. (pg. 154 to 174)	**[03 HOURS]**

Text Book:

"SPSS for you" by A.Rajathi& MJP P. Chandran, Publisher, Edition- 2010

Reference Book:

"SPSS 17.0 for Researchers" by Gupta and Hitesh Gupta – International Book Home Pvt. Ltd. 2014.

Outcomes:

The learners would have the ability to

- *Analyze statistical data using measures of central tendency, dispersion and location.*
- *Analyze statistical data using frequency distributions and cumulative frequency distributions*
- *Calculate and interpret the correlation between two variables.*
- *Know the association between the attributes.*
- *Interpret results of analysis of variance tests.*
- *Analyze statistical data using SPSS.*

SEM: II **B.Sc. MATHEMATICS** **ALLIED COURSE:3**
Credit:3 **Mathematical Statistics – II** **Int.Marks:25**
Hours/Week:5 **CODE: U2R1STAC3** **Ext.Marks:75**
Total Hours:60 **Max.Marks:100**

Objectives:

- *To update the basic knowledge of index numbers.*
- *To review the basic concepts and knowledge in Continuous distribution.*
- *To develop the skills pertinent to the theory of estimation.*
- *To study about the Test of significance using t- test .*
- *To compute the analysis of variance and chi-square test.*

Unit I – Index Numbers **[12 HOURS]**

Concept - construction of index numbers - calculation of index number - simple and weighted quantity index number, value index number, chain indices - criteria of good index number (unit, time, factor reversal test) - classification of index number - cost of living index number (construction and uses) - uses of index number - limitation of index number.

Unit II – Continuous and Sampling distribution **[12 HOURS]**

Gamma distribution: Moment generating function - Moments - Cumulants generating function - Additive property .

Beta distribution: 1st kind and 2nd kind - Constants.

Chi-square distribution : Chi-square variate - Derivation - Moment generating function – Cumulants generating function - Characteristic function - Additive property.

*Student's t- distribution :*Derivation – Constants.

F distribution: F statistic - derivation of Snedecor's F distribution- Constants- Mode.

Unit III – Theory of Estimation **[12 HOURS]**

Concepts - characteristics of estimator - Consistency - Unbiasedness - Efficiency - sufficiency - Invariance property of consistent estimators - Methods of estimation - Maximum likelihood estimator - Moments - Properties of these estimators based on these two methods.

Unit IV - Test of Significance **[12 HOURS]**

Concept of testing of hypothesis - Statistical hypothesis - Test of a statistical hypothesis - Population - Sample - Parameter - Statistic - Sampling distribution - Standard error - Null and Alternative hypothesis (concept only) - Types of error - Level of significance - power of the test - One tail and Two tail test.

Unit V – Analysis of Variance **[10 HOURS]**

Test of significance based on normal and students t-distribution for mean, proportion and correlation -Test of significance: Chi-square test : Goodness of fit, independence of attributes
Introduction - Analysis of variance – One way classification.

Unit –VI: **[02 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books :

[1] "Bussiness Mathematics and Statitisics" – P.A. Navanithan, Jai Publishers, 2014.
[2] "Fundamentals of Mathematical statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & Sons(2002).
[3] " Fundamentals of Applied Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & Sons (2007).

Unit I : Chapter 10 Pg. No. 444 to 471 & 486 – Part –II [1]
Unit II : Chapter 9, Sec 9.5 – 9.7.1, Chapter 15, Sec.15.1 – 15.3.5 [2]
& Chapter 16, Sec. 16.2 - 16.2.4, 16.5 – 16.5.3 [2]
Unit III : Chapter 17, Sec. 17.1 - 17.2.4, 17.6 - 17.6.3. [2]
Unit IV : Chapter 18, Sec. 18.1 - 18.3 & Chapter 14, Sec 14.4.4 [2]
Unit V : Chapter 14, Sec 14.7.2 and 14.8.3[2] Chapter 16, Sec 16.3- 16.3.6 [2] and Chapter 15, Sec 15.6 – 15.6.3 [2] and Chapter 5, Sec 5.1 – 5.2.4 [3]

Reference Books:

[1] "Mathematical statistics" - J.N.Kapur, H.C.Sazena - S.Chand& Company Ltd. - New Delhi.
[2]**"**Introduction to Biostatistics" – Sokal and Rohlf – Toppan Co. Japan
[3] "Primer of Biostatistics" – Stanton A. Clantz – The McGraw Hill Inc. Newyork.

Outcomes: The Learners would have the ability to

- *Acquire the knowledge of index numbers.*
- *Identify the characteristics of continuous distribution.*
- *Develop the skills pertinent to practice Theory of estimation.*
- *Understand the concepts of testing of hypothesis.*
- *Collect and analyze data using ANOVA.*

SEM: III **B.Sc. MATHEMATICS** **CORE COURSE:4**
Credit:5 **Number Theory** **Int.Marks:25**
Hours/Week:5 **CODE: U3R1MTCC4** **Ext.Marks:75**
Total Hours:60 **Max.Marks:100**

Objectives:

- *To study and apply various properties of integers including the Well-Ordering Principle and greatest common divisors.*
- *To identify certain number theoretic functions and their properties.*
- *To understand the concept of Fermat's Factorization Method.*
- *To Identify the perfect numbers.*
- *To describe the sum of the Squares of integers by using waring's problem.*

Unit I: Preliminaries and Divisibility Theory [12 HOURS]

Introduction - Well ordering principle - Mathematical induction - Binomial coefficient - Pascal's triangle - Basis representation theorem - Divisibility - Division algorithm - Greatest common divisor - Euclidean algorithm - least common multiple - Fibonacci sequence - Lame's theorem - Kroneeker's theorem - The linear Diophantine equation.

Unit II: Primes and Their Distribution and Theory of Congruence [12 HOURS]

Introduction - Prime number - Fundamental theorem of arithmetic - Sieve of Eratosthenes - The Goldbach conjecture - Congruence - Basic properties of congruence - Residue system - Tests of divisibility - Linear congruence - Solvability condition of a system of linear congruence.

Unit III: Fermat's Theorem [12 HOURS]

Introduction - Fermat's factorization method - Fermat's little theorem - Wilson's theorem - Euler's factorization method.

Unit IV: Perfect Number [12 HOURS]

Introduction - Perfect numbers - Mersenne primes - Fermat number - Pythagorean triples - Other Diophantine equation - Fermat's last theorem.

Unit V: Sum of Squares of Integers [10 HOURS]

Introduction - Sum of two squares - Sum of more than two squares - Waring's problem.

Unit –VI: [02 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] "Number Theory", HariKishan, Krishna's Publications, 12th edition 2017.

Unit I: Chapter 1: Section: 1.1 to 1.6 & Chapter 2: Sections: 2.1 to 2.10

Unit II: Chapter 3: Sections: 3.1 to 3.5 & Chapter 4: Sections: 4.1 to 4.7

Unit III: Chapter 5: Sections: 5.1 to 5.5

Unit IV: Chapter 9: Sections: 9.1 to 9.7

Unit V: Chapter 10: Sections: 10.1 to 10.4

Reference Books:

1) **"ELEMENTARY NUMBER THEORY"** David M. Burton , TATA McGraw – Hill Edition

Outcomes:

The Learners would have the ability to

- *Prove results involving divisibility and greatest common divisors*
- *Solve systems of linear congruences.*
- *Apply Euler-Fermat's Theorem to prove relations involving prime numbers*
- *Find integral solutions to specified linear Diophantine Equations*
- *To identify how number theory is related to and used in cryptography.*

SEM: III **B.Sc. MATHEMATICS** **CORE COURSE:5**
Credit:5 **Sequences and Series** **Int.Marks:25**
Hours/Week:6 **CODE: U3R1MTCC5** **Ext.Marks:75**
Total Hours:72 **Max.Marks:100**

Objectives:

- *To understand the concept of convergence and divergence in sequences.*
- *To test for convergency series by using cauchy's theorem.*
- *To discuss behavior of absolutely convergent series.*
- *To derive Binomial,Exponential and logarithmic series.*
- *To compute summations of series and recurring series.*

Unit I: Sequences **[14 HOURS]**

Sets, Sequences – Limit of a Sequence – Aggregate – Upper and lower bound Dedikind's theorem – upper and lower bound of an aggregate – Bounded sequences – The upper and lower limits of a sequence – Cauchy's general principle of convergence – Monotonic sequence – a monotonic sequence always tend to a limit – Finite or Infinite.

Unit II: Test for convergency of Series **[14 HOURS]**

Convergence of infinite series, Geometric series – some general theorems concerning infinite series – series of positive terms – Comparison tests – Convergent of the given series – Cauchy's condensation test- D'Alembert's Ratio test.

Unit III: Cauchy's test **[14 HOURS]**

Cauchy's root test – Raabe's test – Absolutely convergent series – Absolutely convergent series and Conditionally convergent series – An absolutely convergent series is convergent - Series whose terms are alternately positive and negative.

Unit IV: Binomial, Exponential and Logarithmic series **[14 HOURS]**

Binomial theorem for a Rational index – some important particular cases of Binomial expansion – sign of terms in Binomial expansion – Application of Binomial expansion to the summation of series - Exponential theorem - summation - Logarithmic series which can be summed up by the Logarithmic series, modification of logarithmic series, Euler's constant.

