THE GANDHIGRAM RURAL INSTITUTE
(DEEMED TO BE UNIVERSITY)
GANDHIGRAM -624302
CURRICULUM WITH OUTCOME BASED EDUCATION (OBE)

Name of the School   :   School of Sciences
Department   :   Department of Mathematics
Academic Programme offered   :   B.Sc. Mathematics, M.Sc. Mathematics, M.Phil.
                                      Mathematics and Ph. D. Mathematics

I.   VISION   :

  ➢ Science & Technology Enabled Rural Development through teaching and research in Mathematical Sciences

II. MISSION   :

  ➢ Proficiency in research and teaching
  ➢ Research studies in International standards and to urge the need for practical significance

III. PROGRMME CODE   :   MATU

IV. PROGRAMME   :   B. Sc. Mathematics

V.   PROGRAMME EDUCATIONAL OBJECTIVES (PEO) OF B.SC. MATHEMATICS:

PEO 1: Demonstrate proficiency in mathematics and allied fields by exhibiting the required knowledge of the mathematical concepts so as to secure appropriate placement and studies.

PEO 2: To develop further career through learning research and extension.

PEO 3: To demonstrate the needed skills for analysis, data interpretation and methodologies as appropriate to the domain of maths.

PEO 4: To address the needs of society by applying the knowledge and leadership so as to seek solutions for society/industry.

PEO 5: Select higher studies in Mathematics and other inter-disciplinary programmes and enable to get employed in private and public sectors

VI. GRADUATE ATTRIBUTES
     GA1: Reasoning Ability
     GA2: Analytical Ability
     GA3: Communication Skill
     GA4: Computational Skill

VII. PROGRAMME OUTCOMES (PO)

PO1: Have the potential to face all competitive exams in public and private sectors.

PO2: Possess the ability to do higher studies in premier institutions

PO3: Posses the computational skills to solve related problems in science and engineering

PO4: Have the ability to develop mathematical models related to real life situations

PO 5: Identifying and solving problems arising in social science, business and banking based on quantitative techniques.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Acquire skills in basic concepts of algebra, real and complex analysis, number theory, Optimization theory

PSO2: Become proficient in differential and integral calculus and familiar with applications of ODE & PDE.

PSO3: Gain knowledge in 2D and 3D geometrical objects using various metrics and solving mechanical and physical problems through geometrical and graphical way.

PSO4: Analyze numerical and statistical data of population dynamics of real life situations

PSO5: Proficient in soft skills and Computing skills for solving complex mathematical problems.

Category	Course Code	Course Title	Number of Credits	Lecture Hours per week	Exam Duration (Hrs)	Marks		
						C.F.A	E.S.E	Total
Semester-I								
Language	18TAMU0101/ 18MALU0101/ 18HIDU0101/ 18FREU0101	Language I (Tamil/Hindi/Malayalam/French)	3	3	3	40	60	100
	18ENGU01F1	Language II English	3	3	3	40	60	100
Core Course	18MATU0101	Classical Algebra	4	4	3	40	60	100
	18MATU0102	Theory of Equations & Trigonometry	3	3	3	40	60	100

Allied Course	18MATU01B1	Introduction to Computers and Office Automation(theory)	3	3	3	30	45	75
	18MATU01B2	Introduction to Computers and Office Automation(practical)	1	2	--	--	--	--
Foundation Course	18NSSU0001/ 18FATU0001/ 18SPOU0001	NSS/FA/Sports	1	1	-	50	-	50
	18YOGU0002	Yoga	1	1	-	50	-	50
	18EVSU0001	Environmental Studies	3+1	5	-	40	60	100
TOTAL			**23**					
Semester-II								
Language	18TAMU0202/ 18MALU0202/ 18HIDU0202/ 18FREU0202	Language I (Tamil/Hindi/Malayalam/French)	3	3	3	40	60	100
	18ENGU02F2	Language II English	3	3	3	40	60	100
	18CTAU0001/ 18CHIU0001/ 18CMLU0001	Core Hindi/Core Tamil/Core Malayalam	2	2	2	20	30	50

Core Course	18MATU0203	Mathematical Statistics	3	3	3	40	60	100
Allied Course	18MATU02B3	Object Oriented Programming with C++(theory)	3	3	3	30	45	75
	18MATU02B4	Object Oriented Programming with C++(practical)	1	2	3	30	20	50
Foundation Course	18GTPU0001	Gandhi's Life, Thought and Work	2	2	2	20	30	50
	18EXNU0001	Extension Education	2	2	--	20	30	50
Soft Skills	18ENGU00C1	Communication and Soft Skills	2	2	--	20	30	50
TOTAL			**21**					
Semester-III								
Language	18TAMU0303/ 18MALU0303/ 18HIDU0303/ 18FREU0303	Language I (Tamil/Hindi/Malayalam /French)	3	3	3	40	60	100
	18ENGU03F3	Language II English	3	3	3	40	60	100

	18CTAU0002 / 18CHIU0002 / 18CMLU0002	Core Tamil/Core Hindi/ Core Malayalam	2	2	2	20	30	50
Core Course	18MATU0304	Calculus	4	4	3	40	60	100
Allied Course	18PHYU01A1 18MATU03B5	1. Allied Physics-I(or) 2. Allied Statistics-I	3	3	3	30	45	75
	18PHYU02A3	1. Allied Physics-I (Practical) (or) 2. Allied Statistics-I (Practical)	1	3	-	-	-	-
Computer Skill	18MATU0305	Programming with JAVA (Theory)	3	3	3	40	60	100
	18MATU0306	Programming with JAVA (practical)	1	2	3	15	10	25
Foundation Course	18SHSU0001	Shanthi Sena	1	2	--			
Extension	18EXNU03V1	Village Placement Programme	2	--	--	50	--	50
Compulsory Non Credit Course	18MATU00F1	Compulsory Non Credit Course (Extension / Field Visit)	--	--	--	50	--	50
TOTAL			**23**					**--**
Semester – IV								
Core Course	18MATU0407	Abstract Algebra	4	4	3	40	60	100
	18MATU0408	Sequences and Series	4	4	3	40	60	100
	18MATU0409	Differential Equations	4	4	3	40	60	100
Allied Course	18PHYU02A2 18MATU04B6	1. Allied Physics-II (or) 2. Allied Statistics-II	3	3	3	30	45	75
	18PHYU04A3 18MATU04B7	1. Allied Physics-II (Practical) (or) 2. Allied Statistics-II (Practical)	1	2	3	15	10	25
Electives	18MATU04EX	Major Elective	3	3	3	40	60	100
		Non Major Elective	3	3	3	40	60	100
Compulsory Non Credit Course	18MATU00F2	Compulsory Non Credit Course Extension / Field Visit	-	-	--	50	--	50
TOTAL			**22**					**--**
Semester – V								
Core Course	18MATU0510	Linear Algebra	4	4	3	40	60	100
	18MATU0511	Real Analysis	4	4	3	40	60	100

	18MATU0512	Linear Programming	4	4	3	40	60	100
Electives	18MATU05EX	Major Elective	3	3	3	40	60	100
		Non Major Elective	3	3	3	40	60	100
Skill Based Elective	18MATU05S1	Quantitative Skills	2	2	--	20	30	50
TOTAL			**20**					
	Semester – VI							
Core Course	18MATU0613	Complex Analysis	4	4	3	40	60	100
	18MATU0614	Graph Theory	4	4	3	40	60	100
	18MATU0615	Mechanics	4	4	3	40	60	100
	18MATU0616	Operations Research	3	3	3	40	60	100
Modular Course	18MATU06MX	Modular Course	2	2	--	50	--	50
	18MATU06MX	Modular Course	2	2	--	50	--	50
Project	18MATU0617	Project	4	8	--	40	40+20	100
TOTAL			**23**					
GRAND TOTAL			**132**					

Note: * End Semester Examination at the end of the Second Semester

MAJOR ELECTIVES:

(18MATU04EX/ 18MATU05EX)

Semester -IV

1. 18MATU04E1 Analytical Geometry
2. 18MATU04E2 Financial Mathematics
3. 18MATU04E3 Matrix Analysis With Applications (Online)

MODULAR COURSES: (18MATU06MX)

Semester -V

1. 18MATU06M1 Fuzzy Set Theory
2. 18MATU06M2 Mathematical Skills
3. 18MATU06M3 Vector Calculus

NON MAJOR ELECTIVE:

Semester –IV
1. 18MATU04N1 Basic Numerical Methods

Semester -V
1. 18MATU05N2 Quantitative Aptitude

Semester -V

1. 18MATU05E4 Numerical Methods
2. 18MATU05E5 Introduction to Actuarial Science
3. 18MATU05E6 Mathematical Modelling: Analysis And Applications (Online)

ABSTRACT	
Course type	**Total number of Courses**
Core Course	17
Major Elective Course	02
Non-Major Elective Course	02
Allied Course	04
Modular Course	02
Foundation Course	06
Compulsory Non Credit Course	02
Language	08
Soft Skills	01
Computer Skill	01
Skill Based Elective	01
Project	01
Extension	01

COURSE SYLLABUS

Course Code and Title	18MATU0101 / CLASSICAL ALGEBRA		
Class	B.Sc.	Semester	First
	If revised, Percentage of Revision effected (Minimum 20%)	80%	
Cognitive Level	Knowing matrices, relations and sets (K1- knowing) Understanding functions and inequalities(K2- understanding) Applying number theory concepts and Congruence relations to solve problems (K3-applying)		
Course Objectives	To impart skills in the various applications of algebraic methods.		

UNIT	Content	No. of Hours
I	Theory of Matrices: Types of matrices - Operations on Matrices - Inverse Matrix- Solution of simultaneous equations- Rank of a matrix- Homogeneous and Non-homogeneous linear equations- Eigen values and Eigen vectors- Cayley-Hamilton theorem.	14
II	Concept of a set- Finite and Infinite set - Set inclusion - Algebra of Sets - Cartesian product of sets - Related Problems.	13
III	Relations and Mappings - Equivalence relations - Partial order - Functions - Algebra of Functions - Countable sets-uncountablesets.	12
IV	Intervals in R-Bounded sets-Least upper bound and Greatest lower bound-Inequalities of Holder's and Minkowski's-Bounded functions.	12
V	Number Theory: Prime Numbers and Composite Numbers - Euler's function - Divisibility and Congruence relations - Fermat's theorem - Wilson's theorem.	14
References	**Text Books:** 1. S. Arumugam& A. T. Isaac, **Modern Algebra**, SciTech Publications, India Pvt. Ltd., 2003. Unit 2: Chapter 1, Unit3: Chapter: 2 (up to 2.4). 2. S. Arumugam& A. Thangapandi Isaac, **Modern Analysis**, New Gamma Publishing House, Palayamkottai, 2015. Unit 3-Secs 1.2-1.3, Unit 4-Sec. 1.4. 3. S. Arumugam& A. Thangapandi Isaac, **Sequences and series**, New Gamma Publishing House, Palayamkottai, 2012.Unit 4-Secs 1.2-1.5. 4. T. K.ManicavachagomPillay,T.Natarajan, KS.Ganapathy, **Algebra**, Vol. 2, S. ViswanathanPublications(India) Pvt. Ltd. Chennai, 2012. Unit 1: Chapter 2, Unit 5: Chapter 5.	

	Reference Books: 1. S. Narayanan & T. K. ManickavasagamPillai, **Modern Algebra**, Vol. I, S. Viswanathan Pvt. Ltd., Chennai, 1997. 2. Seymour Lipschutz, **Set theory & Related Topics**, Schaum 'soutlines, 2nd Edition, Tata McGraw Hill, New Delhi, 2005. 3. Arumugam&Issac, **Classical Algebra**, New gamma Publishing house, Tirunelveli, 2003. **Web Resources:** 1. www.maths.manchester.ac.uk/~avb/0n1_pdf/0N1_All.pdf 2. https://www.maths.ed.ac.uk/~v1ranick/papers/matrices.pdf
Course out comes	After successful completion of the course students will be able to CO1: To solve problems in matrices CO2: Explain the basic concepts of set theory CO3: Analyze various types of functions CO4: Identify lub, glb of sets and inequalities CO5: Explain the knowledge of basic concepts of number theory

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	2	1	3	1	1	3	2	2.0
CO2	1	3	3	1	1	3	2	2	2	1	1.9
CO3	2	3	2	2	1	3	2	2	1	2	2.0
CO4	2	3	3	2	1	3	1	2	2	2	2.1
CO5	2	3	2	2	1	3	1	2	2	3	2.1
Mean overall score											**2.02**

Course Code and Title	18MATU0102 / THEORY OF EQUATIONS AND TRIGONOMETRY		
Class	B.Sc.	Semester	First
	If revised, Percentage of Revision effected (Minimum 20%)	45%	
Cognitive Level	Knowing the basic concepts of equations, roots, remainder theorem, relations between roots and coefficients and symmetric functions of roots. Understanding the transformation of equations, reciprocal equations, diminishing and increasing by given quantity, form of the quotient and		

	remainder when a polynomial is divided by a binomial and removal of terms. Applying the Descartes' rule of signs, Rolles' theorem, Strum's theorem - Newton's method of divisors and Horner's method to find the nature of roots of the given equation. Evaluating the values of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$, Powers of sines and cosines of θ, Expansions of $\sin^n\theta$, $\cos^n x$, $\sin\theta$ and $\cos\theta$ and solved their related problems. Analyzing the Hyperbolic functions, Inverse hyperbolic functions and Logarithm of complex quantities
Course Objectives	To learn techniques of solving algebraic and trigonometric equations.

UNIT	Content	No. of Hours
I	Theory of Equations: Remainder Theorem - Fundamental Theorem of Algebra - Relations between roots and coefficients - Symmetric functions of roots - Sum of the powers of the roots of an equation.	10
II	Transformation of Equations - Reciprocal Equations - To increase or decrease the roots of a given equation by a given quantity - Form of the quotient and remainder when a polynomial is divided by a binomial - Removal of terms.	10
III	Descartes' rule of signs - Rolles' Theorem - Strum's Theorem - Multiple roots - Newton's Method of Divisors - Horner's Method.	9
IV	Trigonometry: Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ - Examples on formation of equations - Powers of sines and cosines of θ - Expansions of $\sin^n\theta$, $\cos^n x$, $\sin\theta$ and $\cos\theta$ - Properties and their related problems.	10
V	Hyperbolic functions – Relation between hyperbolic functions - Inverse hyperbolic functions- Logarithm of Complex Quantities	9
References	**Text Books:** 1. T. K. ManicavachagomPillay, T. Natarajan& K. S. Ganapathy, **Algebra**, Vol. 1, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2015. Unit 1: Chapter 6, Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 Unit 2: Chapter 6, Sections 15, 16, 17, 18, 19. Unit 3: Chapter 6, Sections 24-27, 29.4, 30. 2. S. Narayanan & T. K. ManicavachagomPillay, **Trigonometry**, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2018. Unit 4: Chapter III, Sections 1, 2, 3, 4, 5. Unit 5: Chapter IV, Sections 1, 2(2.1, 2.2, 2.3) Chapter V, Section 5(Only).

	Reference Book: 1. Arumugam&Issac, **Theory of Equations, Theory of Numbers and Trigonometry**, New gamma Publishing house, Tirunelveli, 2011.
Course out comes	After successful completion of the course students will be able to CO1: Utilize basic concepts of roots and coefficients of equation to solve algebraic equations. CO2: Solve various problems in transformation of equations CO3: Apply Newton's and Horner's method to solve various equations CO4: Assess trigonometric functions and related problems CO5: Identify various types of hyperbolic functions

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	1	0	3	0	1	2	3	1.8
CO2	2	3	2	1	0	3	1	2	2	3	1.9
CO3	3	2	3	2	1	3	1	2	3	2	2.2
CO4	3	2	1	3	2	3	2	3	2	2	2.3
CO5	2	3	2	2	0	3	2	1	3	2	2.0
Mean overall score											**2.04**

Course Code and Title	**18MATU01B1 / INTRODUCTION TO COMPUTERS AND OFFICE AUTOMATION (NEW COURSE)**
Class	B.Sc. Semester First
Cognitive Level	Knowing the working procedure of computers and their hard disk, Input devices. (K1) Understanding word processing using MS word (K2) Applying to format the work sheet (K3) Analyzing the usage of computer (K4) Evaluating the worksheet using formula (K5) Creating the MS power point presentation (K6)
Course Objectives	To gain basic knowledge about computer peripherals, MS Office, Internet and E-commerce.

UNIT	Content	No. of Hours
I	Introduction to Computer**:** Block diagram, Memories, Devices, Operating System, Devices. Introduction to Windows**:** Starting Windows - Desktop - closing Windows - Start button - icons - Task bar - shortcut icons. Word pad: Creating &Saving a file, opening the saved file, word processing. Paint: creating & editing bitmaps - Multimedia tools - file system. Hard disk: Drive - folders - file - Exploring the files. My Computer - Explorer - moving files, deleting, cut, copy, paste - Exploring web.	10 hours
II	Word Processing using MS WORD: Word processing - Advantages – MS WORD – Definition. Document: Create - save - Printing - Resave – Close- Exiting word. Editing: Opening document – cursor movement - selecting text - deleting - undo redo - Moving text - Copying text. Formatting text: Font - paragraph formatting - bullets & numbering - getting help - find and replace text - spell checking and correction - grammar checking - auto correct - auto text - using thesaurus – using tabs - defining & changing page setup - page print options. Tables: creating &formatting, multiple columns. Math equations and typesetting in MS Word.	10 hours
III	MS-EXCEL: Introduction to worksheet and Excel - Definitions - Advantages - Organization of worksheet area - entering information - number - Formula - save - data alignment - editing - range -definition - specifying - changing column width - row height - centering cell across column, hiding columns and rows - moving and copying data - inserting and deleting rows and columns - getting help	9 hours
IV	MS-EXCEL**:** Formatting the worksheet - printing - setting up page and margin- defining header and footer - print options. Chart: creation - changing type - resize and move – controlling the appearance - modifying - deleting - printing - naming ranges - using statistical, Mathematical and financial functions - using drawing tool bar.	10 hours
V	MS-POWER POINT: Introduction - Menus - Toolbar - Navigating Power Point–Creating Slides, Presentation, Animation, etc - working with Power Point. Internet: Internet Browsing, creating mail ID, Using search engines etc. – To know important govt. webpage's for various forms, formats, exams etc, National/International University/Institute websites.	9 hours
References	**Text Books:** 1. Sanjay Saxena, **MS-Office -2000 for every one**, Vikas Publishing House Pvt. Ltd., New Delhi, 2000. Unit 1: Part I, Unit 2: Part II, III, Unit 3, 4: Part IV, Unit 5: Part V.	

	Reference Books: 1. R.X. Taxali, **P.C. Software for Windows 98 Made simple**, TATA McGraw-Hill Publishing Company Ltd., New Delhi, 2001. **Web Resources :** https://nptel.ac.in/courses/106106092/ https://nptel.ac.in/courses/106103068/ https://www.youtube.com/playlist?list=PLyy-LLqj7iSZ6SdBBcGnMeba23H6Lj5MD
Course out comes	After successful completion of the course students will be able to CO1: Access Microsoft windows software CO2: Apply Microsoft word in creating documents CO3: Analyze the data in diagram via Microsoft Excel CO4: Design Microsoft power points presentation CO5: Create E-mail and use of web browser

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	3	1	1	1	2	2	3	2.0
CO2	3	2	2	2	1	1	2	1	2	2	1.8
CO3	3	2	2	3	2	2	2	1	2	3	2.2
CO4	3	2	2	3	2	2	1	2	2	2	2.1
CO5	3	2	2	3	1	0	2	2	2	2	1.9
Mean overall score											**2.0**

Semester	I	Course Code	18MATU01B2
Course Title	**INTRODUCTION TO COMPUTERS AND OFFICE AUTOMATION (PRACTICAL) (NEW COURSE)**		
No. of. Credits	1	No. of. contact hours per week	2
Category	Allied Course – Practical		

List of Practical	No. of. Hours
1. Typesetting mathematical equations in MS word. 2. Designing of Advertisement/ Bill for a company in MS Word.	

	3. Preparing a communication letter and send it to many people using mail merge in MS Word.	
	4. Generating salary slip of a company in MS Excel.	
	5. Calculating total earnings of a company in MS Excel.	
	6. Preparing stock record of a company using MS Excel.	
	7. Calculating payment due of selling products in a company using MS Excel.	16

Course Code and Title	**18MATU0203 / MATHEMATICAL STATISTICS**		
Class	B.Sc.	Semester	Second
	If revised, Percentage of Revision effected (Minimum 20%)	40%	
Cognitive Level	Knowing the sampling & sampling distributions (K1) Understanding the random variables and distribution function (K2) Applying the measures of central tendency (K3) Analyzing the theoretical distributions (K4) Evaluating the regression & correlation equations (K5)		
Course Objectives	To impart skills in various applications of statistical methods		
UNIT	**Content**		**No. of Hours**
I	Measures of Central Tendency - Arithmetic mean, Geometric mean, Media, Mode, Harmonic mean - Measures of Dispersion - Moments, Skewness and Kurtosis.		14 hours
II	Theory of Probability: Definition - Axioms - Addition and Multiplication Theorems - Examples and properties - Baye's Theorem on conditional probability and its applications - Boole's inequality.		12 hours
III	Random variables - Discrete and Continuous - Definition of Probability Mass Function and Density Function - Distribution Functions - Examples andProperties - Mathematical Expectations - Mean, Variance and Moments - Moment Generating Functions - Simple properties. - Cumulant generating function - properties of c.g.f - Characteristic function - properties.		14 hours
IV	Theoretical distributions - Discrete: Binomial Distribution and Poisson distribution - Moments of binomial distribution - Addition property - Recurrence formula for binomial distribution - Continuous: Normal Distribution Properties and		12 hours

	Applications - moment generating function of normal distribution, mean, mode, variance - standard normal variate.	
V	Curve Fitting by the Method of Least Squares - Fitting a straight line - fitting a second degree parabola - Correlation - Karl Pearson's coefficient of correlation - Rank correlation - Spearman's formula - Properties - Regression - Equations of Regression Lines - Regression coefficients - Angle between Regression Lines - Properties and Applications.	12 hours

References	**Text Books:**
	1. S. Arumugam & A. Thangapandi Isaac, **Statistics**, New Gamma Publishing House, 2006.
	      Unit 1: Chapter 1: Sections 1.0 -1.4; Chapter 2: Section 2.0-2.5;
	      Chapter 3: Sections: 3.0 -3.2; Chapter 4: Sections: 4.0 -4.2;
	      Unit 2:Chapter 11: Sections: 11.0 -11.2.
	      Unit 3: Chapter 12: Sections 12.0 -12.5.
	      Unit 4: Chapter 13: Sections 13.0-13.3.
	      Unit 5: Chapter 5: Section 5.0, 5.1; Chapter 6: Section 6.0-6.3
	
	Reference Books:
	1. J.N. Kapoor& H.C. Saxena, **Mathematical Statistics**, S. Chand & Co Pvt. Ltd., New Delhi, 1994.
	2. S. C. Gupta & V. K. Kapoor, **Fundamentals of Mathematical Statistics**, S. Chand & Sons Pvt. Ltd., New Delhi, 1994.
	
	Web Resources:
	https://nptel.ac.in/courses/111105041/
	https://nptel.ac.in/courses/111105090/
	https://cosmolearning.org/courses/probability-stats-2-random-variable-probability-distribution/
	https://cosmolearning.org/courses/probability-stats-1/	

Course out comes	After successful completion of the course students will be able to CO1: Analyze the given data by using statistical methods CO2: Explain the basic concepts of probability and related results CO3: Employ different probabilistic methods to solve problems arise in different situations CO4: Design and evaluate hypothesis tests CO5: Apply sampling techniques to real life situations	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	3	3	2	1	1	3	3	2	2.3
CO2	2	2	3	3	3	1	1	2	3	3	2.3

CO3	3	3	3	2	2	2	2	2	3	3	2.4
CO4	2	2	3	2	2	1	1	2	3	3	2.1
CO5	1	2	3	2	2	1	1	2	2	3	1.9
Mean overall score											2.2

Course Code and Title	**18MATU02B3 / OBJECT ORIENTED PROGRAMMING WITH C++**
Class	B.Sc. Semester Second
	If revised, Percentage of Revision effected (Minimum 20%) 30%
Cognitive Level	Identify basic input/output, tokens, operators and functions through C++(Cognitive – Knowing & Understanding - K1&K2) Create objects and classes (Creating – K6) Constructing relationship between classes and objects (Applying – K3) Use function templates and class templates in a program (Applying – K3) Design Object Oriented Programs using class, inheritance diagrams (Creating – K6)
Course Objectives	To develop programming skills in C++ and its object oriented programming concepts

UNIT	Content	No. of Hours
I	Principles of Object Oriented Programing – OOP Paradigm – Basic Concepts of OOP – Benefits of OOP – Applications of OOP - What is C++ - Applications of C++ - A simple C++ program - An example with class - tokens - keywords - Identifiers and constants - basic, user defined, derived data types-symbolic constants - type compatibility - declaration of variables - dynamic initialization of variables.	14 hours
II	Operator in C++ - scope resolution, member differencing, memory management operators - manipulators - type cast operator - Expressions and their types – Special assignment expressions – Implict conversions – Operator overloading - Operator precedence – control structures - - the main function - function prototyping - call by reference - return by reference - inline functions - default, constant arguments - function overloading - math library functions.	14 hours
III	C structure - specifying a class - defining member function - a C++ program with class making an outside function inline - nesting of member function - private member function - array within class - static data members - static member functions - array of objects -objects as function arguments - friendly functions – Returning objects – Constant member functions – pointers to members – Local Classes.	12 hours
IV	Constructors – parameterized constructors - multiple constructors in a class - constructors with default arguments -	12 hours

	dynamic initialization of objects - copy constructor - dynamic constructors – destructors - defining operator overloading - overloading unary, binary operators.	
V	Defining derived classes - single inheritance - multilevel inheritance - multiple inheritance-hierarchical inheritance - hybrid inheritance - virtual base class - abstract classes - constructors in derived classes	12 hours

References	**Text Books:**
	1. E. Balagurusamy, **Object Oriented Programming with C++,** Third edition, Tata McGraw-Hill publication, New Delhi, 2006.
	    Unit 1: Chapters: 1.4 - 1.8, 2.1 - 2.5, 3.1- 3.12,
	    Unit 2: Chapters: 3.14-3.25, 4.1-4.10 & 4.12.
	    Unit 3: Chapters: 5.1- 5.9, 5.11-5.19.
	    Unit 4: Chapters: 6.1-6.8, 6.11, 7.2-7.5.
	Unit 5: Chapters: 8.1-8.11**Reference Books**:
	1. V. Ravichandran, **Programming with C++,** Second Edition Tata McGraw - Hill, New Delhi, 2006.
	2. H. Schildt, **The complete Reference of C++,** Tata-McGraw-Hill publishing Company Ltd. New Delhi, 2003.
	Web Resources:
	https://spoken-tutorial.org/
	https://www.tutorialspoint.com/cplusplus/index.htm

Course out comes	After successful completion of the course students will be able to CO1: Formulate object oriented programming concept CO2: Utilize the C++ tokens and operators CO3: Apply C++ class declaration and definition and its objects in software CO4: Design constructors, destructors and operator overloading CO5: Apply the concept of inheritance in Software problems

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	3	3	2	2	1	2	2	3	3	2.2
CO2	2	1	2	2	1	2	2	3	2	2	1.9
CO3	3	2	3	2	1	0	2	1	2	3	1.9
CO4	2	1	2	1	3	1	2	2	1	3	1.8
CO5	3	1	1	2	3	1	3	1	2	2	1.9
Mean overall score											**1.94**

Semester	II	Course Code	18MATU02B4
Course Title	**OBJECT ORIENTED PROGRAMMING WITH C++ (PRACTICAL)**		
No. of. Credits	1	No. of. contact hours per week	2
Category	**Allied Course – Practical**		
If revised, Percentage of Revision effected (Minimum 20%)	20%		

Unit	Content	No. of. Hours
	1. Write a program that inputs a character from keyboard and display it's corresponding ASCII value on the Screen. 2. Write a C++ Program using a class called Temp. and members functions that will ask for a temperature in Fahrenheit and display it in Celsius. 3. List the prime numbers in each range. 4. Display Fibonacci series. 5. Sorting given list of names in alphabetical order. 6. Sorting given list of numbers in ascending order. 7. Read and display for a given matrix of any order. 8. Compute simple and compound interest values. 9. Computer biggest among three numbers. 10. Compute biggest among N integers. 11. Compute factorial of a given number using recursive function. 12. Write a program to swap the values using functions. 13. Print perfect squares in each range. 14. Write a program to solve a quadratic equation and test with three types of roots. 15. Write a program to calculate the following functions to 0.0001% accuracy. $\sin x = x - \dfrac{x^3}{3!} + \dfrac{x^5}{5!} - \cdots$ $SUM = 1 + \left(\dfrac{1}{2}\right)^2 + \left(\dfrac{1}{3}\right)^3 + \left(\dfrac{1}{4}\right)^4 + \cdots$ $cosx = 1 - \dfrac{x^2}{2!} + \dfrac{x^4}{4!} - \cdots$ 16. Write a program to calculate variance and SD of N numbers. 17. Write a program to read two matrices and compute matrix multiplication using functions. 18. Prepare employee details using class with array of objects. 19. Program to illustrate objects as function arguments. 20. Program to illustrate parameterized constructors. 21. Program to illustrate multiple constructors in a class. 22. Show by a suitable program: how the unary minus operator is overloaded? 23. Show by a suitable program: how the binary operator is overloaded? 24. Prepare student mark list by using multilevel inheritance. 25. Program to illustrate multiple inheritance. 26. Prepare student mark list by using hybrid inheritance. 27. Prepare student mark list by using the concept of virtual base class.	16