Unit V - Summation of Series **[14 HOURS]**

Application of Partial Fractions - Summation of series whose general term is given – Sum to n terms of the given series - Summation by difference series - Successive difference Series - Recurring series - The generating functions - sum to n terms of a given recurring series.

Unit –VI: **[02 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapthy, "Algebra Vol.I", S.Viswanathan Pvt. Limited, Chennai, 2004.

Unit I : Chapter II Sec: 4 to 7
Unit II : Chapter II Sec: 8 to 16
Unit III : Chapter II Sec: 17 to 24
Unit IV : Chapter III Sec: 5 to 10 & Chapter IV Sec. 2, 3, 5 to 9
Unit V : Chapter V Sec: 2 to 7

Reference Books :

1) M.K.Singal&Asha Rani Singal, "A first course in Real Analysis", R.Chand & Co., 1999.
2) 'A guide to Mathematics', L.R.Dhanda, Kalyani Publishers.
3) Dr. S.Arumugam "Sequences & Series", New Gamma Publishers.

Outcomes: The Learners would have the ability

- *To know the properties of convergent and divergent sequence.*
- *To understand and apply test for convergency of series.*
- *To understand and to apply the method of difference to sum the finite series and to extend its use to infinite series.*
- *To know how to use Binomial, Exponential and Logarithmic series.*
- *To acquire the knowledge of the generating function.*

SEM – III: ALLIED COURSE – I: ALLIED PHYSICS – I

Course Code : **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 25**
Credit : 3 **External Marks : 75**

OBJECTIVES:

- *To understand the centre of Gravity and stability of floating bodies.*
- *To understand the concepts of acoustics and properties of the sound waves*
- *To learn the basic concepts of osmosis and diffusion*
- *To study the basic concept of heat.*
- *To study the concepts of spectroscopy and fibre optics*

UNIT-I: MECHANICS [8 HOURS]

Centre of Gravity–Centre of Gravity of a solid hemisphere–hollow hemisphere and Solid Cone. StabilityofFloatingbodies:Metacentre–DeterminationofaMetacentric height of a Ship.

UNIT-II: SOUND [10 HOURS]

Simple Harmonic Motion–Composition of two simple harmonic motion(1) along a straight line and(2)at right angles to each other–Lissa Jou's figures and their applications. Acoustics of buildings Reverberation - Reverberation time – Sabine's formula conditions for good acoustics. Decibel–Phon–Intensity measurement by hotwire microphone method.

UNIT-III: PROPERTIESOF MATER [10 HOURS]

Diffusion:Ficks'sLaw–CoefficientofdiffusionExperimentalDeterminationof Coefficient of Diffusion–Application. Osmosis: Laws of osmotic pressure – Berkeley and Hartley Method of determining Osmotic pressure–Elevation of Boiling point and depression of Freezing point–Application.

UNIT-IV: THERMALPHYSICS [10 HOURS]

Newton's law of cooling–Verification–Specific Heat Capacity of a liquid by Cooling-Bomb Calorimeter. Conduction: Coefficient of thermal conductivity–Good and bad Conductor Stefan's law of radiation–Solar Constant–Angstrom's Pyroheliometer– Temperature of the Sun.

UNIT-V: OPTICS [10 HOURS]

Electromagnetic Spectrum –Spectral response of human eye–UV and IR spectroscopy – Raman Effect – Experimental Arrangement – Application of Raman Effect. Fiber Optic communication: Introduction–Optic Fiber –Numerical Aperature – Coherent bundle – Fiber optic communication System and its advantage–multimode fibre optic sensors.

UNIT-VI: LATEST LEARNING

Latest development related to the course during the semester concerned (For purpose of Continuous Internal Assessment only, not for question setting)

BOOKS FOR STUDY:

1. Statics, Hydrostatics and Hydrodynamics Narayanamoorthy and Nagarathinam. (1990)
2. Sound–Saigal –S. Chand&Co. Delhi.(2000)
3. Properties of matter–D.S. Mathur. S. Chand & Co (2008)
4. Heat and Thermodynamics–Brijlal and Subramaniam-S.Chand & Co Pvt limited((1999)

BOOKS FOR REFERENCE:

1. Optics–Brijlal and Subramaniam S.Chand Publishing (2010)
2. Optics–Ajoy Ghatak –Tata Mc Graw Hill, Delhi. (2004)
3. Allied Physics–I–A. Sundaravelusamy. priya publications. (2015)

COURSE OUTCOMES: On completion of this course, the students will have

- *Proficient with basic concepts in elastic properties of materials and importance of elasticity in beams and girders.*
- *Study of viscous properties of fluids provides knowledge in industrial product development (dyes, paints, food products).*
- *Understand the concept of good and bad conductor*
- *Acquired the ideas of applications of ultrasonic waves in diverse fields.*
- *Acquired the basic knowledge of optics and optical fiber communication*

SEM: IV **B.Sc. MATHEMATICS** **CORE COURSE:6**
Credit:5 **Vector Calculus and Fourier Series** **Int.Marks:25**
Hours/Week:5 **CODE: U4R1MTCC6** **Ext.Marks:75**
Total Hours:60 **Max.Marks:100**

Objectives:

- *To give a systematic study of Vector Calculus and Fourier Series.*
- *To understand the basic concepts of vector differentiation and integration.*
- *To learn the techniques of calculus and its applications.*
- *To explain the Fourier series with the period of 2π.*
- *To explain the basic properties of half range Fourier series.*

Unit I - Vector differentiation and Integration [12 HOURS]

Vector function – Limit and Continuity of a vector function- Derivative of a vector function with respect to a scalar – Curves in space – Velocity and Acceleration – Integration of Vector functions.

Unit II –Gradient, Divergence and Curl [12 HOURS]

Partial derivatives of vectors – The vector differential operator ∇ - Gradient of a scalar field – Definition – Level Surfaces – Directional derivative of a scalar point function – Tangent plane and normal to a level surface – Divergence of a vector point function – The Laplacian operator ∇^2 - Important vector identities.

Unit III –Green's, Gauss's and Stoke's Theorem [12 HOURS]

Line Integrals – Surface Integrals – Volume Integrals – Green's theorem in the plane – The divergence theorem in the plane- The divergence theorem of the Gauss – Green's Theorem – Stoke's theorem (without proof) – Related problems.

Unit IV - Fourier series [12 HOURS]

Definition - To determine the value of a_0, a_n and b_n, Fourier Series expansion of periodic functions with period 2π, Fourier series- Even and Odd Functions – Properties of Odd and Even functions.

Unit V - Fourier series - Half range [10 HOURS]

Definition - Development in Cosine Series - Development in Sine series - Problems of Half range Fourier Sine series and Half range Cosine series - Change of interval.

Unit –VI: [02 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] "Vector Calculus" by J. N. Sharma and A.R. Vasishtha published by Krishna Prakashan Mandir (1984) Co., 9th Edition.

[2] "Calculus Vol. III" by T.K. Manicavachagom Pillay and S. Narayanan, S.V. Publications(2011)

Unit I : Chapter I- All sections [1]
Unit II: Chapter II- All sections [1]
Unit III : Chapter III – Sec 2 to 9 [1]
Unit IV : Chapter VI – Sec 1, 2, 3 [2]
Unit V : Chapter VI - Sec 4, 5.1,5.2, 6, 6.1 [2]

Reference Books:

1) "Vector Algebra and Analysis", T.K.Manicavachagom Pillay & S. Narayanan, S.V. Publications.
2) "Allied Mathematics" - S.G.Venkatachalapathy - Margham Publications.

Outcomes: The Learners would have the ability to

- *Acquire the knowledge of Vector Differentiation and Integration.*
- *Use the vector identities, directional derivatives and divergence of a vector point function are evaluated easily.*
- *Find the line integral, surface integral and volume integrals.*
- *Evaluate integrals by using Green's, Gauss's & Stoke's theorem.*
- *Apply Fourier series techniques in Electrical Engineering, Vibration Analysis, Optics, Signal and Image Processing etc.*

SEM: IV **B.Sc. MATHEMATICS** **CORE COURSE:7**
Credit:5 **Differential Equations and Laplace Transforms** **Int.Marks:25**
Hours/Week:5 **CODE: U4R1MTCC7** **Ext.Marks:75**
Total Hours:72 **Max.Marks:100**

Objectives:

- *To study the methods used to solve differential equation of first order*
- *To understand the method of solving second order differential equations.*
- *To solvE differential equations as well as methods based on the use of Laplace transforms.*
- *To find the solution of PDE first order.*
- *To learn standard types of PDE second order.*

UNIT I: ODE –First Order **[14 HOURS]**

Type F: Exact differential equations – Sufficient condition – practical rule for solving an exact differential equation – Rules for finding integrating factors - Equations solvable for dy/dx – equations solvable for y – Exact equation solvable for x – Clairaut's form – equations that do not contain x explicitly – equations that do not contain y explicitly –Equations homogeneous in x and y.

UNITII: ODE – Second Order **[14 HOURS]**

Definition – the operator D – Complementary function of a linear equation with constant coefficients – Particular integral – General method of finding P.I. – Special methods for finding P.I. such as e^{ax}, cosax, sinax, x^m, e^{ax}cosbx, e^{ax}sinbx.

UNIT III: Laplace Transform **[14 HOURS]**

Definition – Sufficient conditions for the existence of the Laplace transform – Laplace transform of periodic function- Some general theorem – Evaluating certain integrals - The inverse Laplace transform – Solving ODE using Laplace transform with constant coefficients, Solving system of Differential equations, Solving differential equation containing variable coefficients and Solving certain DE involving integrals.

UNIT IV: PDE First Order **[14 HOURS]**

Classification of integrals – Singular integral - Derivative of PDE – By elimination of constants – By elimination of an arbitrary function – Lagrange's method –Special method: Standard forms I: F(p,q) = 0, II: F(x, p, q) = 0, III: $F_1(x, p) = F_2(y, q)$, IV: Clairaut's form, V: Equations reducible to the standard form, VI: Charpit's method.

UNIT V : PDE Second Order **[14 HOURS]**

Some useful results – Linear differential equations with constant coefficients- Auxillary equation – Working rule for finding C.F. –Example of Type - I.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

TEXT BOOKS

[1]. S. Narayanan, "Differential Equations", S. Viswanathan Publishers, 2011.
[2]. M.D. Raisinghania, "Ordinary& Partial Differential Equations", S. Chand & Co.
Unit I: Chapter II Sections 6.1 -6.4 and Chapter IV: Sections 1-4 [1].
Unit II: Chapter V Sections 1-4 [1].
Unit III: Chapter IX All Sections Except section 2 & 9 [1].
Unit IV: Chapter XII All Sections [1].
Unit V: Chapter IV Sections 4.1-4.5[2].

Reference Books:

1) M.L.Khanna, " Differential Calculus", Jaiprakashnath and Co., Meerut – 2004.
2) M.K.Venkataraman,"Engineering Mathematics",S.V. Publication,1985,Revised Edition.

Outcomes: The Learners would have the ability to

- *Extract the solution of differential of first order ODE by Homogeneous methods.*
- *Solve the second order ODE by using special method.*
- *Apply the Laplace Transform to solve ODE with constant coefficents.*
- *Form partial differential equations.*
- *Use Differential equations as a powerful tool in solving problems in physical and social science.*

SEM: V **B.Sc. MATHEMATICS** **CORE COURSE:8**
Credit:5 **Mechanics** **Int.Marks:25**
Hours/Week:5 **CODE: U5R1MTCC8** **Ext.Marks:75**
Total Hours:72 **Max.Marks:100**

Objectives:

- *To understand the basic concepts of forces acting at a point.*
- *To find the moments & couple acting on a rigid body.*
- *Understand the concepts of laws of friction.*
- *To find the path of the projectile.*
- *To understand the concept of simple Harmonic motion and its Geometrical representation.*

UNIT I:Forces acting at a Point and Parallel Forces. [14 HOURS]

Resultant and Component – Parallelogram Forces – Triangle of forces – Perpendicular Triangle of forces- The Polygon forces – Lami's Theorem – Resolution of a force –Conditions of Equilibrium – Parallel Forces – Resultant of Two Parallel Forces –Conditions of equilibrium of three Coplanar forces- Centre of two parallel forces (Simple Problems only).

UNIT II:Moment, Couples and Equilibrium of three forces acting on a rigid body [14 HOURS]

Moment of a force – Geometrical representation – Moment of a force about an axis – Couples –Equilibrium of two couples – Resultant of Coplanar Couples.

UNIT III :Friction [14 HOURS]

Introduction – Statistical, Dynamical and Limiting Friction – Laws of Friction – Angle of Friction – Cone of Friction – Equilibrium – Problems on Friction – Miscellaneous Problems.

UNIT IV: Projectiles [14 HOURS]

Definitions – Two Fundamental principles – Path of the Projectile – characteristic of the motion of the projectile – Horizontal Range – Range on an inclined Plane.

UNIT V:Simple Harmonic Motion [14 HOURS]

Introduction – Simple harmonic motion in a straight line – Geometrical Representation – Change of origin – Composition of two simple Harmonic motion – Motion of a particle suspended by a spiral spring – Horizontal oscillations of a particle tied to an elastic spring – Simple pendulum – Equivalent simple pendulum – The seconds pendulum – Loss or Gain in the number of oscillation made by the pendulum.

Unit –VI: [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] "Statics", M.K. Venkataraman, Agasthiyar Publications, 2002.
[2] "Dyanamics", M.K. Venkataraman, Agasthiyar Publications, 2002.

UNIT I : Chapter 2 full & Chapter 3 Section 1 to 6 [1]
UNIT II : Chapter 3 Section 7 to 14, Chapter 4 Section 1 to 10 [1]
UNIT III : Chapter 7 page no. 206 to 234 [1]
UNIT IV : Chapter 6 Sections 6.1 to 6.15, pg. no, 139 to177 [2]
UNIT V : Chapter 10 [2]

Reference Books:

[1]P. Duraipandian, "Mechanics (Vector Treatement)", S. Chand & co. 1997.
[2] A.V.Dharmapadham, "Statics", S. Viswanathan Publishers Pvt. Ltd., 1979.
[3] S.L. Lony, "Elements of Statics and Dynamics", Part-I, A.I.T. Publishers,1991.

Outcomes:

The Learners would have the ability to

- *Understand the conditions of equilibrium of three coplanar forces.*
- *Study the Geometrical representation of moment of a force.*
- *Understand the problems of the friction.*
- *Study the concept of projectile on an inclined plane.*
- *Acquire the knowledge of composition of simple harmonic motion.*

SEM: V **B.Sc. MATHEMATICS** **CORE COURSE:9**
Credit:5 **Modern Algebra** **Int.Marks:25**
Hours/Week:5 **CODE: U5R1MTCC9** **Ext.Marks:75**
Total Hours:72 **Max.Marks:100**

Objectives:

- *To educate the basic concepts of Groups.*
- *To understand the meaning of normal subgroups and homomorphism.*
- *To know the concept of rings and quotient rings.*
- *To use algebra to for solving field of quotients of integral domain.*
- *To study the concept of the polynomial rings.*

UNIT I-GROUPS [14 HOURS]

Introduction –Definition and Examples – Elementary Properties of Group – Equivalent definitions of a group – Permutation Groups – Subgroups – Cyclic groups – Order of an element.

UNIT II- NORMAL SUBGROUPS AND HOMOMORPHISM [14 HOURS]

Cosets and Lagrange's Theorem – Normal subgroups and Quotient groups – Isomorphism – Homomorphism.

UNIT III – RINGS [14 HOURS]

Definition and Examples – Elementary Properties of rings – Isomorphism – Types of rings – Characteristics of a ring – Subrings – Ideals – Quotient rings – Maximal and Prime ideals – Homomorphism of rings.

UNIT IV- FIELD [14 HOURS]

Field of quotients of an integral domain - Ordered integral domain- Unique factorization domain (U.F.D).

UNIT V- POLYNOMIAL RINGS [14 HOURS]

Euclidean domain – Every P.I.D is a U.F.D.- Polynomial Rings- Polynomial Rings over U.F.D.- Polynomials over Q

UNIT –VI: [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] S. Arumugam & A.Thangapandi Isaac, "Modern Algebra", Scitech Publication (2003).

Unit I : Chapter III sections 3.0 to 3.7
Unit II : Chapter III sections 3.8 to 3.11
Unit III : Chapter IV sections 4.1 to 4.10
Unit IV : Chapter IV sections 4.11 to 4.13
Unit V : Chapter IX sections 4.14 to 4.18.

Reference Books:

1) T.K. Manicavasagam Pillai, T.Natarajan, K.S.Ganapathy, Algebra, Vol.I, S.Viswanathan Pvt. Limited, Chennai, 2004.
2) M.L. Santiago, Modern Algebra, Tata McGraw Hill, 2003.

Outcomes:

The learners would have be ability to

- *Recognize technical terms groups, permutation groups and cyclic groups.*
- *Acquire the knowledge of normal subgroups.*
- *Understand the elementary properties of rings.*
- *Formulate and develop unique factorization domain.*
- *Describe the properties of polynomial rings.*

SEM: V	**B.Sc. MATHEMATICS**	**CORE COURSE:10**
Credit:5	**Real Analysis**	**Int.Marks:25**
Hours/Week:5	**CODE: U5R1MTCC10**	**Ext.Marks:75**
Total Hours:70		**Max.Marks:100**

Objectives:

- *Students are familiar with the basic facts about set theory and the set of real numbers.*
- *To familiarize the fundamental concepts of continuous function.*
- *The course will develop a deeper and more rigorous understanding of derivative of function.*
- *To know about the mean value theorems.*
- *To prove theorems about Riemann integration.*

Unit I - Real Number System **[14 HOURS]**

Introduction to Real Number System - Field axioms - Order relation in R - Absolute value of a real number & its properties – Supremum & Infimum of a set - Order completeness property - countable & uncountable sets.

Unit II - Continuous Functions **[14 HOURS]**

Definition of Continuous functions - Limit of a Function - Algebra of Limits - Continuity of a function - Types of discontinuities- Algebra of continuous functions- Intermediate value theorem - Elementary properties of continuous functions - Uniform continuity of a function.