Course Code and Title	**18MATU0304 / CALCULUS**		
Class	B.Sc.	Semester	Third
	If revised, Percentage of Revision effected (Minimum 20%)	40%	
Cognitive Level	Knowing successive differentiation, mean value theorems (K1- Knowing) Understanding limits and continuity, Curvature, maxima and minima (K2- understanding) Applying integral concepts to find Length of a curve, area of surfaces and volume - (K3-applying) Evaluating double and triple integrals (K5-evaluating)		
Course Objectives	To learn the different concepts of differential and integral calculus		

UNIT	Content	No. of Hours
I	Differentiation: Limits and continuity - Standard forms - Logarithmic differentiation - Transformation, Rolle's theorem - Mean value theorem - Generalised mean value theorem	14
II	Differential Calculus: Successive Differentiation - Leibnitz theorem and its applications - Curvature - Radius of Curvature and Centre of Curvature - Evolutes and Involutes - Maxima and Minima	12
III	Integral Calculus: Evaluation of Definite integrals - Integration by parts - Reduction formulae - Integration as the limit of a sum	13
IV	Double and Triple integrals: Double Integrals - Evaluation of double integrals - Triple integrals- Jacobians - Change of variables in double and Triple integrals	12
V	Application of Integration: Length of a curve - Area - Volume of a solid of revolution - Surface area of a solid of revolution - Volume as Triple integral - Area of surfaces	13

References	**Text Books:** 1. S. Narayanan & T. K. ManickavasagamPillai, **Calculus,Vol.1**. S. Viswanathan Pvt. Ltd., Chennai, 2004. Unit 1:Chapter I Secs 5-12, Chapter II, Chapter VI Secs 6.1-6.2.5. Unit 2: Chapter III, Chapter V Secs 1.1-1.5, Chapter X Secs 10.2.1-10.3.1. 2. S. Arumugam& A. Thangapandi Isaac, **Calculus,Vol.2.,**New Gamma Publishing House, Palayamkottai, 1999. Unit 3:Chapter 2 Secs 2.6-2.9. Unit 4:Chapter 4 Secs 4.1-4.5. Unit 5:Chapter 6 Secs 6.1-6.6. **Reference Books**: 1. George B. Thomas, JR &Ross L. Finney, **Calculus and Analytic Geometry,** Sixth edition, Narosa Publishing House, New Delhi, 1986. **2.** S. Arumugam& A. Thangapandi Isaac, **Calculus,**Vol.1, New

	GammapublishingHouse, Palayamkottai,1999.
	Web Resources:
	1. https://freevideolectures.com/course/2502/calculus
	2. https://freevideolectures.com/course/2071/calculus-i-key-concepts
Course out comes	After successful completion of the course students will be able to
	CO1: Explain basic knowledge of applications of differentiation
	CO2: Compute various types of differentiation
	CO3: Outline the concepts of Riemann integrals
	CO4: Apply the techniques of multiple integrals to find area and volume
	CO5: Evaluate the integrals using change of variables

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	2	1	2	2	3	1	2	2	2.0
CO2	3	2	1	2	2	2	3	2	2	1	2.0
CO3	2	3	2	2	1	2	2	2	1	2	1.9
CO4	3	3	2	1	3	2	3	2	1	1	2.1
CO5	2	2	3	1	2	2	3	2	2	2	2.1
Mean overall score											**2.02**

Course Code and Title	**18MATU03B5 / ALLIED STATISTICS-I (NEW COURSE)**		
Class	B.Sc.	Semester	Third
Cognitive Level	K-1		
	Know the concept of attributes		
	Learn the concept of hypothesis and sampling distributions		
	To know the different between correlation and association		
	To know what is χ^2 test and goodness of fit		
	Know the uses of χ^2 test		
	K-2		
	Understand the methods of studying association		
	Understand the techniques of analysis and variance		
	Understand conditions for applying χ^2		
	Understand the concept of statistical inference		
	K-3		
	Apply the technique of attributes		
	Find the standard error and estimate various sampling parameters		

		Apply Yate's corrections
		Apply the technique of analysis of variance for some statistical problems.
		Apply the skills about the occurrence of null and alternate hypothesis
	K-4	
		Analyze the variance and coding of data
		Analyze the given data by using χ^2 test
	K-5	
		Evaluate the significance for large samples and small samples
	K-6	
		Create statistical models for real world situations and solve them using these techniques
Course Objectives	To impart deep knowledge about statistical methods	
UNIT	**Content**	**No. of Hours**
I	Association of Attributes: Introduction-Difference between correlation and association-Notation and Terminology-Consistency of data- association and disassociation-methods of studying association-Miscellaneous illustrations	10 hours
II	Statistical inference-Tests of hypotheses: Introduction-standard error and sampling distribution-estimation	10 hours
III	Statistical inference- Tests of hypotheses (continued): test of significance for large samples Test of significance for small samples	9 hours
IV	χ^2 test and goodness of fit: Introduction-χ^2 defined-conditions for applying χ^2 test-Yates' corrections-Uses of χ^2 test-additive property of χ^2 - Chi-square for specified value of population variance.	9 hours
V	Analysis of variance-assumptions in analysis of variance-technique of analysis of variance-coding of data-analysis of variance in two-way classification model.	10 hours

References	**Text Books:**
	S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi, 2001.
	    Unit I: Page number 477-499.
	    Unit II: Page number 881-901.
	    Unit III: Page number 901-929.
	    Unit IV: Page number 953-972.
	    Unit V: Page number 1009-1038.
	Reference Books:
	1.S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons, New Delhi, 1994.
	2. Chung, Elementary Probability Theory with Stochastic Process, Narosa publishing House, New Delhi, 1993.
	3. J. N. Kapoor and H. C. Saxena, Mathematical Staitstics, Sultan Chand & Sons, New Delhi, 1994.	

Course out comes	After successful completion of the course students will be able to
	CO1: Analyze the concept about the methods of attributes
	CO2: Compute standard error and sampling distribution
	CO3: Predict the occurrence of null and alternate hypotheses
	CO4: Analyze the given data using Chi-square test
	CO5: Estimate the variance and coding of data

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	3	2	1	2	1	2	3	1	2
CO2	2	3	3	3	2	3	2	1	3	2	2.4
CO3	2	1	2	3	1	2	2	2	3	3	2
CO4	1	2	3	3	2	2	2	1	3	3	2.2
CO5	2	2	3	3	2	2	2	1	3	2	2.2
Mean overall score											2.16

Course Code and Title	**18MATU0305 / PROGRAMMING WITH JAVA**		
Class	B.Sc.	Semester	Third
	If revised, Percentage of Revision effected (Minimum 20%)	20%	
Cognitive Level	Identify Classes, objects and methods to define a class, Operators and expressions, Accessing interface variables(Cognitive – Knowing-K1)		
	To understand about decision making with looping and branching using control statements(Understanding -K2)		
	Java applets are applied to create Web pages to contain animated graphics or interactive content(Applying and Creating – K3, K6)		
	Analyzing graphics programming with geometry and statistical data (Analyzing – K4)		
	To create geometrical shapes (Creating – K6)		
Course Objectives	To develop object oriented programming skills in JAVA and its applications in webpage designing, geometry and graphical representation of statistical data		

UNIT	Content	No. of Hours
I	Object oriented Paradigim – Basic concepts of OOP- Benefits of OOP – Applications of OOP -Overview of java language: Introduction - Simple java program - An application with two classes - Java program structure - Java tokens - Java statements - implementing a java program - Java virtual machine - Command line arguments: Constants, Variables and Data types - declaration of variables giving values to variables - Scope of variables - Symbolic constants - Type casting - Getting values of variables - Standard default values	14 hours
II	Operators and Expressions: Arithmetic operators - Relational operators - Logical operators -Assignment operators - Increment and decrement operators- Conditional operators - Bitwise operators - Special operators- - Arithmetic expressions -Evaluation of expressions - Precedence of Arithmetic operators - Type conversion in expressions - Operator precedence and associatively - Mathematical functions - Decision making and Branching: Decision making with if statement - Simple if statement - The if....else statement - Nesting of if else statements - The else if ladder - Switch statement –The?: operator.	14 hours
III	Decision making and Looping: The while statement - The do statement - the for statement - Jumps in loops - Labeled loops. Classes, Objects and Methods Defining a Class - Adding variables -.Adding methods - Creating Objects - Accessing Class members - Constructors -Methods. Overloading - Static members- Nesting of methods - Inheritance: Extending a class - Overriding methods - Final variables and methods - final classes - finalizer methods - Abstract methods and classes - visibility control - Arrays - One dimensional. Arrays - Crating an array -Two dimensional array - Strings - Vectors - wrapper Classes - Enumerated types - Some selected programs for practical.	12 hours
IV	Interfaces: Defining interfaces - Extending interfaces - Implementing interfaces -Accessing interface variables - Packages: Java API Packages - Using system packages - Naming conventions - Creating packages - Accessing a package -Using a package - adding a class to a package - Hiding classes - Multithreaded programming – Creating Threads – Extending the Thread lass – Stoping and blocking a thread – lfe cycle of thread – Using thread methods – Thread exception – thread priority – Synchronization.	12 hours
V	Applet Programming: Introduction - How applets differ from applications - Preparing to write applet - Building applet code - Applet life cycle - Creating an executable applet - Designing a web page - Applet tag - Adding applet to HTML File - Running The Applet -More about applet tag - Displaying	12 hours

	numerical values- Getting input from the user. Graphics Programming: Introduction - The Graphics class - Lines and Rectangles - Circles and Ellipses - Drawing arcs - Drawing polygons -. Line graphs - Using control loops in applets - Drawing bar charts.	

References	**Text Books**:
	 1. E. Balagurusamy, **Programming with Java**, McGraw - Hill Publishing Company Ltd., New Delhi, 2005.
	      Unit 1: Chapters 1, 3, 4
	      Unit 2: Chapters 5, 6
	      Unit 3: Chapters 7, 8, 9
	      Unit 4: Chapters 10, 11,12
	      Unit 5: Chapters 14, 15.
	 Reference Books:
	 1. 1. H. Sehildt, **JAVA2: The Complete Reference,** Fourth Edition, TMH Publishing Company, New Delhi, 2001.
	 2. C. Xavier, **Programming with JAVA 2**, SciTech Publications, Chennai, 2000
	 Web Resources:
	 https://www.udemy.com/java-tutorial/
	 https://www.tutorialspoint.com/java/index.htm	

Course out comes	After successful completion of the course students will be able to CO1: Create Java programs and implement java tokens CO2: Solve problems using Java operators and expressions CO3: Demonstrate decision making and looping in programs CO4: Critique the concept of interfaces CO5: Apply the applet and graphics programming with geometry and statistical data analysis	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO2	1	3	3	2	2	1	2	2	3	3	2.2
CO3	2	3	2	2	1	2	2	1	3	2	2.0
CO4	3	3	0	2	2	3	2	3	2	3	2.3
CO5	2	3	2	3	3	2	1	2	2	2	2.2
Mean overall score											**2.16**

Semester	III	Course Code	18MATU0306
Course Title	PROGAMMING WITH JAVA (PRACTICAL)		
If revised, Percentage of Revision effected (Minimum 20%)	20%		
No. of. Credits	1	No. of. contact hours per week	2
Category	Computer Skill		

List of Practical	No. of. Hours
Practical related to Programming with Java Practical related to Programming with Java Programming with Java 1. Write a JAVA Program to determine economic order quantity and optimal time between orders in inventory management. 2. Write a program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by 7. 3. Write a program for fitting a straight line through a set of points (x_i, y_i) 4. Write a program to determine the sum of harmonic series 5. Write a program to convert the given temperature in Fahrenheit to Celsius 6. Write a program to perform any 5 math functions 7. Write a program to solve two linear equations with two unknowns 8. Prepare your house EB bill according to unit price of reading range by TNEB 9. Display Floyd's triangle 10. Compute power of 2 using for loop 11. Reverse the digits using while loop 12. Write a program that computes and prints a table of factorials for any given m. 13. Write a program to compute sum of digits of a given integer 14. Write a program using do….while loop to calculate and print first m Fibonacci numbers	16

15. Program to illustrate Class
16. Program to illustrate Constructors
17. Program to illustrate method overloading
18. Program to illustrate static members
19. Program to illustrate inheritance concept
20. Write a program to sort a list of numbers
21. Write a program to perform matrix multiplication
22. Write a program for alphabetical ordering of strings
23. Write a program to calculate compound interest value by using wrapper class methods
24. Prepare student mark list by implementing multiple inheritance using interfaces
25. Program to illustrate packages
26. Develop an applet that receives three numeric values as input from the user and then displays the largest value on the screen. Write a HTML page and test the applet.
27. Applet program to display bar chart for the following data: Year : 2010 2011 2012 2013 2014 2015 Turnover : 110 150 100 170 190 120 (Rs. Crores)
28. Write applets to draw the following shapes: a) Cone b) Cylinder c) Cube d) Square inside a circle e) Circle inside a square

Course Code and Title	**18MATU0407 / ABSTRACT ALGEBRA**		
Class	B.Sc.	Semester	Fourth
	If revised, Percentage of Revision effected (Minimum 20%)	40%	
Cognitive Level	Knowing the basic properties of groups, subgroups, rings, ideals and fields. (K1-Knowing) Understanding the order of elements in a group, cosets, normal subgroups, and isomorphism of groups as well as rings (K2-Understanding). Using Lagrange's theorem to find the properties of subgroups of a group and find the order of an element of a group (K3-Applying) Testing of isomorphism of groups and rings (K4-Analyse) Investigate the properties of permutation groups and some special types of rings (K5-Evaluate)		

	Constructing Cayley Table, subgroups, subrings, ideals in groups and rings (K6-Create)	
Course Objectives	To provide some knowledge about various algebraic structures	
UNIT	**Content**	**No. of Hours**
I	Groups: Introduction - Definition and examples - Elementary properties of a group - Equivalent definition of a group - Permutation groups - permutation multiplication - Cycles and transpositions.	13 hours
II	Subgroups - Cyclic groups - examples - properties of cyclic groups - structure of finite and infinite cyclic groups - Generators of cyclic groups - Order of an element - Cosets and Lagrange's theorem.	14 hours
III	Normal subgroups and quotient groups - Isomorphism - Examples - Some results on isomorphism - Structure of isomorphic groups - non isomorphic groups - Cayley's theorem - Homomorphisms - Examples - Elementary properties of homomorphisms - Types of homomorphisms.	13 hours
IV	Rings: Definition and examples - Elementary properties of rings – Isomorphism - Type of rings - Characteristic of a ring - Subring.	12 hours
V	Ideals - Quotient rings - Maximal and prime ideals - Homomorphism of rings.	12 hours

References	**Text Books:**
	1. S. Arumugam& A. T. Isaac, **Modern Algebra**, SciTech Publications(India) Pvt. Ltd., 2003.
	    Unit 1: Chapter 3: Sections 3.0, 3.1, 3.2, 3.3, 3.4
	    Unit 2: Chapter 3: Sections 3.5, 3.6, 3.7, 3.8
	    Unit 3: Chapter 3: Sections 3.9, 3.10, 3.11
	    Unit 4: Chapter 4: Sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6
	    Unit 5: Chapter 4: Sections 4.7, 4.8, 4.9, 4.20
	Reference Books:
	1. S. Narayanan & T. K. ManickavasagamPillai, **Modern Algebra**, Vol. II, S. Viswanathan Pvt. Ltd., Chennai, 1997.
	2. John. B. Fraleigh, **A first course in abstract algebra**, 7th edition, Addison-Wesley Publications, US, 2003.	