Unit III - Derivative of function **[14 HOURS]**

Differentiability of a function - Derivability & continuity - Algebra of derivatives - Inverse function theorem - Daurboux's Theorem on derivative.

Unit IV – Mean Value Theorems **[14 HOURS]**

Rolle's Theorem - Mean Value Theorems on derivative - Lagrange's mean value theorem - Cauchy's mean value theorem - Taylor's Theorem with remainder - Power series expansion.

Unit V - Riemann Integrability **[12 HOURS]**

Riemann Integration - Definition – Darboux's Theorem – Necessary and Sufficient condition for integrability – Integrability of continuous and monotonic Functions – Integral Functions – Properties of integral functions – Continuity and derivability of integrable functions –Fundamental theorem of Calculus - First mean value theorem - Second mean value theorem.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books :

[1] "A First Course in Real Analysis", M.K. Singhal & Asha Rani Singhal, R.Chand & Co., June 1997 Edition

[2] "A Course of Mathematical Analysis", Shanthi Narayan, S.Chand & Co., 2014.

Unit I : Chapter 1 of [1]
Unit II : Chapter 5 of [1] Except sec 5.
Unit III : Chapter 6 of [1] Except sec 6, 7.
Unit IV : Chapter 8 of [1] Except sec 7, 8.
Unit V : Chapter 6 Sec 6.1 – 6.9 [2]

Reference Books:

[1] "Methods of Analysis", Gold Berge, Richar. R, Oxford and IBHP Publishing Co. New Delhi.
[2] " Real Analysis", H.L. Royden, P.M. Fitzpatrick, PHI Learning Pvt. Ltd., 2010.

Outcomes:

The Learners would have the ability to

- *Emphasize the proofs development defines the counting of a function and uniform continuity of a function.*
- *Understand the knowldege of types of discontinuities.*
- *Acquire the knowledge of Daurboux's theorem on derivative.*
- *Use results and techniques involving mean value therorems to solve a variety of problems.*
- *Understand the concepts of fundamental theorem of integral calculus.*

SEM: V **B.Sc. MATHEMATICS** **CORE COURSE:11**
Credit:4 **Numerical Methods** **Int.Marks:25**
Hours/Week:5 **CODE: U5R1MTCC11** **Ext.Marks:75**
Total Hours:68 **Max.Marks:100**

Objectives:

- *To make the students to aware of the problems in numerical processing.*
- *To understand basic concepts of operators.*
- *To solve problems using Numerical Differentiation and Integration.*
- *To find the solution of ODE by using Taylor's, Picard's & Euler's Method.*
- *To develop appropriate numerical solution of PDE by using special methods.*

Unit I - Algebraic & Transcendental equations [14 HOURS]

Introduction - Bisection Method - Iteration method - Method of False Position - Newton Raphson Method.

Unit II –Interpolation [14 HOURS]

Introduction - Finite differences –Newton's method for Interpolation - Lagrange's interpolation formulae - Newton's general interpolation formulae - Method of successive approximation.

Unit III - Numerical differentiation & Integration [14 HOURS]

Introduction - Numerical differentiation – Errors in Numerical differentiation – The cubic spline method - Numerical Integration using Trapezoidal rule & Simpson's $1/3^{rd}$, $3/8^{th}$ rules - Theory and Problems.

Unit IV - Numerical Solution of ODE [12 HOURS]

Introduction - Solution by Taylor Series Method - Picard's method of successive approximations - Euler's method - Modified Euler's Method –Runge Kutta 2^{nd} and 4^{th} order methods – Predictor – Corrector method – Adams Moulton method – Milne's method.

Unit V –Numerical Solution of PDE [12 HOURS]

Introduction – Gaussian Elimination method – Gauss Jordan method – Solution of Linear system- Iterative methods- Finite – Difference approximations to derivatives – Laplace's equation – Jacobi's method – Gauss- seidel - Successive over – relaxation or SOR Method – the ADI method

Unit –VI: [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books :

[1] "Introductory Methods of Numerical Analysis" - S.S. Sastry, Prentice Hall of India Pvt. Limited, 1995.

Unit I : Chapter 2 section 2.1 to 2.3 (except 2.3.1), 2.4 – 2.5 (except 2.5.1)
Unit II: Chapter 3 section 3.1, 3.3, 3.6, 3.9(3.9.1 only), 3.11(3.11.1 only), 3.12(3.12.1 only)
Unit III: Chapter 5 sections 5.1,5.2, 5.4(5.4.1, 5.4.2, 5.4.3 only)
Unit IV: Chapter 7 Section 7.1- 7.3, 7.4 (7.4.2 only) 7.5, 7.6
Unit V: Chapter 6 Section 6.3.2, 6.4 &Chapter 8 Sections 8.1 - 8.3

Reference Books:

1) "Numerical Analysis" - S.Narayanan& Others S.Viswanathan Publishers, 1994.
2) "Numerical Methods" - A.Singaravelu, Meenachi Agency, June 2000.

Outcomes:

The Learners would have the ability to

- *Acquire the knowledge of Algebric and Transcendental Equations.*
- *Implement the Numerical methods for computing Interpolation.*
- *Derive Simpson's 1/3, 3/8 rules by using Trapezoidal rule.*
- *Solve the ODE by using Taylor's, Picard's & Euler's Methods*
- *Understand the concepts of Relaxation or SOR method.*

SEM: VI	**B.Sc. MATHEMATICS**	**CORE COURSE:12**
Credit:3	**Numerical Methods with MATLAB**	**Int.Marks:40**
Hours/Week:4	**CODE: U6R1MTCC12P**	**Ext.Marks:60**
Total Hours:60		**Max.Marks:100**

Objectives:

To enable the students to

- *Apply Computer theory and algorithmic aspects in various situations*
- *Design and debug the programs*
- *Develop program skills independently by themselves*
- *Solve the system of Linear equations by using Gauss Elimination method.*
- *Solve ODE problems by using RK method.*

LIST OF PRACTICALS

1.	Linear Interpolation.	**[6 HOURS]**
2.	Linear regression	**[6 HOURS]**
3.	Curve fitting	**[6 HOURS]**
4.	Trapezoidal rule of integration.	**[6 HOURS]**
5.	Simpson's 1/3 rule of integration.	**[6 HOURS]**
6.	Newton – Raphson method for solving equations.	**[6 HOURS]**
7.	Gauss elimination method of solving simultaneous equations.	**[6 HOURS]**
8.	Gauss – Seidel method of solving simultaneous equations.	**[6 HOURS]**
9.	R-K Fourth order method of solving differential equations	**[6 HOURS]**
10.	Lagrange's method of interpolation	**[6 HOURS]**

Text Books:

[1] **"**Applied Numerical Methods Using MATLAB**",** By Won Young Yang, Wenwu Cao, Tae – Sang Chung, John Morris, A John Wiley and sons Inc. Publications.

Reference Books:

[1]. "Introduction to MATLAB" Delores M.Etter, David C.Kuncicky, Holly Moore, Published by Dorling Kindersley (India) Pvt. Ltd., licenses of Pearson Education in South Asia.
[2]. "Numerical methods in Science and Engineering", M.K.Venkatraman, National Publisher Company, Fifth Edition, 2001 (For Units IV and V).

Outcomes:

The Learners would have the ability to

- *Express programming & simulation for engineering problems.*
- *Find importance of this software for lab experimentation.*
- *Determine better and more accurate solution.*
- *Develop program skills for various methods of Numerical Problems.*
- *Acquire knowledge on MATLAB Software.*

SEM: VI	**B.Sc. MATHEMATICS**	**CORE COURSE:13**
Credit:5	**Complex Analysis**	**Int.Marks:25**
Hours/Week:5	**CODE: U6R1MTCC13**	**Ext.Marks:75**
Total Hours:68		**Max.Marks:100**

Objectives :

- *To demonstrate an understanding of the fundamental concepts of Analytic function.*
- *To prove the basic results relating to Bilinear transformation.*
- *To apply the Cauchy's Theorem for solving Definite Integration.*
- *To learn about the concepts of Power series.*
- *To solve the problems by using Residues.*

Unit I: Analytic Functions [14 HOURS]

Introduction- Functions of a complex variable- Limits- Theorems on Limits- Continuous functions- Differentiability- The Cauchy- Riemann equations- Analytic functions- Harmonic functions.

Unit II: Bilinear Transformations and power series [14 HOURS]

Introduction- Elementary transformations- Bilinear transformations- Cross ratio- Fixed points of Bilinear transformations- Power series- Elementary Functions.

Unit III: Complex Integration [14 HOURS]

Introduction - Definite integral – Cauchy's Theorem- Cauchy's integral formula- Higher Derivatives.

Unit IV: Series Expansions [12 HOURS]

Introduction- Taylor's series- Laurent's series – Zeroes of Analytic functions- Singularities.

Unit V:Calculus of Residues [12 HOURS]

Introduction – Residues- Cauchy's Residue Theorem- Evaluation of Definite integrals.

Unit –VI: [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] " Complex Analysis", S. Arumugam, A. ThangapandiIssac and A. Somasundaram, SCITECH Publications, Reprint 2014.

Unit I: Chapter 2: sec 2.0 to 2.8 [1]
Unit II: Chapter 3: sec 3.0 to 3.4 and Chapter 4: sec 4.3 and 4.4. [1]
Unit III: Chapter 6 All Sections [1]
Unit IV: Chapter 7 All Sections [1]
Unit V: Chapter 8 All Sections [1]

Reference Books:

[1] "Complex Analysis", T.K. Manichavasagam Pillai and others, S.V Publications
[2] " Functions of a complex variable", J.N. Sharma, Krishna Prakasan Media Ltd., 13th edition.

Outcomes:

The learners would have the ability to

- *Give an account of the concepts of Analytic functions and Harmonic functions with the role of the C-R equations.*
- *Learn about elementary transformations concepts in complex variables.*
- *Acquire the knowledge of Cauchy's theorems on Derivatives.*
- *Represent the functions as Taylor's and Laurent Power series method.*
- *Understand the singularity concepts and Residues, Solving definite integrals using the Residue concepts.*

SEM: VI	**B.Sc. MATHEMATICS**	**CORE COURSE:14**
Credit:4	**LINEAR ALGEBRA**	**Int.Marks:25**
Hours/Week:5	**CODE: U6R1MTCC14**	**Ext.Marks:75**
Total Hours:68		**Max.Marks:100**

Objectives

- *To study the algebraic structure of vector spaces.*
- *To understand several important concepts in linear transformations.*
- *To study mathematical methodologies and models.*
- *To develop mathematical skills in single linear operator.*
- *To enhance thinking power of Inner product spaces.*

UNIT I: Vector Spaces **[14 HOURS]**

Vector space – Linear Independence and Basis- Rank of a Matrix- Change of Basis.

UNIT II: Linear Transformations **[14 HOURS]**

Linear Transformations- Algebra of linear Transformations- Matrix of a Linear Transformations- Dual Spaces-Linear Transformations on Direct sums.

UNIT III: Determinants **[14 HOURS]**

Permutations – Determinants – Cofactor Expansion – Characteristic Values.

UNIT IV: Single Linear Operator **[12 HOURS]**

Polynomial Rings- Modules and Minimal Polynomials- Triangularization- Canonical Forms- Semi- simple Linear operators.

UNIT V: Inner Product Spaces **[12 HOURS]**

Inner products- Adjoint Operator- Hermitian Form.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] "LINEAR ALGEBRA", Surjeetsingh, vikas publishing house pvt ltd, new edition 2015.

Unit I: Chapter 2
Unit II: Chapter 3
Unit III: Chapter 4
Unit IV: Chapter 5
Unit V: Chapter 6

Reference Books:

[1] Linear Algebra, Seymour lipschutz, Ph.D.,Marc Lipson, Ph.D., Tata McGraw Hill Education Private Limited New Delhi, Edition 2005.
[2] Linear Algebra, S.K. Jain, A.D. Gunawardena, Thomson Asia Pte Ltd.,

Outcomes:

The learners would have the ability to

- *Know and recall core knowledge of Vector Spaces*
- *Understand basic concepts in linear independence of vectors, subspaces bases and dimension of vector spaces.*
- *Analyze the problems and apply the appropriate concept of Determinants.*
- *Apply core conceptsin single linear operators.*
- *Acquire the knowledge of Adjont operator in Inner product spaces.*

SEM: V	**B.Sc. MATHEMATICS**	**ELECTIVE COURSE :1**
Credit:5	**Operations Research**	**Int.Marks:25**
Hours/Week:5	**CODE: U5R1MTMBE1**	**Ext.Marks:75**
Total Hours:68		**Max.Marks:100**

Objectives

- *To understand the basic concepts of Operation Research, Linear programming formation and role of Computer in OR.*
- *To introduce concepts of Duality in linear programming..*
- *To improve the skills of solving very common problems in which Transportation Problem.*
- *To develop computational skill and logical thinking in Assignment problem.*
- *To understand the rules of Network Construction.*

UNIT I: Linear Programming Problem **[14 HOURS]**

Introduction to OR – An overview of OR – Mathematical Formulation of linear Programming problem – Graphical Solution – Simplex Methods for <, = , >.

UNIT II: Duality in Linear Programming **[14 HOURS]**

Introduction – General primal – dual pair – Formulating a Dual problem – Primal - Dual pair in Matrix form – Duality and Simplex method - Dual Simplex Method.

UNIT III: Transportation problem **[14 HOURS]**

Introduction - LP Formulation of Transportation problem –Solution of Transportation problem – Finding an initial basic Feasible solution - Test for Optimality – MODI Method - Stepping Stone Method – Unbalanced Transportation problem.

UNIT IV : Assignment problem **[12 HOURS]**

Introduction – Mathematical Formulation of problem –Solution Methods of Assignment - Unbalanced Assignment problem - Travelling salesman problem.

UNIT V: Network **[12 HOURS]**

Introduction - Basic components- Logical sequencing – Rules of Network Construction – Concurrent Activities - Critical Path Analysis – Probability Consideration in PERT- Distinction between PERT and CPM.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] "Operations Research", Kanti Swarup, Gupta.P.K & Manmohan, Sultan Chand & Co., 2013.

Unit I: Chapter I Sec:1.1,1.2,1.4 to1.6 ,Chapter II sec: 2.2 , 2.3 ,Chapter III Sec:3.2 to 3.5 and Chapter IV Sec:4.1,4.3,4.4 only.

Unit II: Chapter V Sections: 5.1 to 5.4, 5.7 and 5.9.

Unit III: Chapter X Sections 10.1 to 10.16 Except (10.11,10.12).

Unit IV: Chapter XI Sections 11.1 to 11.4 and11.7.

Unit V: Chapter XXV Sections 25.1 to 25.8.

Reference Books:

[1] Hamdy A. Taha, "Operations Research" (7^{th} Edn.), Prentice Hall of India, 2002.

[2] Richard Bronson, "Theory and Problems of Operations Research", Tata McGraw Hill Publishing Company Ltd, New Delhi, 1982.

Outcomes:

The Learners would have the ability to

- *Acquire the basic concepts of the Operations Research.*
- *Understand and solve the LPP.*
- *Apply the Transportation Problem in marketing.*
- *Understand the concepts of Assignment problems.*
- *Analyze and apply the Network Problems.*

SEM: VI	**B.Sc. MATHEMATICS**	**ELECTIVE COURSE :2**
Credit:5	**Graph Theory**	**Int.Marks:25**
Hours/Week:5	**CODE: U6R1MTMBE2**	**Ext.Marks:75**
Total Hours:72		**Max.Marks:100**

Objectives

- *To determine a mathematical graph, identifying the vertices and edges.*
- *To determine which graphs have Euler circuits.*
- *To represent real life situation with mathematical graphs.*
- *To describe the knowledge of matrix representation of Graphs.*
- *To recognize patterns that arise in various graph problems by using colouring.*

Unit I - Graphs - Paths and Circuits **[14 HOURS]**

Definition of a graph – Application of graphs finite & infinite graphs - incidence, degree, isolated & pendent vertices – Null graph - isomorphism - sub graphs - walks, paths & circuits - connected & disconnected graphs - components - Euler graphs - Operations on Graphs - More on Euler graphs - Hamiltonian paths & circuits.

Unit II - Trees and Fundamental Circuits **[14 HOURS]**

Trees - properties of trees - pendent vertices in a tree - distances & centers in a tree - Rooted & binary trees - Spanning trees - fundamental circuits - finding all spanning trees of a graph - spanning trees in a weighted graph.

Unit III - Cut-sets and Cut-vertices **[14 HOURS]**

Cut sets – Some properties of a cut set - all cut set in a graph - fundamental circuits and cut sets - connectivity and separability - Edge connectivity, vertex connectivity, separable graph.

Unit IV - Matrix Representation of Graphs **[14 HOURS]**

Incidence matrix – Sub matrices - Circuit Matrix - Fundamental Circuit Matrix and rank of the circuit matrix - cut set matrix - adjacency matrix

Unit V –Coloring and Partition **[14 HOURS]**

Chromatic Number - Chromatic partitioning - Chromatic polynomial.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1]"Graph Theory with applications to Engineering and Computer Science", Narsingh Deo, Prentice Hall of India, New Delhi, 1997.

Unit I : Chapter 1, Sec. 1.1 to 1.5 & Chapter 2, Sec. 2.1, 2.2, 2.4 to 2.9.
Unit II : Chapter 3, Sec. 3.1 - 3.5, 3.7 - 3.10.
Unit III: Chapter 4, Sec. 4.1 to 4.5.
Unit IV: Chapter 7, Sec. 7.1 to 7.4, 7.6, 7.9.
Unit V :Chapter 8, Sec. 8.1 to 8.3.

Reference Books:

[1] "Basic Graph Theory" - K.R.Parthasarathy, Tat McGraw Hill Publishing Company, New Delhi,
[2] "Invitation to Graph theory" – Dr.S. Arumugam and Dr. S. Ramachandran – Scitech publications.
[3] "A first look at Graph theory" – G. T. John clark, Derek Allan Holten – World scientific publishing company.