Course out comes	After successful completion of the course students will be able to CO1: Analyze the basic properties of groups and subgroups CO2: Identify the types of homomorphism and use them to classify groups CO3: Apply the theorems to study the structure of groups CO4: Outline the basic properties of rings, fields and integral domains CO5: Utilize the algebraic methods for solving problems	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	1	2	3	2	1	1	2	2.0
CO2	3	2	2	1	3	3	1	1	1	2	1.9
CO3	3	2	2	2	2	3	2	1	1	2	2.0
CO4	3	2	2	1	2	3	1	1	1	2	1.8
CO5	3	3	2	1	3	3	2	3	2	2	2.4
Mean overall score											**2.02**

Course Code and Title	**18MATU0408/ SEQUENCES AND SERIES**		
Class	B.Sc.	Semester	Fourth
	If revised, Percentage of Revision effected (Minimum 20%)	90%	
Cognitive Level	Knowing the basic concepts of sequences, bounded sequences, monotonic sequences, convergent sequences, Divergent and oscillating sequences. Understanding the algebra of limits, behavior of monotonic sequences, subsequences and limit points. Applying the Comparison test, Kummer's test, Root test and Condensation test to given the sequence is converge or diverge or not. Evaluating the problems of binomial series, an exponential series and the logarithmic series. Analyzing the summations of trigonometric series and solve their related problems.		
Course Objectives	To enhance basic skills in the areas of sequences and series		
UNIT	**Content**	**No. of Hours**	
I	Sequences: Introduction - Sequences-Bounded sequences - Monotonic sequences - Convergent sequences-Divergent and oscillating sequences.	11	
II	The algebra of limits - Behaviour of monotonic sequences-Some theorems on limit - Subsequences -Limit points.	9	
III	Cauchy sequences -The upper and lower limit of a sequences - Series of positive terms: Infinite series-Comparison test-Kummer's test - Root test and Condensation test.	10	

IV	Binomial Series - Exponential Series and Logarithmic Series	10
V	Summations of trigonometric series-Properties and their related problems.	10
References	**Text Books:** 1. S. Arumugam& A. Thangapandi Isaac, **Sequences and series**, New Gamma Publishing House, Palayamkottai, 2015.Unit 1-Sections 3.0, 3.1, 3.2, 3.3, 3.4, 3.5. Unit 2-Sections 3.6, 3.7, 3.8, 3.9, and 3.10. Unit 3-Sections3.11, 3.12, 4.1, 4.2, 4.3, 4.4. 2. S. Arumugam, A. Thangapandi Isaac& A. Somasundaram, **Engineering Mathematics**, Volume 1, Scitech Publications (India) Pvt. Ltd, Chennai.Unit4 -Sections 1.7, 1.8, 1.9. 3. S. Narayanan & T. K. ManicavachagomPillai, **Trigonometry**,S.Viswanathan Pvt. Ltd., Chennai, 2001.Unit 5-Chapters VI: Sections 1, 2, 3. **Reference Books**: 1. N. P. Bali, **Real Analysis**, An imprint of Laxmi Publications Pvt. Ltd., New Delhi, 2005. 2. T. K. Manicavachagom Pillay, T. Natarajan & K. S. Ganapathy, **Algebra**, Vol. 1, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2014. 3. Arumugam&Issac, **Theory of Equations, Theory of Numbers and Trigonometry**, New gamma Publishing house, Tirunelveli, 2011. 4. Richard R. Goldberg,**Methods of Real Analysis**, Oxford & IBH Publishing CO. PVT. LTD., New Delhi, 1970. 5. Ajith Kumar and S. Kumaresan, **A Basic Course in Real Analysis** CRC Press, Reprint 2015
Course out comes	After successful completion of the course students will be able to CO1: Discuss the sequences and its types CO2: Outline the behavior of sequences and its subsequences CO3: Apply infinite series and various tests for finding its convergence CO4: Evaluate the Binomial, Exponential and Logarithmic Series CO5: Explain the summations of trigonometric series and problems

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	1	2	2	2	1	2	3	2	2.1
CO2	3	2	2	3	0	3	2	2	2	1	2.0
CO3	2	3	3	2	2	2	2	2	2	3	2.3
CO4	3	2	2	2	2	3	2	2	3	2	2.3
CO5	2	2	3	1	1	2	3	2	2	1	1.9
Mean overall score											**2.12**

Course Code and Title	**18MATU0409** / **DIFFERENTIAL EQUATIONS**		
Class	B.Sc.	Semester	Fourth
	If revised, Percentage of Revision effected (Minimum 20%)	30%	
Cognitive Level	K-1 Identify the different types of differential equations Find the order and degree of differential equations Find particular integral of some special type of differential equations Know the standard forms of various differential equations Identifying odd and even function K-2 Solve simultaneous differential equations Find the Laplace Transform for various functions Form partial differential equations Find the Fourier series and determine its coefficients K-3 Formulate the differential equation for real life problems Apply Laplace transforms to solve ODE Apply Lagrange's method to solve linear PDE Solve a PDE using Charpit's method. Solve the functions of the type x^m, $e^{ax}\cos bx$ and $e^{ax}\sin bx$ K-4 Estimate inverse Laplace Transforms K-5 Find half range sin series and half range cosine series K-6 Create a new method to find solutions to differential equations		
Course Objectives	To introduce the basic concepts of differential equations and Fourier series.		

UNIT	Content	No. of Hours
I	Differential Equations: Introduction - First order O.D.E - Types of first order O.D.E - first order O.D.E of higher degree - Applications of First order ODE: Growth, Decay and Chemical reaction - Flow of water from an orifice - Falling Bodies and other rate problems.	13
II	Linear Second Order Equations with constant coefficient and particular integral of the functions of the type x^m, $e^{ax}\cos bx$ and $e^{ax}\sin bx$ only - Homogeneous linear equations with variable coefficients - Simultaneous Equations - Forced vibrations - Newtons law of gravitation and motion of planets.	14
III	Laplace Transform of Elementary Functions - Laplace Transforms of Periodic Functions - Inverse Transforms - Solutions of Ordinary Second Order Differential Equations	12

	with Constant Coefficients-Solutions of system of differential Equations.	
IV	Partial Differential Equations (PDE) Forming a PDE - Lagrange Method of solving Linear Equations - Standard forms of PDE - Clairaut's form - Charpits Method.	13
V	Fourier series: Expansion of a function - Drichlet's Conditions - Determining the Fourier Coefficients - Odd and Even Functions - Half Range Sine Series - Half Range Cosine Series.	12

References	**Text Books:**
	1. S. Narayanan &T.K. ManickavachagomPillay, **Differential Equations and its Applications,** S. Viswanathan Pvt. Ltd., Chennai, 2013.
	    Unit 1: Chapters I, II, III, IV
	    Unit 2: Chapter V **(up to section 8)**, Chapter VI.
	    Unit 3: Chapter IX**(up to Section-9)**
	    Unit 4: Chapter XII
	
	2. T. Veerarajan,**Transforms and Partial Differential Equations,** Tata McGraw Hill Education Private Ltd., New Delhi, 2012.
	    Unit 5: Chapter 1-Section 1.1 – 1.9
	Reference Books:
	1. Arumugam& Isaac, **Differential Equations and Applications,** New Gamma Publishing House, 2003.
	2. M. D. Raisinghania, **Advanced Differential equations,** S. Chand Publications, New Delhi 2004.
	3. K. Vairaamanickam, Nirmala P. Ratchagar& T. Tamilselvan, **Transforms and Partial Differential Equations,** SciTech Publications Pvt. Ltd., 2011.	

Course out comes	After successful completion of the course students will be able to CO1: Discuss the basic concepts of first order differential equation and it Applications CO2: Determine solutions to second order linear homogeneous, non-homogeneous differential equations with constant coefficients. CO3: Estimate the solutions by applying Laplace transform methods CO4: Outline the elementary theory of partial differential equations, and solve it using various techniques. CO5: Apply the Fourier series to solve partial differential equations	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	0	2	2	3	3	2	1	2	2
CO2	2	3	1	2	2	3	3	2	1	1	2
CO3	2	2	1	1	2	2	3	2	1	2	1.8

CO4	2	3	1	2	2	3	3	2	1	1	2
CO5	2	2	1	2	2	3	3	2	1	1	1.9
Mean overall score											**1.94**

Course Code and Title	18MATU04B6 / ALLIED STATISTICS-II (NEW COURSE)		
Class	B.Sc.	Semester	Fourth

Cognitive Level	K-1
	
	      Know the concept of moment generating functions
	      Know the Chebyshev's inequality
	      To know the various types of continuous probability distribution
	      Know the concept of vital statistics
	 K-2
	
	      Understand the methods of applying Vital statistics
	      Understand the importance of characteristics functions
	      Understand the weak law of large numbers
	      Understand the properties of various continuous probability distributions
	 K-3
	
	      Apply the Chebyshev's inequality to check the convergence in probability
	      Use Moment generating function to find moments and cumulants with respect to distributions
	      Apply Vital statistics to find the measurement of fertility and mortality
	      Apply Vital statistics to find the reproduction rates
	 K-4
	
	      Analyze the convergence in probability
	      Analyze different factors that varies with respect to time
	 K-5
	
	      Evaluate the moments of various orders
	 K-6
	
	      Create a statistical model of a real world situation and use the distribution to solve it		

Course Objectives	To impart deep knowledge about statistical methods		
UNIT	**Content**	**No. of Hours**	
I	Generating functions and Law of large numbers: Moment generating functions-cumulants-characteristic functions	10 hours	
II	Generating functions and Law of large numbers (continued): Chebychev's inequality-convergence in probability- weak law of large numbers.	9 hours	

III	Special continuous probability distributions: Rectangular(or uniform) distribution-triangular distribution-gamma distribution-beta distribution of first kind-beta distribution of second kind.	10 hours
IV	Special continuous probability distributions (continued): Exponential distribution-standard Laplace distribution-Cauchy distribution	9 hours
V	Vital Statistics: Introduction-vital statistics defined-uses of vital statistics-methods of obtaining vital statistics-measurement of fertility-reproduction rates-measurement of mortality	10 hours
References	**Text Books:** 1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons, New Delhi, 1994. Unit I: page numbers 7.1-7.17 Unit II: page numbers 7.24-7.39 Unit III: page numbers 9.29 -9.50 Unit IV: page numbers 9.50-9.55, 9.58-9.63 2. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi, 2001. Unit V: Page numbers 711-736. **Reference Books**: 1.Chung, Elementary Probability Theory with Stochastic Process, Narosa publishing House, New Delhi, 1993. 2. J. N. Kapoor and H. C. Saxena, Mathematical Staitstics, Sultan Chand & Sons, New Delhi, 1994.	
Course out comes	After successful completion of the course students will be able to CO1: Compute the moments of various orders CO2: Analyze the convergence in probability CO3: Identify the special types of continuous probability distributions CO4: Formulate the different factors that varies with respect to time CO5: Apply the various methods of statistics in real life data	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	3	2	1	2	1	2	3	1	2
CO2	2	3	3	3	2	3	2	1	3	2	2.4
CO3	2	1	2	2	1	2	2	2	3	3	2
CO4	1	2	3	3	2	2	2	1	3	3	2.2
CO5	2	2	3	3	2	2	2	1	3	2	2.2
Mean overall score											**2.16**

Semester	III & IV	Course Code	18MATU04B7
Course Title	**Allied Statistics – I & II (PRACTICAL) (NEW COURSE)**		
No. of. Credits	1	No. of. contact hours per week	2
Category	**Computer Skill**		

List of Practical	No. of. Hours
1. Drawing bar charts, Pie diagrams, Histograms, Pictograms, 3-Dbarsand other related diagrams. 2. Drawing graphs of frequency curves, frequency polygons, Normal probability curve, cumulative distribution curves, probability curves for different distributions. 3. Computation of Mean, Variance, Skewness and Moments, Kurtosis measures. 4. Computation of Moment generating functions, characteristic functions, cumulants and related measures. 5. Computation of Covariance, Correlation Coefficient, Equations of Regression lines and curves. Computing F-ratio and preparation of Analysis of variance tables. 6. Computation of Index Numbers 7. Analysis of timeseries:Introduction-timeseries-componentsofatimeseries-measurementof trends. 8. SPSS Package	16

Reference Books:

1. S.C.GuptaandV.K.Kapoor,FundamentalsofMathematicalStatistics,SultanChandand Sons (1994).
2. N.KapoorandH.C.Saxena,MathematicalStatistics,S.ChandandCo.(1994).
3. Chung,ElementaryProbabilitytheorywithStochasticProcess,Narosapublishing House (1993).
4. ArumugamandIsaac,Statistics,NewGammaPublications,July2016.
5. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi, 2001. Software: SPSS package 11.6 version

Course Code and Title	**18MATU0510 / LINEAR ALGEBRA**		
Class	B.Sc.	Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)	40%	
Cognitive Level	Recognizing the basic properties of vector spaces, inner product spaces (K1-Knowing). Interpreting the concepts of linear algebra in geometric point of view (K2-Understanding). Solving simultaneous linear equations, finding eigenvalues and eigenvectors, the inverse of a matrix by using Cayley Hamilton Theorem (K3-Apply). Examining the linear independence and orthogonality of set of vectors (K4-Analyse). Constructing linearly independent sets, basis, subspaces, linear transformations in a vector space (K6-Create).		
Course Objectives	To introduce the fundamentals of vector spaces		

UNIT	Content	No. of Hours
I	Vector Spaces: Introduction - Definition and examples - Elementary properties of vector spaces - Subspaces - Examples - Intersection, union and sum of subspaces - Direct sum of subspaces - quotient spaces.	12 hours
II	Linear transformation - Types of linear transformations – Examples - Image of a subspace under a linear transformation - kernel of a linear transformation - Fundamental theorem of linear transformation - Span of a set - Linear independence.	13 hours
III	Basis and dimension - Rank and nullity - Matrix of a linear transformation.	14 hours
IV	Inner product spaces: Introduction - Definition and examples - Properties of inner product spaces - norm of a vector - Schwarz inequality - Orthogonality - Orthogonal Complement.	12 hours
V	Elementary transformations - Rank of a matrix - Simultaneous linear equations - Characteristic equation and Cayley Hamilton Theorem - Eigen values and eigen vectors.	13 hours
References	**Text Books**: 1. S. Arumugam&A. T. Isaac, **Modern Algebra**, SciTech Publications(India) Pvt. Ltd., 2003. 　　　　Unit 1: Chapter 5: Sections 5.0, 5.1, 5.2. 　　　　Unit 2:Chapter 5: Sections 5.3, 5.4, 5.5. 　　　　Unit 3:Chapter 5: Sections 5.6, 5.7, 5.8. 　　　　Unit 4:Chapter 6: Sections 6.0, 6.1, 6.2, 6.3. 　　　　Unit 5:Chapter 7: Sections 7.4, 7.5, 7.6, 7.7, 7.8.	