Outcomes:

The learners would have the ability to

- *Acquire the knowledge of graph theory and its applications.*
- *Understand the techniques of Trees and Fundamental circuits in Graph Theory.*
- *Study advanced methods from structural graph theory.*
- *Study the relationship between Fundamental Circuit Matrix and rank of the circuit matrix*
- *Analyze the concepts of Colorings and Partitioning.*

SEM:VI	**B.Sc. MATHEMATICS**	**ELECTIVE COURSE :3**
Credit:5	**Astronomy**	**Int.Marks:25**
Hours/Week:5	**CODE: U6R1MTMBE3**	**Ext.Marks:75**
Total Hours:73		**Max.Marks:100**

Objectives

- *To provide working knowledge about the Celestial Sphere.*
- *To increase the scientific awareness among the students on Astronomy.*
- *To identify the causes of seasons on Earth.*
- *To empower astronomical communities in developing Parallax.*
- *To educate the concepts of Moon.*

UNIT I - Spherical Trigonometry - Celestial Sphere [15 HOURS]

Relevant properties of a sphere & relevant formulae for spherical trigonometry (All without proof) - Celestial sphere - Diurnal motion, Cardinal points, Sidereal Time, Latitude of a place, relation between them.

UNIT II – Earth [14 HOURS]

Dip of the horizon - Effects of Dip - Twilight - Duration of Twilight - Astronomical refraction - Law's of refraction - Tangent & cosine's formula - properties & simple problems applying them.

UNIT III - Kepler's Law & Time [14 HOURS]

Kepler's Law of Planetary motion (statement only) - Verification of laws in the case of earth - Newton's deductions from them - Three anomalies of the Earth and relation between them - Time - Equation of time - mean time, true time, effects of equation of time seasons.

UNIT IV –Years, Calendar, Parallax and Aberration [14 HOURS]

Different kinds of Years and Calendar - Conversion of time, relation between them - Geocentric Parallax - Aberration of light - simple problems in the above.

UNIT V – Moon [14 HOURS]

Sidereal month, Synodic month phases of moon, age of the moon, summer and winter, full moon - motions of planet (assuming that orbits are circular) - eclipses.

UNIT VI [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] S. Kumaravelu and Prof. Susheela Kumaravelu, "Astronomy", SKV Publications, 2004.

Unit I:Chapter I & II
Unit II :Chapter III, Sec. 5 and 6 only & Chapter IV
Unit III :Chapter VI and Chapter VII, Sec. 1 & 2 only
Unit IV :Chapter VII, Sec. 3, 4 only, Chapter VIII and Chapter IX
Unit V : Chapter XII and Chapter XIII.

Reference Books:

[1] "An introduction to Astrophysics" by BidynathBasu, PragathiPrakasam (1981).
[2] G.V. Ramachandran "Astronomy"

Outcomes:

The learners would have the ability to

- *Understand the basic terms used in Astronomy.*
- *Study the different position on Earth.*
- *Apply the Knowledge of Kepler's Laws and Equations of Time.*
- *Understand the concepts different kinds of Years and Calendar*
- *Acquire the Knowledge about Eclipses and Phases of moon.*

SEM: **B.Sc. MATHEMATICS** **ELECTIVE COURSE :**
Credit:5 **DISCRETE MATHEMATICS** **Int.Marks:25**
Hours/Week:5 **CODE:** **Ext.Marks:75**
Total Hours:68 **Max.Marks:100**

Objectives

- *To understand the theory logic and technique of and algebraic system.*
- *To apply the knowledge and skills obtained to investigate the Predicate Calculus.*
- *To understand the concept of Lattices and Boolean Algebra.*
- *To make effective use of appropriate technology on Combinatorics.*
- *To solve linear equations by using Recurrence Relations.*

Unit I: Mathematical Logic **[14 HOURS]**

Introduction- Statements and Notations- Connectives- Normal forms- The theory of Inferences for the Statement calculus.

Unit II: Predicate calculus and Inference Theory **[14 HOURS]**

The Predicate calculus- Predicates, statement functions, variables and quantifier, Predicate formulas, Free and Bound variables, Universe of discourse, Inference Theory- Valid formulas, Equivalences, Theory of inferences for the Predicate calculus, formulas involving more than one quantifier.

Unit III: Lattices and Boolean Algebra **[14 HOURS]**

Introduction- Lattices as partially ordered sets- Boolean Algebra- Boolean functions- Representation and minimization of Boolean functions.

Unit IV: Combinatorics **[12 HOURS]**

Permutations – Combinations – Permutations with Repetitions Combinations with Repetition – Permutations of sets with Indistinguishable objects-Miscellaneous problem on permutations and combinations- Binomial Identities.

Unit V: Recurrence Relations **[12 HOURS]**

Formulation - Solving by iteration method-Solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of order two- Solving Linear Non - Homogeneous Recurrence Relations-Generating functions.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] " Discrete Mathematical Structures with applications to computer science", J.P. Tremblay and R. Manohar, McGraw Hill, 1987.

[2] " Discrete Mathematics", N.Chandrasekaran and M.Umaparvathi, PHI Learning Private Limited, New Delhi, 2010.

Unit I : Chapter 1: Sec 1,1, 1.2- Except 1.2.5, 1.3- Except 1.3.5, 1.3.6, 1.4- Except 1.4.4 [1]
Unit II : Chapter 1: Sec 1.5, 1.6 full [1]
Unit III: Chapter 4: Sec 4.1 – 4.4 full [1]
Unit IV : Chapter3: Sec 3.1 to 3.6, 3.7.1 [2]
Unit V : Chapter 6: Sec 6.1 to 6.6 [2]

Reference Books:

[1] "Application Oriented Algebra" by James L.Fisher, Dun Donnelly Publisher.
[2] "Elements of Discrete Mathematics``, C.L. Liu, second edition. McGraw Hill.

Outcomes:

The learners would have the ability to

- *Learn core idea in Logic, Permutations and Combinations counting Principles.*
- *Understand and apply the concepts of Theory of Inferrence.*
- *Acquire the knowledge of basics of Boolean Algebra.*
- *Use Generating functions to solve a variety of combinatorial problems.*
- *Apply the mathematical ideas for solving the problems by using Recurrence relations..*

SEM: **B.Sc. MATHEMATICS** **ELECTIVE COURSE :**
Credit:5 **Fuzzy Logic** **Int.Marks:25**
Hours/Week:5 **CODE:** **Ext.Marks:75**
Total Hours:70 **Max.Marks:100**

Objectives

- *To introduce the comparative study of fuzzy and crisp set.*
- *To acquire knowledge of fuzzy relations.*
- *To provide the knowledge of membership functions.*
- *To compare classical logic and fuzzy logic.*
- *To learn how to convert fuzzy to crisp.*

UNIT I: Fuzzy Sets and Classical Sets **[14 HOURS]**

Basic definitions – Classical sets – Representation of a fuzzy set – Fuzzy measures – Cardinality of fuzzy set – Special α-cuts of a fuzzy set – Normalized fuzzy set – Height of a fuzzy set - Basic Theoretic operation of fuzzy sets – Algebraic operations on fuzzy sets – Logical operations on fuzzy sets.

UNIT II: Fuzzy Relations and Classical Relations **[14 HOURS]**

Cartesian product – Crisp relation – Operations on crisp relations – Composition operator – Fuzzy Relations – Fuzzy Cartesian product and composition – Equivalence relations – Binary relation on a fuzzy set – Properties of binary relations.

UNIT III: Membership Functions **[14 HOURS]**

Features of the membership function – Fuzzification – Membership functions shapes – Assignment of membership function to fuzzy variables – Evaluation of membership function.

UNIT IV: Classical Logic and Fuzzy Logic **[14 HOURS]**

Classical predicate logic – logical connectives – Tautologies – Contradictions – Equivalence – Logical proofs – Fuzzy logic – Approximate Reasoning.

UNIT V: Fuzzy to Crisp Conversions **[12 HOURS]**

Introduction – Defuzzification techniques – Lamda cuts – Defuzzification method-applications – Comparison and evaluation of defuzzification methods.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] 'Fuzzy Logic and Neural networks', M.Amirthavalli, Published by Scitech 2004.

Unit I: Chapter 2
Unit II: Chapter 3
Unit III: Chapter 4
Unit IV: Chapter 5
Unit V: Chapter 7

Reference Books:

[1] 'Fuzzy sets and Fuzzy logic', George J.Klir and Bo Yuan, Prentice Hall of India, New Delhi, 1995.

[2] 'Introduction to Fuzzy sets and Fuzzy logic', M.Ganesh – PHI Private Limited.

Outcomes:

The learners would have the ability to

- *Gain the knowledge of fuzzy sets.*
- *Discuss the types of operations on fuzzy sets and fuzzy arithmetic.*
- *Identify fuzzy relations, binary fuzzy relations & fuzzy equivalence relations.*
- *Apply the fuzzy models to natural science and technical fields.*
- *Acquire the Knowledge of Comparison and evaluation of defuzzification methods*

SEM:IV	**B.Sc. MATHEMATICS**	**SKILL BASED ELECTIVE:1**
Credit:2	**Theory of Games and Decision theory**	**Int.Marks:25**
Hours/Week:3	**CODE: U4R1MTSBE1**	**Ext.Marks:75**
Total Hours:45		**Max.Marks:100**

Objectives:

- *To solve two-person zero sum game.*
- *To solve 2Xn and nX2 game by using graphical method.*
- *To understand the concepts of Linear Programming.*
- *To learn about decision theory and decision under risk.*

Unit I: Game Theory **[9 HOURS]**

Two –Person – zero – Sum Game, Payoff matrix, Saddle point, Value of the Game- Problems. Methods for solving game without Saddle point – Problems, Algebraic method of solve a 3 X 3 game.