	Reference Books: 1. 1. S. Narayanan & T. K. ManickavasagamPillai, **Modern Algebra**,Vo1 III, S. Viswanathan Pvt. Ltd., Chennai, 1997. 2. S. Kumaresan, **Linear Algebra: A Geometric approach**, Prentice Hall of India, 2006. 3. VivekSahai & VikasBist, **Linear Algebra**, Narosa Publishing House, 2002.
Course out comes	After successful completion of the course students will be able to CO1: Explain the basic properties of vector spaces CO2: Identify the concepts of linear algebra in geometric point of view CO3: Create the linear transformations as matrix form CO4: Apply the tools of linear algebra to solve the system of equations CO5: Design the applications of linear algebra in many branches of mathematics

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	1	3	3	3	3	1	3	2.4
CO2	3	3	2	1	3	3	2	3	2	3	2.5
CO3	3	3	1	1	3	3	2	2	1	3	2.2
CO4	3	3	2	1	2	3	3	2	1	3	2.7
CO5	3	3	3	2	3	3	3	2	2	3	2.7
Mean overall score											**2.5**

Course Code and Title	**18MATU0511 / REAL ANALYSIS**		
Class	B.Sc.	Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)	90%	
Cognitive Level	Understanding metric spaces by using basic concepts of sets and functions (K1 & K2-Remembering and understanding). Identifying open, closed, connected and compact sets in metric spaces (K4-Analyzing). Applying open & closed set to study continuous and discontinuous functions (K3-Applying).		

	Identifying differentiable & integral functions and evaluate its derivatives and integral values (K4 & K5 – Analyzing and Evaluating). Constructing trigonometric, logarithmic, exponential functions using power series (K3& K6- Applying and creating).	
Course Objectives	To impart concepts about sets with metric and related properties	

UNIT	Content	No. of Hours
I	Limit of a function on the real line - Metric spaces - Limits in metric spaces - Functions continuous at a point on the real line - Functions continuous on a metric space	14
II	Open sets - Closed sets- Discontinuous function on R - More about open sets	12
III	Connected sets - Bounded sets and totally bounded sets - Complete metric spaces - Compact metric spaces	14
IV	Continuous functions on compact metric spaces - Continuity of the inverse function, Uniform continuity	11
V	Definition of the Riemann integral - Existence of the Riemann integral - Properties of the Riemann integral - Derivatives - Rolle's theorem - The law of the mean - Fundamental theorem of calculus - Improper integrals	13

References	**Text Books**: 1. Richard R. Goldberg, **Methods of Real Analysis**,Oxford& IBH Publishing Co. Pvt. Ltd, New Delhi, 1970. Unit 1-Secs 4.1-4.3, 5.1-5.3. Unit 2-Secs 5.4-5.6,6.1. Unit 3-Secs 6.2-6.5. Unit 4-Secs 6.4-6.8. Unit 5-Secs 7.2-7.9. **Reference Books**: 1. N. P. Bali, **Real Analysis**, An imprint of Laxmi Publications Pvt. Ltd., New Delhi, 2005. 2. Sterling K. Berberian, **A First Course In Real Analysis**, Springer, New York, 2004. 3. S. Arumugam& A. Thangapandi Isaac, **Modern Analysis**, New Gamma Publishing House, Palayamkottai, 2002. 4. Robert G. Bartle and Donald R. Sherbert, **Introduction to Real Analysis**, John Wiley and Sons, New Delhi, 1982. 5. S. C. Malik & Savita Arora, **Mathematical Analysis**, New Age International LTD., New Delhi, 1992
Course out comes	After successful completion of the course students will be able to CO1: Create the geometrical view of spaces with different metrics CO2: Explain the open, closed, connected and compact sets and its

	properties in metric spaces
	CO3: Discuss continuous and discontinuous functions on metric spaces
	CO4: Evaluate integration of bounded functions
	CO5: Communicate differentiation of functions to the geometry

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	2	1	3	3	1	3	1	1	2
CO2	3	3	2	1	2	2	3	3	1	2	2.2
CO3	2	3	2	1	3	2	3	3	1	1	2.1
CO4	3	3	3	1	3	3	1	3	1	1	2.2
CO5	3	3	3	1	3	3	2	3	1	1	2.3
Mean overall score											**2.16**

Course Code and Title	**18MATU0512 / LINEAR PROGRAMMING**			
Class	B.Sc.		Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)		50%	
Cognitive Level	Knowing the basic concepts of mathematical formulation of LPP and solving the linear programming problems using graphical method, simplex method, Big M method and two phase method.			
	Understanding the concept of duality in Linear Programming, General Primal-Dual pair, formulating a dual problem and dual simplex method.			
	Applying the North-West Corner rule and Vogel's approximation method to Finding an initial basic feasible solution.			
	Evaluating the processing 'n' jobs through two machines, processing 'n' jobs through k machines and processing 2 jobs through k machines.			
	Analyzing the two-person zero-sum games, the MAXIMIN-MINIMAX principle, graphical solution of $2 \times n$ and $m \times 2$ games and dominance property.			
Course Objectives	To impart the basic concepts and applications of linear programming			
UNIT	**Content**			**No. of Hours**
I	Linear Programming Problem - Mathematical Formulation of			13 hours

	LPP and Problems – Illustration on Mathematical Formulation of LPP - Graphical Solution Method–General Linear Programming Problem - Simplex Method – Big M Method - Two Phase Method	
II	Introduction – General Primal - Dual pair -Duality in Linear Programming: Introduction – General Primal-Dual Pair – Formulating a Dual Problem - Duality and Simplex Method - - Economic Interpretation of Duality - Dual Simplex Method	13 hours
III	Transportation Problem (TP): Introduction – LP Formulation of the transportation Problem–Existence of Solution in T.P.– Transportation table - Mathematical Formulation of TP - Finding an Initial Basic Feasible Solution using North West Corner Rule and Vogel's approximation method – Transportation Algorithm (MODI Method) – Degeneracy in T.P. - Unbalanced Transportation Problems. Assignment Problems (AP): Introduction - Mathematical formulation of AP – Solution Methods of Assignment Problems - Assignment algorithm –A typical Assignment Method – Dual Assignment Method -The Travelling Salesman Problem	13 hours
IV	Sequencing Problem: Introduction - Problem of Sequencing – Basic Terms used in Sequencing – Processing 'n' Jobs through Two Machines– Processing 'n' Jobs through k Machines- Processing 2 Jobs through k machines – Dynamic Programming: Introduction – The Recursive Equation Approach-Dynamic programming Algorithm – Solution of Discrete D. P. P. – Some Applications –Solution of L.P.P. by Dynamic Programming	13 hours
V	Games and Strategies: Introduction – Two-Person Zero-Sum Games –Some Basic Terms – The MAXIMIN-MINIMAX Principle - Games without Saddle Points-Mixed Strategies - Graphical Solution of $2 \times n$ and $m \times 2$ Games - Dominance Property – Arithmetic Method for $n \times n$ Games – General Solution of $m \times n$ Rectangular Games – Limitations and Extensions	12 hours
References	**Text Books**: 1. KantiSwarup, P. K. Gupta& Man Mohan, **Operations Research**, Sultan Chand& Sons, New Delhi, Eighteenth Thoroughly Revised Edition, 2015. Unit 1: Chapter 2: Sections 2:3,2.4, Chapter 3: Sections 3.2, Chapter 4: Sections 4.1 - 4.4. Unit 2: Chapter 5: Sections 5.1, 5.2, 5.3, 5.7, 5.9. Unit 3: Chapter 10: Sections 10.1 - 10.17, Chapter 11: Sections 11.1 - 11.7. Unit 4: Chapter 12: Sections 12.1, 12.2, 12.3, 12.4, 12.5, 12.6. Chapter 13 Sections 13.1 -13.7 Unit 5: Chapter 17: Sections 17.1 - 17.11.	

	Reference Books: 1. P. K. Gupta & D. S. Hira, **Operations Research**, S. Chand &Company Ltd., New Delhi, 2013. 2. J. K. Sharma, **Operations Research theory and its applications,** 2nd Edition, Macmillan, New Delhi, 2006. 3. R. Panneerselvam, **Operations Research**, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
Course out comes	After successful completion of the course students will be able to CO1: Formulate a linear programming problem and solve them graphically and simplex method CO2: Explain the concepts of duality programming CO3: Analyze the different aspects of transportation problems and also assignment problems CO4: Develop, organize, evaluate short, long term processes and solve problems CO5: Utilize the acquired knowledge of basics in game theory

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	2	0	3	1	1	2	3	1.9
CO2	2	3	2	1	1	3	2	3	1	3	2.1
CO3	2	2	3	2	1	3	2	2	3	1	2.1
CO4	3	2	2	2	2	3	2	3	2	1	2.2
CO5	3	3	2	2	1	3	2	1	3	2	2.2
Mean overall score											**2.1**

Course Code and Title	**18MATU05S1 / QUANTITATIVE SKILLS**		
Class	B.Sc.	Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)	20%	
Cognitive Level	Knowing various concepts like simplifications, problems on numbers and tabulation for competitive exams (K1-knowing) Understanding different topics like Time and work, percentages (K2-Understanding) Applying Logical deduction, Alphabet Test and Group discussion real life situation (K3-applying)		

Course Objectives	To impart skills in numerical and quantitative techniques	
UNIT	**Content**	**No. of Hours**
I	H.C.F and L.C.M of Numbers- decimal fractions- simplifications- square roots and cube roots- average- Problems on Numbers- Problems on Ages Surds and Indices	11 hours
II	Tabulation- Bar graphs- Pie charts- Line graphs- Permutation and combinations-Probability- true discount- Banker's discount- Heights and distances - Odd Man Out& Series.	10 hours
III	Percentages- Profit and Loss- Ratio-Proportion- Partnership- Chain rule- Time and work- Pies and cistern-Time and Distances - Probability.	9 hours
IV	Problems on Trains- Boats and Streams- Coding and decoding- Blood Relations- Logical Venn Diagram - Simple Interest-Compound Interest	9 hours
V	Logical deduction- Alphabet Test- Deriving conclusion from passages- Group discussion (on any current relevant topic)	9 hours

References	**Text Book:**
	1. R.S. Aggarwal, **Quantitative Aptitude,** 7thRevised Edision, S. Chand & Company Ltd., New Delhi, 2015.
	Reference:
	1. R.S. Aggarwal, **A Modern approach to verbal Reasoning**, (Fully solved), Chand & Company Ltd., New Delhi, 2012.
	Web Resources:
	  1. https://www.wiziq.com/tutorials/quantitative-aptitude
	  2.https://www.youtube.com/watch?v=l0OjOnNkFZM	

Course out comes	After successful completion of the course students will be able to CO1: Evaluate various real life situations by resorting to Analysis of key issues and factors CO2: Apply graphs, charts and probability techniques on various problems CO3: Discuss the problems on relations, coding and decoding CO4: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	3	1	3	2	2	3	1	2.3

CO2	2	2	3	2	1	2	2	2	3	1	2.0
CO3	2	3	2	2	1	2	1	2	3	2	2.0
CO4	2	2	1	2	2	2	1	2	2	3	1.9
Mean overall score											**2.05**

Course Code and Title	**18MATU0613**		**/ COMPLEX ANALYSIS**		
Class	B.Sc.			Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)			45%	
Cognitive Level	Understanding analytic, harmonic and conformal mapping (K1 & K2- Remembering and understanding). Understanding Bilinear transformations –Cross Ratio-Fixed points of bilinear transformations (K2-Understanding). Applying Cauchy's Theorem and Cauchy's Integral formula to evaluate integral of complex functions (K3 & K5 – Applying and Evaluating). Identifying singular points of complex functions using Laurent's series and classifying the singular points (K4 & K5 – Analyzing and Evaluating). Evaluating indefinite integrals of complex functions using Residue Theorem (K3& K5- Applying and Evaluating).				
Course Objectives	To introduce the concepts of complex numbers and analytic functions				
UNIT	**Content**				**No. of Hours**
I	Functions of complex variables - Limits- Continuous functions- Differentiability- Cauchy Riemann Equation– Analytic functions - Harmonic function-Conformal mapping.				13 hours
II	Elementary mappings - Bilinear transformations –Cross Ratio-Fixed points of bilinear transformations- Some special bilinear transformations.				12 hours
III	Integration in the Complex plane - Cauchy's theorem - Cauchy's Integral formula - Cauchy's Integral formula for higher derivatives- Liouville's theorem - Maximum modulus theorem.				13 hours
IV	Sequences and series of functions – Power series-Taylor's and Laurent's series –Zeros of an analytic functions- Singular points - Types ofsingularities.				15 hours
V	Residues –Cauchy's Residue theorem –Evaluation of definite integrals.				11 hours

References	**Text Books**:
	1. S. Arumugam, A. Thangapandi Isaac& A. Somasundaram, **Complex Analysis**, SciTech Publications, India, Pvt. Ltd., 2002.
	Unit 1: Chapter 2 (Sections 2.0-2.9)
	Unit 2: Chapter 3 (Sections 3.0-3.5), Chapter 5 (Sections 5.0-5.7)
	Unit 3: Chapter 6 (Sections 6.0-6.4)
	Unit 4: Chapter 4 (Sections 4.0-4.4), Chapter 7 (Sections 7.0-7.4)
	Unit 5: Chapter 8 (Sections 8.0-8.3)
	Reference Books:
	1. S. Narayanan & T.K. ManickavasagamPillai, **Complex Analysis**, S. Viswanathan Publishers, Chennai, 1997.
	2. S. Ponnusamy, **Foundations of Complex Analysis**, 2ndEdition, Narosa Publication, New Delhi, 2005.
	3. R. V. Churchill & J.W. Brown, **Complex variables and applications**, 5thEdition, McGraw Hill, Singapore, 1990.
Course out comes	After successful completion of the course students will be able to
	CO1: Outline the basic concepts of analytic function and its properties
	CO2: Explain about conformal and bilinear transformation
	CO3: Compare the integration of complex valued function with real valued function
	CO4: Predict the series of analytic function
	CO5: Apply the integration of complex function to find residues

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	2	1	3	3	2	3	1	1	2
CO2	3	3	1	1	3	3	3	3	1	1	2.2
CO3	3	3	2	1	3	3	2	3	2	1	2.3
CO4	3	3	2	1	3	3	3	3	1	1	2.3
CO5	2	3	3	1	3	3	3	3	1	1	2.3
Mean overall score											**2.22**

Course Code and Title	**18MATU0614 / GRAPH THEORY**		
Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	60%	
Cognitive	Knowing the applications of graph in real life (K1)		

Level	Applying many concepts need based situations (K2) Implement in algorithms in various fields (K3)	
Course Objectives	To acquire knowledge of fundamentals of graphs and its applications	
UNIT	**Content**	**No. of Hours**
I	Graphs and Subgraphs: Introduction - Definition andexamples - Degree - Subgraphs - Isomorphism - Ramsey Numbers - Independent sets and coverings - Intersection graphs and line graphs - Matrices - Operations on graphs.	14
II	Degree Sequences: Introduction - Degree sequences - Graphic sequences - Connectedness: Introduction - Walks, trails and paths - Connectedness and components - Blocks – Connectivity	12
III	Eulerian and Hamiltonian graphs: Introduction - Eulerian Graphs - Hamiltonian graphs - Trees: Introduction - Characterization of trees - Centre of a tree	13
IV	Matchings: Introduction - Matchings - Matchings in bipartite graphs - Planarity: Introduction - Definition and properties	12
V	Colourability: Introduction - Chromatic number and chromatic index - Directed graphs: Introduction - Definitions and basic properties - paths and connections	13
References	**Text Books**: 1. S. Arumugam& S. Ramachandran, **Invitation to Graph Theory**, SciTech Publications (India) Pvt. Ltd., 2001. Unit 1: Chapter 2: Sections 2.0 – 2.9 Unit 2: Chapter 3: Sections 3.0 – 3.2 & Chapter 4: Section 4.0 – 4.4 Unit 3: Chapter 5: Sections 5.0 – 5. 2 & Chapter 6: Section 6.0 – 6.2 Unit 4: Chapter 7: Sections 7.0 – 7.2 & Chapter 8: Section 8.0, 8.1 Unit 5: Chapter 9: Sections 9.0, 9.1 & Chapter 10: Section 10.0 – 10.3 **Reference Books**: 1. J.A. Bondy & U.S.R.Murty, **Graph Theory with Applications**, Elsevier, New York,1976. 2. S.A.Choudam, **A first course in Graph Theory, Macmillian**, India Ltd., Delhi,2007. 3. J.Clark&D.A.Holton, **A first Look at Graph Theory**, Allied Publishers, New Delhi,1995	
Course out comes	After successful completion of the course students will be able to CO1: Explain the different models of a graph CO2: Outline various parameters of graphs CO3: Analyze various properties of graphs	

	CO4: Apply graph theoretic methods to solve different real life problems
	CO5: Demonstrate various graph structures in network models

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	3	1	3	3	2	3	2	2	3	2.4
CO2	2	3	2	1	3	2	3	3	3	1	2.3
CO3	1	1	2	3	3	3	2	2	2	1	2.0
CO4	3	3	3	2	1	1	1	2	3	3	2.2
CO5	2	3	2	3	2	3	2	1	2	3	2.3
Mean overall score											**2.24**

Course Code and Title	**18MATU0615 / MECHANICS**

Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	50%	

Cognitive Level	Knowing about forces, velocity, acceleration, moments, couples, friction etc., in trigonometrically and geometrically (Cognitive – Knowing K1)
	Understanding Newton's laws of motion and equilibrium of forces acting on a rigid body(Understanding - K2)
	Applying geometrical concepts in parallel forces, moments and couples in physics problems (Applying – K3)
	Analyses for Newton's laws of motion and projectiles (Analyzing – K4)
	Create a new problems in motion under action of central forces (Creating – K6)
Course Objectives	To learn the application of geometric and trigonometric properties in equilibrium and motion of particles

UNIT	**Content**	**No. of Hours**
I	Basic Concepts and Principles - Forces acting at a Point – Resultant and Components of two or more forces acting a point – Parallelogram of forces – Triangle of forces – Polygon of forces - Lami's Theorem and Applications –Resolution of a force – Theorem on Resolved Parts – Resultant of any	14 hours

	number of coplanar forces acting at a point -Parallel Forces - Like and Unlike Parallel Forces - Moment of a force - Couples – Related problems	
II	Equilibrium of Three Forces acting on a rigid body –Three Coplanar forces theorem –Conditions of Equilibrium –Two trigonometrical theorems - Friction –Types of Friction - Laws of Friction – Coefficient of friction - Angle of Friction - Cone of Friction –Equilibrium of a particle on a rough inclined plane – equilibrium of a body on a rough inclined plane under a force parallel to the plane - equilibrium of a body on a rough inclined plane under any force - Properties and related simple problems	12 hours
III	Kinematics – Velocity – Resolution of Velocity – Relative Velocity – Angular Velocity – Acceleration – Relative Acceleration -Motion in a Straight line under uniform acceleration - Newton's Laws of motion. Projectiles**:** Definition - Path of Projectile - Range on an Inclined Plane - Properties and Problems	14 hours
IV	Impulse and Impact: Collision of Elastic Bodies – Direct and Oblique Impact – Loss of Kinetic Energy – Related Properties and simple problems	12 hours
V	Central Orbits: Motion under the action of Central Forces - Properties and Related Problems - Differential Equation of Central Orbit - Pedal Equation of Central Orbit - Velocities in a Central Orbit - Law of Forces - Properties and Related Problems	12 hours

References	**Text Books**:
	1. M. K. Venkataraman, **Statics**, Agasthiar Publications, Trichy, 2004.
	    Unit 1: Chapters 2, 3, 4
	    Unit 2: Chapters 5, 7
	2. M. K. Venkataraman, **Dynamics**, Agasthiar Publications, Trichy, 2004.
	    Unit 3: Chapters 3: section 3.22, Chapter 4: Section 4.3, Chapter 6
	    Unit 4: Chapter 8
	    Unit 5: Chapter 11
	Reference Books:
	1. T. K. ManickavasagamPillai, **Statics,** S. Viswanathan& Co., Chennai, 1980.
	2. S. Narayanan, **Dynamics**, S. Chand & Co., New Delhi, 1980.
	Web Resources:
	https://nptel.ac.in/courses/112106180/
	https://freevideolectures.com/course/2553/physics	

Course out comes	After successful completion of the course students will be able to CO1: Apply geometrical concepts in parallel forces, moments and couples CO2: Evaluate static equilibrium of three forces acting on a rigid body and friction CO3: Explain Newton's laws of motion and projectiles CO4: Analyze the effects of collision of elastic bodies CO5: Predict the motion under action of central forces	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	3	3	2	3	1	2	2	3	3	2.2
CO2	2	1	2	2	3	2	2	3	2	2	2.1
CO3	3	2	0	3	1	3	2	1	2	3	2.0
CO4	2	1	3	1	3	3	2	2	1	3	2.1
CO5	3	2	2	2	3	1	3	1	2	2	2.1
Mean overall score											**2.1**

Course Code and Title	**18MATU0616** **/ OPERATIONS RESEARCH**		
Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	50%	
Cognitive Level	Knowing the basic concepts of decision analysis, decision-making process, decision-making environment, decision under uncertainty and decision under risk.		
	Understanding the queuing theory, operating characteristics of a queuing system, probability distributions in queuing system and classification of queuing models.		
	Applying the Economic Order Quantity (EOQ) to solve the inventory problems.		
	Evaluating the problems of replacement of equipment/asset that deteriorates gradually, replacement of equipment that fails suddenly.		
	Analyzing the critical path analysis and probability considerations in PERT.		
Course Objectives	To impart mathematical modeling skills through operations research techniques		
UNIT	**Content**		**No. of Hours**
I	Decision Analysis: Introduction – Decision Making Problem – Decision Making Process – Decision Under Risk – Decision Tree Analysis – Decision – Making With Utilities		9 hours
II	Queuing Theory: Introduction – Queuing System – Operating Characteristics of a Queuing System – Probability Distributions in Queuing System – Classification of Queuing Models – Definitions of Transient and Steady States – Poisson Queuing system – Poisson Queuing Systems – Non – Poisson Queuing Systems -		10 hours

	Cost Models in Queuing – Other Queuing Models – Queuing Control – Queuing Theory and Inventory Control	
III	Inventory Control: Introduction – Types of Inventories – Reasons for Carrying Inventories - The inventory decisions – Cost Associated with Inventories – Factors Affecting Inventory Control – The Concept of Economic Order Quantity (EOQ) – Deterministic Inventory Problems with No Shortages – Deterministic Inventory Problems with Shortages – Problems of EOQ with Price Breaks – Multi – Item Deterministic Problems – Dynamic Order Quantity – Selective Inventory Control Techniques	10 hours
IV	Replacement Problems and System Reliability: Introduction - Replacement of Equipment/Asset that Deteriorates Gradually – Replacement of Equipment that Fails Suddenly – Requirement and Promotion Problem – Equipment Renewal Problem – Reliability and System Failure rates – Simulation: Introduction – Simulation Models – Monte – Carlo Simulation – Simulation in Investment and Budgeting – Simulation of Networks	9 hours
V	Network Scheduling by PERT/CPM: Introduction – Network: Basic Components – Logical Sequencing – Rules for Network Construction – Critical Path Analysis – Probability Considerations in PERT – Distinguish between PERT and CPM – Applications of Network Techniques – Advantages of Network Techniques – Limitations and Difficulties in Using Network	10 hours
References	**Text Books**: 1. Kanti Swarup, P. K. Gupta& Man Mohan, **Operations Research**, Sultan Chand& Sons, New Delhi, Eighteenth Thoroughly Revised Edition, 2015. Unit 1: Chapter 16: Sections 16.1 – 16.7 Unit 2: Chapter 21: Sections 21.1 - 14 Unit 3: Chapter 19: Sections 19.1 – 19. 15 Unit 4: Chapter 18: Sections 18. 1- 18.6. Chapter 22: Section 22.1 - 22.14 Unit 5: Chapter 25: Sections 25.1- 25.11. **Reference Books**: 1. P. K. Gupta & D. S. Hira, **Operations Research**, S. Chand and Company Ltd., New Delhi, 2013. 2. J. K. Sharma, **Operations Research theory and its applications**, 2ndEdition, Macmillan India Limited, 2003.	
Course out comes	After successful completion of the course students will be able to CO1: Demonstrate knowledge of the major concepts of decision theory and decision making process CO2: Identify the basic analysis of queuing systems CO3: Apply the basic various inventory models in real life problems	

	CO4: Identify the system reliability and specific types of simulation
	CO5: Critique the role and application of PERT/CPM for project scheduling

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	1	2	2	2	1	2	3	2	2.0
CO2	3	2	2	2	1	3	2	2	2	0	1.9
CO3	2	3	3	2	1	2	2	2	1	3	2.1
CO4	3	2	2	1	2	3	2	2	3	1	2.1
CO5	2	2	3	1	2	2	3	2	2	1	2.0
Mean overall score											**2.02**

Course Code and Title	**18MATU06M1 / FUZZY SET THEORY**		
Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	20%	
Cognitive Level	Know various definitions of fuzzy sets, membership functions and identify basic standard operations such as complement, union, intersection, composition and other operations in Fuzzy Set theory (Cognitive – Knowing & Understanding - K1&K2) Applying fuzzy concepts to solve real life problems and using fuzzy relations to create fuzzy Graph (Applying & Creating – K3& K6) Deriving the characteristics and classify the fuzzy relation (Creating – K6)		
Course Objectives	To develop the concepts of fuzzy sets and its various operations, fuzzy graph and relations		
UNIT	**Content**	**No. of Hours**	
I	Fuzzy Sets: Sets- Definition- Types- Expanding Concepts of Fuzzy Set -Different operations- Fuzzy Complement – Fuzzy Union– Fuzzy Intersection – Other Operations– T-norms and T-conorms-simple examples	16 hours	
II	Fuzzy Relation and Composition: Fuzzy Relation– Extension of Fuzzy set –Examples-Fuzzy Graph and Relation:Graphs – Characteristics of Fuzzy Relation- Classification of Fuzzy Relation- Other Relations	16 hours	

References	**Text Books**:
	1. Kwang H. Lee, **First Course on Fuzzy Theory and Applications**, Springer, New York, 2005.
	      Unit 1: Chapter 1: Sections 1.4-1.6; Chapter 2: Sections 2.1 - 2.6
	      Unit 2: Chapter 3: Sections 3.3 - 3.4; Chapter 4: Sections 4.1 - 4.4
	Reference Books:
	1. G. J. Klir and B. Yuan, **Fuzzy Sets and Fuzzy Logic**, Prentice-Hall India, 1995.
	2. H. J. Zimmermann, **Fuzzy Set Theory and Its Applications**, Springer, 2001.
	3. Didier Dubois and Henri Prade, **Fuzzy Sets and Systems: Theory and Applications**, Academic Press, 1980.
	