Unit II : Graphical method **[9 HOURS]**

Graphical method to solved a 2 X n (or) n X 2 game – Problems – Dominance property – Modified dominance property – Problems.

Unit III: Linear Programming **[9 HOURS]**

Applications to solve a game – Simple problems – Solving the game using the method of Approximation problems.

Unit IV: Decision Theory **[8 HOURS]**

Decision criteria- The maximum or Minimum criteria – Problems. The expected value / Laplace Criteria the minimum regret / Savage criterion – The Hurwitz Criterion – Problems.

Unit V: Decision under Risk **[8 HOURS]**

The Expected Monetary value (EMV) criterion and the Expected Opportunity Loss (EOL) criterion- Expected Value of Perfect Information (EVP)- Problems, Decision trees – Roll-back Technique.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] "Operations Research methods and Applications", P. Mariyappan, New Century Book House Pvt. Ltd. Chennai, 2002.

Unit I: Chapter 11, Sections: 11.1 to 11.3.
Unit II: Chapter 11, Sections: 11.4 to 11.5.
Unit III: Chapter 11, Sections: 11.6.
Unit IV: Chapter 11, Sections: 11.7.
Unit V: Chapter 11, Sections: 11.8 to 11.9.

Reference Books:

[1] "Operations Research", V.K. Kapoor, Sultan Chand & sons Ltd.
[2] " Operations Research", Hamdy A. Taha, Prentice Hall of India, 2002.

Outcomes:

The learners would have the ability to

- *Understand theMethods for solving game with and without Saddle point*
- *Acquire the knowledge of Graphical methods.*
- *Know about the applications of game theory by using the method of Approximation.*
- *Gain knowledge in Decision Analysis*
- *Understand the concept of EMV*

SEM: V **B.Sc. MATHEMATICS** **SKILL BASED ELECTIVE :2**
Credit:2 **A Prime on Divisibility & Number Sequences** **Int.Marks:25**
Hours/Week:3 **CODE: U5R1MTSBE2** **Ext.Marks:75**
Total Hours:42 **Max.Marks:100**

Objectives

- *To connect number theory to the real world.*
- *To examine the solution for the problem by usinf divisibility.*
- *To apply the strategies to solve routine and non- routine problems.*
- *To determine Exponetial sequences and procedures are needed to complete the problem.*
- *To find the sum of the square of the roots in the number sequences.*

Unit I - Introduction & Congruences **[8 HOURS]**

What is Number Theory? - Terms and Symbols - Odd and Even Numbers - The Remainder symbol - other divisors - The congruence symbol - Using congruences - A test for divisibility by 13 - Using negative remainders.

Unit II - Elementary and Remaining Cases **[8 HOURS]**

Introduction - Divisibility by 2, 5, 4 - A generalization. Introduction - Divisibility by 9, 11 - More general results - Divisibility by 101 - Divisibility by 7 and 13 - Divisibility by 27 and 37 - Other Divisors - concluding remarks - Divisibility by 7 - Another formulation - searching for new rules - divisibility by 17, 53, 11.

Unit III –The Method of differences **[8 HOURS]**

Introduction - what is a pattern? - Number sequences - sequences in mathematics - terms and symbols - polynomial sequences - introduction - a symbolic apparatus.

Unit IV - Exponential Sequences **[8 HOURS]**

Sequences of the form $\{a^n\}$ - The sequence $\{(-1)^n\}$ - The sequence $\{z^n\}$ - The sequence $\{2^n\}$ - The sequences $\{3^n\}$ - Mixed sequences - seeking an explanation.

Unit V –Square root **[8 HOURS]**

Closeness – Sum of square roots - A Square roots spiral – A random sequence – Worked out problems.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Books:

[1] FIRST STEPS IN NUMBER THEORY - ShaileshShirali - Universities press.
[2] A prime on number sequences - ShaileshShirali - Universities press.

Unit I : Chapter 1 & 2 All sections [1]
Unit II: Chapter 3, 4, 5 All sections [1]
Unit III: Chapter 1, 2, 3 All sections [2]
Unit IV: Chapter 5 All sections [2]
Unit V : Chapter 14 All sections [2]

Reference Book :

[1] **"**Elementary Number Theory**" –** David .M.Burton – Tata McGraw – Hill - Edition

Outcomes:

The learners would have the ability to

- *Acquire the knowledge of Number theory and Congruence.*
- *Understand general results of Divisibility's.*
- *Develop problem solving skills and to gain self assess knowledge of method of differences.*
- *Know about the knowledge of mixed sequnces.*
- *Understand the concept of square root.*

SEM: V1 **B.Sc. MATHEMATICS** SKILL BASED ELECTIVE :3

Credit:2 **Quantitative Mathematics For Competitive Examination** **Int.Marks:25**

Hours/Week:3 **CODE: U6R1MTSBE3** **Ext.Marks:75**

Total Hours:43 **Max.Marks:100**

Objectives:

- *To educate the students in basic concepts of Profit and Loss.*
- *To make the students prepare simple and compound interest.*
- *To educate the knowledge of Partnership.*
- *To understand the properties of Ratio and Proportion.*
- *To find average speed and distance by given time.*

UNIT I - Percentage, Profit and Loss **[9 HOURS]**

Basic concepts - important formula - profit and loss - short cut methods - simple problems.

UNIT II - Simple and Compound Interest **[8 HOURS]**

Introduction - formula for simple interest - relation between amount and price - simple problems on simple interest - compound interest - some important rule - simple problems based on compound interest.

UNIT III – Partnership **[8 HOURS]**

Introduction - simple partnership - compound partnership - working partner - sleeping partner - monthly equivalent investments.

UNIT IV - Ratio and Proportion **[8 HOURS]**

Introduction - Definition of ratio - compounding of ratio - comparison of ratio - properties of ratio - equal ratio - proportion - continued proportion - fourth proportional - Third proportional - mean proportional - direct proportion - inverse proportion - use of proportion in geometry.

UNIT V – Time, Speed and Distance **[8 HOURS]**

Speed – unit of speed – Conversion of units – Average speed – Some important points: illustrations and solutions - Relative speed and Problems.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] 'Quantitative Aptitude' - Naresh Sharma, Anjali Kaushik - Variety books publishers distributors 2008.

Unit I: Chapter 1
Unit II: Chapter 2
Unit III: Chapter 3
Unit IV: Chapter 6
Unit V: Chapter 7

Reference Books:

[1] 'Quantitative Aptitude for Competitive Examinations' by R.S.Aggarwal – S.Chand & sons, New Delhi 2006.

[2]'Quantitative methods' by D.C. Sonchati, S.Chnad & sons Delhi.

Outcomes:

The learners would have the ability to

- *Equip in a relative sense as for as preparation for entrance examinations involving placement opportunities.*
- *Understood the concept of Mathematics with emphasis on analytical ability.*
- *Learn the techniques for solving aptitude problems.*
- *Identify and classify the Ratio and Proportion.*
- *Gain the knowledge on conversion of units.*

SEM:	**B.Sc. MATHEMATICS**	Skill Based Elective :4
Credit:2	**Foundation Mathematics For Competitive Examination**	**Int.Marks:25**
Hours/Week:3	**CODE:**	**Ext.Marks:75**
Total Hours:43		**Max.Marks:100**

Objectives:

- *To develop problems on Numbers and Ages.*
- *To Study about the Time and Work.*
- *To know about the Area of two dimensional objects.*
- *To learn the Volume and Surface Area of three dimensional objects..*
- *To know about the True discount and Banker's discount.*

Unit – I : Problems on Numbers and Ages **[9 HOURS]**

Problems on Numbers – Consecutive Numbers – Fraction of Numbers – worked out Problems on Ages.

Unit – II : Time & Work, Time & Distance **[8 HOURS]**

Relation between time and work – Problems – Formulae - Relation between time and Distance – Worked out problems.

Unit – III : Area **[8 HOURS]**

Definition – Formulae – Results on Quadrilateral – Area on Square, Rectangle, Triangle, Rhombus, Parallelogram – Applications.

Unit – IV : Volume and Surface Area **[8 HOURS]**

Definitions – Formulae – Problems on cuboid, cube, cylinder, cone, sphere & Hemisphere – simple Applications only.

Unit – V : True Discount & Banker's Discount **[8 HOURS]**

Important concepts – Formulae – Problems – Definitions – Banker's Discount – Problems.

Unit –VI: **[2 HOURS]**

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] "Quantitative Aptitude for Competitive Examination" – R.S.Aggarwal – S. Chand & Sons – New Delhi –Seventh edition – 2006.

Unit – I : Chapter 7 & 8

Unit – II : Chapter 15 & 17

Unit – III : Chapter 24

Unit – IV : Chapter 25

Unit – V : Chapter 32 & 33

Reference Books:

[1] "Quantitative Aptitude and Reasoning" – R.V.Praveen –Phi – Second Edition - 2012.