	Web Resources:
	https://nptel.ac.in/courses/108104049/13
	https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_set_theory.htm

Course out comes	After successful completion of the course students will be able to CO1: Recognize the concept of fuzzy sets and its properties CO2: Distinguish fuzzy sets from crisp sets CO3: Apply various operations on fuzzy sets CO4: Analyze the fuzzy graphs and fuzzy relations

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	2	1	2	3	1	3	2	2	3	2.1
CO2	3	2	3	1	2	3	3	1	1	2	2.1
CO3	2	1	2	0	3	1	2	3	3	3	2.0
CO4	3	3	3	2	2	2	3	0	2	2	2.2
Mean overall score											**2.1**

Course Code and Title	**18MATU06M2 / MATHEMATICAL SKILLS**		
Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	30%	
Cognitive Level	Knowing Allegation , Simple and Compound Interest (K1-Knowing) Understanding the concepts volume and surface Areas - Odd man out and series (K2-Understanding)		
Course Objectives	To impart Mathematical competitive skills		

UNIT	Content	No. of Hours
I	Allegation - mixture – Simple Interest – Compound Interest – Area – Formula – simple problems	16 hours
II	Volume and surface Areas – Basic Formula - Calendar - Odd man out and series	16 hours
References	**Text Books**: R.S. Aggarwal, **Quantitative Aptitude,** 7th Revised Edition, S. Chand and Company Ltd, New Delhi, 2015 Unit 1: Section1 Unit 2: Section1 **Reference Books**: AbhijitGuha, **Quantitative Aptitude for MBA Entrance Examinations**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2006 **Web Resources:** 1.https://www.youtube.com/watch?v=ARSxlUX1yWw	
Course out comes	After successful completion of the course students will be able to CO1: Compute simple & compound interest CO2: Evaluate area and volume of different geometrical shapes	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	3	1	2	0	2	2	3	2.0
CO2	3	3	2	2	1	2	0	2	2	2	1.9
Mean overall score											**1.95**

Course Code and Title	**18MATU06M3 / VECTOR CALCULUS**		
Class	B.Sc.	Semester	Six
	If revised, Percentage of Revision effected (Minimum 20%)	--	
Cognitive Level	Knowing vector differentiation and its applications (K1-Knowing) Applying integration in to vectors (K2-Applying)		
Course Objectives	To impart skills of vector calculus techniques		
UNIT	**Content**		**No. of Hours**
I	Vector Differentiation: Introductory Ideas-Vector Products-Gradient-Divergence - Curl.		16 hours
II	Vector Integration: Line integral-Surface integral–Volume		16 hours

	integral-Gauss divergence theorem(without proof) -Stoke's theorem (without proof) – Green's theorem (without proof).

References	**Text Books**:
	
	S. Narayanan & T. K. ManicavachagomPillai, **Vector Algebra and Analysis**,S.Viswanathan Pvt. Ltd., Chennai, 1995.Unit 1- Chapters 1, 2, 4, Unit 2- Chapter 6.
	
	Reference Books:
	S. Arumugam, A. Thangapandi Isaac, **Calculus volume II**, New Gamma Publishing House, 1999
	
	Web Resources:
	    1.https://cosmolearning.org › Subject: Mathematics › Courses › Vector Calculus
	    2.www.math.canterbury.ac.nz/php/resources/math100/vector-geometry-and-vector-calculus

Course out comes	After successful completion of the course students will be able to CO1: Outline the vector differentiation CO2: Asses vector integration

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	1	1	2	3	2	2	1	1.9
CO2	2	3	2	2	1	3	2	2	2	1	2.0
Mean overall score											**1.95**

Course Code and Title	**18MATU04E1 / ANALYTICAL GEOMETRY 3D**
Class	B.Sc. Semester Fourth
	If revised, Percentage of Revision effected (Minimum 20%) --

Cognitive Level	K-1
	      Learn various representations of conics
	      Find directional cosines for a line
	      Learn different forms of equations of plane
	      Learn the equations of standard line
	      Find equations of sphere
	K-2
	      Understanding the properties of conics
	      Concepts of skew lines and knowledge about coplanar lines

	Understand the properties of a sphere Understand the concept of projection	
	K-3	
	Find the intersection of three planes Find the angle between two planes Apply the polar equations Find the intersection of two spheres	
	K-4	
	Trace the conic and analyze its properties	
	K-5	
	Evaluate the length of perpendicular from a point on the plane	
	K-6	
	Create problems related to geometry of two dimensions and three dimensions	
Course Objectives	To study the various properties of geometrical figures in two dimension and three dimension.	

UNIT	Content	No. of Hours
I	Polar Equations: Representation of basic curves in polar coordinates. General equation of Conic: Tracing the Conic - Properties and its applications	10 hours
II	Rectangular Cartesian co-ordinates: Direction cosines of a line: Co-ordinates – Projections – Direction Cosines	10 hours
III	The Plane: Equations of Plane – Angle between planes – Length of perpendicular from a point on the plane	9 hours
IV	The Straight Line: Equation of the straight line – coplanar lines – skew lines – intersection of three planes	10 hours
V	The Sphere: Equation of Sphere – Equation of a circle on a sphere – intersection of two spheres.	9 hours
References	**Text Books**: S. Narayanan & T. K. ManickavasagamPillai, **Analytical Geometry 2D**, S. Viswanathan Pvt. Ltd., Chennai, 2001. Unit 1 : Chapter IX (up to section 9), X (up to section 8) S. Narayanan & T. K. ManickavasagamPillai, **Analytical Geometry 3D**, S. Viswanathan Pvt. Ltd., Chennai, 2001.Unit 2: Chapter I, Unit 3: Chapter II, Unit 4: Chapter III, Unit 5: Chapter IV 1. George B. Thomas, JR & Ross L.Finney, **Calculus and Analytic Geometry**, Sixth edition, Narosa Publishing House, New Delhi, 1986. 2. S. Arumugam&Issac, **Analytical Geometry 3D and Vector Calculus**, New Gamma Publications – Palayamkottai, 1997.	
Course out comes	After successful completion of the course students will be able to CO1: Discuss conics in polar co-ordinates CO2: Outline planes and its properties as a 3 dimensional objects CO3: Apply the concepts skew lines and spheres in geometrical problems.	

	CO4: Solve problems related to geometry of two dimension and three dimension

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	2	2	3	2	2	3	0	2	2.1
CO2	3	3	1	2	3	2	2	3	1	1	2.1
CO3	3	3	1	2	3	2	2	3	1	1	2.1
CO4	2	3	1	2	3	2	2	3	1	2	2.1
Mean overall score											**2.1**

Course Code and Title	**18MATU04E2 / FINANCIAL MATHEMATICS**		
Class	B.Sc.	Semester	Fourth
Cognitive Level	Knowing the concepts of life insurance and their types (K-1) Understanding net premium reserves (K-2) Applying the mathematics concepts in the compound interest (K-3) Analyzing the regression terms in life insurance (K4) Evaluate the total claim amount in a portfolio (K5)		
Course Objectives	To impart mathematical concepts related to finance and insurance		
UNIT	**Content**		**No. of Hours**
I	Mathematics of Compound interest - Mathematical base of life contingencies - effective interest rate, nominal interest rate - continuous payments, interest in advance - perpetuities - annuities - repayment of debit- internal rate of return future life time of a life aged x - the model - force of mortality - analytical distribution of T – the curate future life time of (x) - Life table -Probabilities of deaths for fraction of a year		9 hours
II	Life insurance - insurance types - whole life and term insurance – pure Endowment - Endowments - insurance, payable at the moment of death- general type of life insurance - variable life insurance - recursive formula. Life annuities - elementary life annuities - payment made more frequently than once a year - variables life annuities - types of life annuities - recursive formula - inequalities - Payment starting at non-integral age. Net premium - elementary forms of insurance - whole life - Term insurance, pure Endowment - Endowments - deferred life annuities - premium paid m times		10 hours

	year - general type of life insurance - policies with premium refund - stochastic interest	
III	Net premium reserves - examples - recursive consideration - survival risk - net premium risk of a whole life insurance - net premium reserve at fractional duration - allocations of overall loss to policy year - conversion of an insurance - Technical gain - procedure for pure endowment - continuous model - multiple decrements model - forces of decrement - curate life time of (x), general type of insurance, net premium reserve - continuous model. Multiple life insurance - Joint life status – simplification- last survivor status general symmetric status - Schuette-Nesbitt formula - asymmetric annuities- asymmetric insurances	10 hours
IV	The total claim amount in a portfolio - normal approximations - calculation of total claim amount distribution - compound Poisson approximation - recursive calculation of compound Poisson distribution - reinsurance stop-loss reinsurance - expense loading – introduction expenses loaded premium - expense loaded premium reserves - estimating probabilities of death - problem description - classical method - Alternative solution - maximum likelihood method - statistical inference - Bayesian approach - multiple causes of decrement - interpretation of result	10 hours
V	Applications in regression analysis - Functional form -dummy variable - distributed log model - forecasting - binary choice model - interpretation of binary choice model - solved problems	9 hours
References	**Text Books**: 1. Hans U.Gerber, **Life Insurance Mathematics,**Third edition, Springer Verlag, New York 1997. Chapters: 1-ll. 2. D.Salvalore & D.Reagle, **Statistics and Economics**, Schaum's outline Series, Tata McGraw Hill, New Delhi, 2005. Chapter 8 only. Web Resources: 1.https://cosmolearning.org/video-lectures/introducion-financial-mathematics/ 2.https://freevideolectures.com/course/2055/mathematical-methods-for-engineers-ii/14	
Course out comes	After successful completion of the course students will be able to CO1: Explain advanced topics in the area of financial mathematics and actuarial analysis and their applications CO2: Differentiate between simple and compound interest and extrapolate the advantages and disadvantages of each in specific situations CO3: Apply computational tools efficiently and correctly and verify solutions in terms of the context.	

CO4: Calculate effectively to define the changes that occur over a period

CO5: Discuss the methods of correlation and regression to analyse and interpret a given data set and make predictions

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	2	3	3	3	0	2	3	3	3	2.3
CO2	1	3	2	2	3	0	0	2	3	2	1.8
CO3	1	0	2	3	3	0	0	2	3	3	2.0
CO4	2	2	3	3	3	0	0	2	2	3	2.0
CO5	2	3	3	3	3	0	0	3	2	3	2.1
Mean overall score											**2.04**

Course Code and Title	**18MATU05E4 / NUMERICAL METHODS**		
Class	B.Sc.	Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)	45%	
Cognitive Level	Knowing the basic concepts errors in numerical calculations, the bisection method, the method of false position, iteration method, Newton-Rapson method and finding solution of algebraic and transcendental equations. Understanding the forward differences, backward differences, central differences, Gauss's central difference formulae, Stirling's formula, Lagrange's interpolation formula. Applying the trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule - Romberg integration to find the approximate solution. Evaluating the problems of Gauss elimination method, Gauss-Jordan method, Modification of the Gauss Method to compute the Inverse - Jacobi's method - Gauss - Seidel method. Analyzing the solution by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge-Kutta Methods and Milne's Predictor -Corrector Method.		
Course Objective	To develop efficient algorithms for solving problems in Science, Engineering and Technology.		

UNIT	Content	No. of Hours
I	Errors in Numerical Calculations: Errors and their computations - A general error formula - Error in a series Approximation. Solution of Algebraic and Transcendental equations: The Bisection method - The Method of False position - Iteration method - Newton - Raphson method	9
II	Interpolation: Finite differences - Forward Differences - Backward Differences - Central Differences - Symbolic Relations and Separation of Symbols. Newton's Formulae for Interpolation - Central difference interpolation Formulae - Gauss's central difference formulae - Gauss's forward formula - Gauss's backward formula - Stirling's formula - Interpolation with unevenly spaced points: Lagrange's interpolation formula - Inverse Interpolation - Method of successive approximation.	9
III	Numerical Differentiation: Newton's Forward Difference Formula - Newton's Backward Difference Formula - Stirling's Formula - Numerical Integration - Romberg Integration.	9
IV	Numerical Solutions of System of Linear Equations: Solution of linear systems - Direct methods - Gauss elimination method – Gauss Jordan method –Modification of the Gauss Method to compute the Inverse - Solution of linear systems - Iterative methods - Jacobi's method - Gauss - Seidel method.	9
V	Numerical Solutions of Ordinary Differential Equations: Solution by Taylor's series - Picard's method of successive approximations - Euler's Method – Modified Euler's Method - Runge - Kutta Methods - Predictor - Corrector Methods - Milne's Predictor - Corrector Method.	12
References	**Text Books**: 1. S. S. Sastry, **Introductory Methods of Numerical Analysis**, Fifth Edition,PHI Learning Pvt. Ltd., Delhi, 2015. Unit 1: Chapter 1: Section 1.3 to 1.5, Chapter 2: Section 2.1 to 2.5 Unit 2: Chapter 3: Section 3.3.1 to 3.3.4, 3.6, 3.7.1, 3.7.2, 3.9.1 Unit 3: Chapter 6: Section 6.2, 6.3, 6.4.1, 6.4.2, 6.4.3, 6.4.6 Unit 4: Chapter 7: Section 7.5.1, 7.5.3, 7.5.4, 7.6. Unit 5: Chapter 8: Section 8.2, 8.3, 8.4, 8.4.2, 8.5, 8.6.2 **References:** 1. Gerald &Wheatly, **Applied Numerical Analysis**, Sixth Edition, Pearson Education Pvt. Ltd., New Delhi, 2002. 2. S. Arumugam, A. Thangapandi Isaac & A. Somasundaram, **NumericalMethods,**Scitech Publications Pvt. Ltd., 2001. 3. V. N. Vedamurthy&N. Ch. S. N. Iyengar, **Numerical Methods**, Vikas Publishing House Pvt. Ltd. New Delhi, 2000.	
Course out comes	After successful completion of the course students will be able to CO1: Solve the interpolation problems CO2: Identify the basic concept of numerical differentiation and integration,	

principle of least squares

CO3: Analyze the different aspects of numerical solution of algebraic and
Transcendental equations.