[2] "Quantitative Methods" – D.C. Sanchati – S. Chand & Sons – New Delhi .

[3] Quantitative Aptitude - Naresh Sharma, Anjali Kaushik - variety book publishers distributors.

Outcomes:

The learners would have the ability to

- *Guess & Check the Problems quickly.*
- *Understand the relation between time and distance.*
- *Prepare for Competitive & Entrance Examinations in various fields.*
- *Know the application of Volume and Surface Area.*
- *Acquire the knowledge of Discount.*

SEM: **B.Sc. MATHEMATICS** **Skill Based Elective :**
Credit:2 **Mathematical Modeling** **Int.Marks:25**
Hours/Week:3 **CODE:** **Ext.Marks:75**
Total Hours:43 **Max.Marks:100**

Objectives

- *To understand the notion of linear independence of first order.*
- *The notion of a fundamental set of solutions through ODE.*
- *To learn how to use the method of reduction of order to find a second linearly independent solution of a second order.*
- *To apply the mathematical modelling in real life situations.*
- *To understand the Mathematical Modeling in terms of Directed Graphs*

Unit I : Mathematical modeling Through ODE of first Order [9 HOURS]

Mathematical Modeling Through Differential Equation - Linear Growth and Decay Models, Compartment Models - Mathematical modeling in Dynamics Through ODE of first order.

Unit II : Mathematical modeling Through Systems ODE of first Order [8 HOURS]

Mathematical Modeling in Population Dynamics – Mathematical Modeling of Epidemics Through Systems of ODE of First - Compartment Model Through ODE - Mathematical modeling Economics Through System ODE of first order – Mathematical models in Medicine, Arms race, Battles and International Trade in terms of system of ODE.

Unit III : Mathematical Modeling Through ODE of Second Order [8 HOURS]

Mathematical modeling of Planetary Motions - Mathematical modeling of Circular Motion and Motion of Satellites - Mathematical modeling Through Linear Differential Equation of Second order.

Unit IV: Mathematical modeling Through Linear Differential Equations [8 HOURS]

The Need for Mathematical modeling Through Linear Differential Equations: Some Simple Models – Basic Theory For Linear Differential Equation with Constant Coefficients - Mathematical Modeling Through Linear Differential Equations in Economics and Finance - Mathematical Modeling Through Linear Differential Equations in Dynamics and Genetics.

Unit V: Mathematical modeling Through Graphs [8 HOURS]

Situations that can be Modeled through Graphs - Mathematical Modeling in terms of Directed Graphs - Mathematical Modeling in terms of signed Graphs - Mathematical Modeling in terms of Weighted Digraphs.

Unit –VI: [2 HOURS]

Latest development related to the course during the semester concerned. [For purpose of Continuous Internal Assessment only]

Text Book:

[1] Mathematical Modeling – J. N. Kapur, Wiley Eastern Limited, Third print.

Unit I: Chapter 2. Sec 2.1, 2.2, 2.4, 2.5
Unit II: Chapter 3. Sec 3.1-3.5
Unit III: Chapter 4. Sec 4.1- 4.3
Unit IV: Chapter 5. Sec 5.1-.5.4
Unit V: Chapter 7. Sec 7.1- 7.4

Reference Books:

[1] Mathematical Modeling By Meerscharet. Mark M., Academic Press. New York, 1993.
[2] Concepts of Mathematical Modeling. Meyer W.Megraw Hill, New York, 1994.

Outcomes:

The learners would have the ability to

- *Use the method of variation of parameters to find particular solutions of second order, linear homogeneous equations.*
- *Appreciate the fundamental principles and to understand the different concepts and methods in Mathematical modeling.*
- *Utilize them in solving problems.*
- *Understand the applications of mathematical modelling.*
- *Acquire the knowledge of Situations can be Modeled through Graphs*

SEM – III: ALLIED COURSE – I: ALLIED PHYSICS – II
(ANY 15 EXPERIMENTS ONLY)

Course Code : **Max. Marks : 100**
Hours/Week : 3 **Internal Marks : 40**
Credit : 3 **External Marks : 60**

Objective:

To motivate and educate the students to acquire skill in physics Experiments.

1. Non uniform bending–Pin and Microscope Method
2. Surface Tension and Interfacial Tension–Drop Weight Method
3. Coefficient of Viscosity of Liquid using graduated burette.
4. Specific heat capacity of liquid by Cooling Method.
5. Lee's Disc –Thermal Conductivity of Bad Conductor.
6. Spectrometer–Grating–Normal incidence method.
7. Spectrometer–Refractive index of Solid Prism(A,Dandμ)
8. Newton's Rings–Radius of curvature of a convex lens
9. Sonometer –Verification of Three laws.
10. Carey Foster's Bridge–Specific Resistance.
11. Carey Foster's Bridge–Temperature Coefficient
12. EMF of thermocouple–Direct Deflection method
13. Characteristics of a junction diode
14. Construction of a full wave rectifier.
15. Meter Bridge –Determination of Specific Resistance.
16. AND, OR and NOT logic gates–verification of truth table using Discrete components.
17. De Morgan's theorem and Boolean Algebra
18. Air Wedge – Thickness of Insulation

REFERENCE BOOKS:

1. A text book of practical Physics–M.N. Srinivasan and others–Sultan Chand & Sons, NewDelhi.
2. Practical Physics, S. Somasundaram, V. Balachandran, S. Padmanathan, Apsara Publications, Tiruchirapalli.
3. Practical Physics – A.DhanaLakshmi and K.R. Paramasivam – Apsara Publication,Tiruchirapalli.

COURSE OUTCOMES:

On completion of this course, the students will have

- *Be able to understand the concepts of mechanics, properties of matter and sound through different experiments.*
- *Acquire the basic trouble shooting skills and appreciate physics concepts through experiments.*

SEM – IV: ALLIED COURSE – I: ALLIED PHYSICS – III

Course Code : **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 25**
Credit : 3 **External Marks : 75**

OBJECTIVES:

- *T o study the static characteristic of electric charges*
- *To understand the atomic behavior of electric and magnetic field*
- *To understand the basic concepts of nuclear physics*
- *To study the basic concept of atomic physics.*
- *To understand the electronics and digital electronics*

UNIT-I: ELECTROSTATICS [10 HOURS]

Coulomb's Law–Gauss Theorem and it's application- intensity due to charged sphere and cylinder. Capacitors – Principles of a Capacitor – Capacity of a capacitor – CapacityofanisolatedSphereandCylinder– EnergyofachargedCapacitor–sharingof charges and loss of energy.

UNIT-II: ELECTRICITY [10 HOURS]

Krichoff'sLaw'sandtheirapplicationstoWheatstone'snetwork–Conditionfor bridge balance–Carey Foster's bridge–Variation of resistance with temperature– Laws of electromagnetic Induction–Expression for induced EMF–Co-efficient of coupling–Determination of co-efficient of self inductance by Rayleigh's Method–Eddy Current and its applications.

UNIT-III: ATOMIC PHYSICS [9 HOURS]

Atom models–Summer field's and Vector atom Models–Pauli's exclusion Principle –various quantum numbers and quantization of orbits. X-rays–Continuous and Characteristic X-rays–Mosley's Law and its importance –Bragg's Law –Miller indices–determination of Crystal Structure by Laue's Powder photograph method.

UNIT-IV: NUCLEAR PHYSICS [9 HOURS]

Nucleus–Nuclear Size–Charge– Mass and Spin–Liquid drop and shell models. Nuclear Radiations and their properties -Particle Detectors: Cloud Chamber and Bubble Chambers. Four types of reactions– Elementary particles and their classifications.

UNIT-V: DIGITALELECTRONICS [10 HOURS]

Number systems− Decimal–Binary –Octal and Hexa Decimal number systems and theirMutualConversions-1'sand2'scomplementofaBinary number and Binary arithmetic (Addition, Subtraction, Multiplication and Division) – Binary Subtractionby1'sand2'scomplementmethods–Basiclogic gates–AND, OR, NOT, NOR, NAND and EXOR Gates – NAND and NOR as universal building gates– BooleanAlgebra–Laws of Boolean Algebra–De Morgan's Theorems–Their verifications using truth tables.

UNIT-VI: LATEST LEARNING

Latest development related to the course during the semester concerned (For purpose of Continuous Internal Assessment only, not for question setting)

BOOKS FORSTUDY:

1. Magnetism and Electricity–Khare and Srivastava – Atma Ram and Sons– New Delhi.(1976)
2. Modern Physics–R. Murughesan –S. Chand and Co.(2012)
3. Digital Principles and their applications – Malvino and Leach – Tata McGraw Hill. .(2010)
4. Hand Book of Electronics–Gupta and Kumar–Pragati Prakasan. .(2016)
5. Allied Physics–II–A. Sundaravelusamy, priya publications. .(2015)

COURSE OUTCOMES: On completion of this course, the students will have

- *Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.*
- *Apply Gauss's law of electrostatics to solve a variety of problems.*
- *An ability to determine and describe static and dynamic electric and magnetic fields .*
- *Atomic physics studies about the atoms which isolates the system of electrons and an atomic nucleus.*
- *Understand the structure of various number system and basic logic gates.*