CO4: Evaluate the solutions of simultaneous linear equations

CO5: Discuss the role and application of nnumerical solution of ordinary
differential equations

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	2	1	3	2	2	1	3	3	2	2.1
CO2	3	2	1	2	3	3	2	1	2	1	2.0
CO3	2	3	2	2	2	2	1	3	2	3	2.2
CO4	3	1	2	1	2	3	2	1	3	2	2.0
CO5	2	2	3	0	2	2	3	2	2	1	1.9
Mean overall score											**2.04**

Course Code and Title	**18MATU05E5 / INTRODUCTION TO ACTUARIAL SCIENCE**		
Class	B.Sc.	Semester	Fifth
Cognitive Level	Knowing the widening scope of Actuarial Theory (K1) Understanding the General characteristics of foreign currency bonds(K2) Applying investment and valuation (K3) Analyzing investment risk (K4) Evaluating portfolio selection techniques and investment modeling (K5)		
Course Objectives	To impart various concepts related to insurance		
UNIT	**Content**		**No. of Hours**
I	The widening scope of Actuarial Theory and practice: Introduction – Financial Intermediaries -their role in resolving the "constitutional weakness" - Functional Approach to the Analysis of Intermediaries - Intermediating function If Banks, insurance, unit Trust and mutual funds. Banks, Insurance Companies and Pension Funds: Fundamental Similarities and Differences- Banks loans, Credit Risk and Insurance -The Evolving Relationship Banking and Insurance - Some examples of the Evolving Product Links between Banks and Non-banks – conclusion		9 hours

II	Investment and Valuation: Introduction-Cash Instruments-General Characteristics-Specific Cash instruments and Valuation Issues-Risk Characteristics – General Characteristics of conventional Bonds- Government Bonds-Corporate Bonds – Bond Valuation- Economic Analysis-Risk Characteristics-General Characteristics of Index Linked Bonds - Valuation - Economic Analysis - Risk Characteristics – Estimating Market Expectations of Inflation using Market Information	9 hours
III	General Characteristics of Foreign Currency Bonds: Valuation-Economic Analysis - Risk Characteristics. General Characteristics of Equity Investment: Equity Valuation-Economic Analysis - Risk Analysis. Real Estate Investment: Valuation - Economic Analysis - Risk Analysis. International Equity Investment: International Equity Valuation - Economic Analysis - Risk Analysis - Derivatives - General Characteristics – Valuation - Risk Characteristics	9 hours
IV	Investment Risk: Introduction-Utility theory and Risk measures - Relating Utility Functions to Risk Aversion and the Risk Premium -Summary Risk Measures – Standard Deviation of Returns- Downside/Shortfall Risk Measures-Value at Risk-Practical Issues when Calculating VAR- Tail Loss-Combining Risk and Return Measures – Coherent Risk Measures- The use of Shortfall Constraints	9 hours
V	Portfolio selection Techniques and Investment Modeling: Introduction – Immunization - Derivation of Conditions - Observation on the Theory of Immunization-The usefulness of Immunization in Practice-Modern Portfolio Theory – Portfolio Diversification-Efficient Portfolios-Capital Market Line- The Capital Asset Pricing Model. Modern Portfolio Theory: Insights and Limitations - Extension of Portfolio Theory to Include Actuarial Liabilities-Portfolio Optimization in the Presence of Liabilities-Connection between Redington and the Wise-Willkie Approach-Generalization of Portfolio Optimization in the Presence of Liabilities-Portfolio Selection in an Asset/Liability Framework using a Generalized Approach to Risk	12 hours
References	**Text Book:** 1. Philip Booth, **Modern Actuarial Theory and Practice**, Second Edition, Chapman and Hall / CRC, New York, 2004. Chapter 1: Secs1.1 to. 1.11, Chapter 2: Secs2.1 to 2.9,Chapter 4: Secs4.1 to 4.6, Chapter 5: Secs5.1 to 5.4. **Web Resources:** 1. https://www.edx.org/course/introduction-actuarial-science-anux-anu-actuarialx-1	
Course out comes	After successful completion of the course students will be able to CO1: Discuss the actuarial profession, what actuaries do, and how they do it	

	CO2: Explain how liabilities in general insurance and life insurance are modeled and evaluated
	CO3: Predict the importance of life insurance
	CO4: Develop the critical and analytical thinking skills necessary for success in the profession
	CO5: Apply the quantitative skills to problems in finance that normally involve risk or uncertainty

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	2	0	3	3	0	0	3	3	3	1.9
CO2	1	3	3	3	3	2	0	3	3	3	2.1
CO3	1	3	2	3	3	1	0	3	3	3	2.2
CO4	2	2	3	3	2	1	0	2	3	3	2.1
CO5	2	2	2	3	3	0	0	2	3	3	2.0
Mean overall score											**2.06**

Course Code and Title	**18MATU04N1 / BASIC NUMERICAL METHODS**		
Class	B.Sc.	Semester	Fourth
	If revised, Percentage of Revision effected (Minimum 20%)	90%	
Cognitive Level	Knowing forward interpolation and backward interpolation K-1 Understanding Numerical Differentiation through Newton's formula, Gauss's formula K-2 Applying Taylor's series method - Euler's method - Modified Euler's to solve ODE (K3) Evaluate the Solution to Simultaneous Linear Equation (K-4)		
Course Objectives	To develop efficient algorithms for solving problems in Science, Engineering and Technology.		

UNIT	Content	No. of Hours
I	Interpolation: Differences - relation between differences and derivatives - differences of polynomial - Newton's formula for forward interpolation - Backward interpolation–Central	11

	differences - Gauss's forward formula - backward formula and Stirling's interpolation formula	
II	Numerical Differentiation: Newton's formula, Gauss's formula for first and second derivatives. Numerical Integration: General quadrature formula - Trapezoidal rule - Simpson's rule- Weddle's rule. Curve Fitting: Principles of least squares - Fitting a straight line - A parabola and exponential curve.	10
III	Numerical Algebra and Transcendental Equation: Finding approximate values of the roots Iteration method - Bisection method - Newton Raphson method - RegulaFalsi method.	9
IV	Solution to Simultaneous Linear Equation: Back substitution - Gauss elimination method Gauss - Jordon method. Iterative methods: Gauss - Jacobi's iteration method - Gauss-Seidal iterative method	9
V	Numerical Solution of Ordinary Differential Equations: Taylor's series method - Euler's method - Modified Euler's method - Runge-Kutta method of second and fourth order	12

References	**Text Book:**
	1. P. Kandasamy, K. Thilagavathy& K. Gunavathi, **Numerical Methods**, S. Chand & Company Ltd., New Delhi, 2012.
	  Unit 1: Chapters 5, 6, 7
	  Unit 2: Chapters 1, 9
	  Unit 3: Chapter 3
	  Unit 4: Chapter 4
	  Unit 5: Chapter 11
	References:
	1. A. Singaravelu, **Numerical Methods**, Meenakshi Publications, Chennai, 1992.
	2. S. Arumugam, **Numerical Methods,** 2nd edition, Scitech Publications (India) Pvt Ltd., 2010.	

Course out comes	After successful completion of the course students will be able to CO1: Evaluate different kinds of problems in real life situation by interpolation methods CO2: Discuss numerical differentiation and integration CO3: Outline algebraic and transcendental equations CO4: Evaluate systems of simultaneous equations CO5: Assess numerical solution of ordinary differential equations	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	2	2	3	2	1	3	2	3	2	2.1

CO2	2	2	3	3	1	2	3	2	2	3	2.3
CO3	3	2	1	2	1	1	3	2	3	1	1.9
CO4	3	3	2	2	1	1	3	2	3	2	2.2
CO5	3	3	2	2	1	2	3	1	3	1	2.1
Mean overall score											**2.12**

Course Code and Title	**18MATU05N2 / QUANTITATIVE APTITUDE**		
Class	B.Sc.	Semester	Fifth
	If revised, Percentage of Revision effected (Minimum 20%)	20%	
Cognitive Level	Knowing various concepts like simplifications, problems on numbers and tabulation for competitive exams (K1-knowing) Understanding different topics like Time and work, percentages (K2-Understanding) Applying Logical deduction, Alphabet Test and Group discussion real life situation (K3-applying)		
Course Objectives	To impart skills in numerical and quantitative techniques		
UNIT	**Content**	**No. of Hours**	
I	H.C.F and L.C.M of Numbers- decimal fractions- simplifications- square roots and cube roots- average- Problems on Numbers- Problems on Ages Surds and Indices	11 hours	
II	Tabulation- Bar graphs- Pie charts- Line graphs- Permutation and combinations-Probability- true discount- Banker's discount- Heights and distances - Odd Man Out& Series.	10 hours	
III	Percentages- Profit and Loss- Ratio-Proportion- Partnership- Chain rule- Time and work- Pies and cistern-Time and Distances - Probability.	9 hours	
IV	Problems on Trains- Boats and Streams- Coding and decoding- Blood Relations- Logical Venn Diagram - Simple Interest-Compound Interest	9 hours	
V	Logical deduction- Alphabet Test- Deriving conclusion from passages- Group discussion (on any current relevant topic)	9 hours	
References	**Text Book:** 2. R.S. Aggarwal, **Quantitative Aptitude,** 7[th]Revised Edision, S. Chand & Company Ltd., New Delhi, 2015. **Reference:** 2. R.S. Aggarwal, **A Modern approach to verbal Reasoning**, (Fully solved), Chand & Company Ltd., New Delhi, 2012.		

	Web Resources:
	    1. https://www.wiziq.com/tutorials/quantitative-aptitude
	    2.https://www.youtube.com/watch?v=l0OjOnNkFZM

Course out comes	After successful completion of the course students will be able to CO1: Evaluate various real life situations by resorting to Analysis of key issues and factors CO2: Apply graphs, charts and probability techniques on various problems CO3: Discuss the problems on relations, coding and decoding CO4: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	3	1	3	2	2	3	1	2.3
CO2	2	2	3	2	1	2	2	2	3	1	2.0
CO3	2	3	2	2	1	2	1	2	3	2	2.0
CO4	2	2	1	2	2	2	1	2	2	3	1.9
Mean overall score											**2.05**

Course Code and Title	**18MATU03B1 / MATHEMATICS- I (NEW COURSE)**		
Class	B.Com.	Semester	Third
Cognitive Level	Knowing correlation K-1 Understanding the variations K-2 Applying the growth rate & growth indexK-3 Analyzing data collection K-4 Evaluation of mean, median mode K5		
Course Objectives	To impart the fundamental concepts of statistical techniques		
UNIT	**Content**		**No. of Hours**
I	Statistics: Meaning, Scope, Uses and Limitations of Statistics-Collection of Data-Primary and Secondary Data Sources-Classification, Tabulation and Interpretation		13 hours
II	Measures of Central Tendencies: Arithmetic Mean,		14 hours

	Geometric Mean, Harmonic Mean, Median and Mode	
III	Measures of Dispersion: Range, Mean Deviation, Quartile Deviation, Standard Deviation and Co-efficient of Variation	13 hours
IV	Correlation: Meaning and Definition-Scatter Diagram-Pearson's Co-efficient of Correlation-Rank Correlation-Regression-Linear Regression-Simple Problems	12 hours
V	Index Numbers: Method of construction-Aggregative & Relative Types-Cost of living Index- Growth Rate and Growth Index- Time Series- Definition-Applications	12 hours

References	**Text Book:**
	1. RSN Pillai&Bhagavathi ,**Statistics**, S. Chand & Company Ltd, New Delhi 2012.
	    Unit 1: Chapters 3, 4, 5, 6, 7
	    Unit 2: Chapter 9
	    Unit 3: Chapters 10, 11
	    Unit 4: Chapters 12, 13
	    Unit 5: Chapter 14.
	References:
	1. P.R. Vittal, **Business Mathematics and Statistics**, 2002
	2. P. Navnitham, **Business Mathematics & Statistics,** 2008

Course out comes	After successful completion of the course students will be able to CO1: Explain basic data collection statistical techniques CO2: Evaluate various types of mean, median and mode CO3: Assess Measures of Dispersion CO4: Compare correlation and regression CO5: Analyze the concepts of Index Numbers

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	2	1	3	1	0	3	3	3	2.2
CO2	1	2	3	2	0	0	1	2	3	3	1.7
CO3	0	1	2	2	2	1	0	3	3	3	1.7
CO4	3	3	2	0	2	2	2	3	3	3	2.3
CO5	2	3	3	1	3	2	1	3	3	3	2.7
Mean overall score											**2.12**

Course Code and Title	**18MATU04B2 / MATHEMATICS- II (NEW COURSE)**		
Class	B.Com.	Semester	Fourth
Cognitive Level	Knowing matrices K-1 Understanding the application of business economic problems K-2 Applying interest in real life K-3 Analyzing in linear programming K4 Evaluating assignment problem K5		
Course Objectives	To gain basic knowledge about mathematical and operations research techniques		

UNIT	Content	No. of Hours
I	Set Theory: Types of Sets, Set Operations-Law and Properties of Sets- De-Morgan's Laws-Applications to Business and Economic Problems	12 hours
II	Simple and Compound Interest**:** Effective Rate and Nominal Rate of Interest-Depreciation: Straight line method, Balancing Method and Annuities-Discounting.	12 hours
III	Matrix: Basic Concepts-Addition and Multiplication of Matrices- Properties- Inverse of Matrix- Rank of a Matrix	13 hours
IV	Linear Programming Problem: Formulation-Solutions by Graphical Method, Simplex Method: Feasible solution, Unbounded Solution, Infeasible solution	14 hours
V	Transportation and Assignment Problem: Formulation and Solution of Transportation Models-North West Corner Rule (NWCM)-Vogel's Approximation Method (VAM)– Formulation and Solution of the Assignment Models-The Hungarian Method for Solution of the Assignment Problems-Variations of the Assignment Problem	13 hours

References	**Text Books:** 1. P. Navnitham, **Business Mathematics & Statistics,** 2008, Unit 1,2,3&4 2. Prem Kumar Gupta & D. S. Hira, **Operations Research**, S. Chand & Company Ltd, New delhi, 2008. Unit 5: Chapter 3, Secs 3.5, Chapter 4, Secs 4.5&4.6 **References:** 1. RSN Pillai & Bhagavathi, **Statistics**, S. Chand & Company Ltd, New Delhi, 2012. 2. S. P. Gupta & P. K. Gupta, **Business Statistics and Business Mathematics,** sultan chand & sons, 2009.
Course out comes	After successful completion of the course students will be able to CO1: Discuss the basic set theory CO2: Evaluate the problems in simple and compound Interest CO3: Critique the concepts of matrix theory

	CO4: Formulate and solve linear programming problem
	CO5: Optimize the transportation and assignment problem

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	2	2	2	1	1	3	2	3	3	2.0
CO2	0	2	1	3	1	0	1	2	2	3	1.5
CO3	3	2	2	2	3	2	2	3	3	3	2.5
CO4	3	3	3	1	2	2	3	3	2	3	2.5
CO5	3	3	3	2	2	1	2	3	3	3	2.5
Mean overall score											**2.2**

Course Code and Title	**18MATU01A1 / ALLIED MATHEMATICS – I (NEW COURSE)**		
Class	B.Sc. (Physics / Chemistry)	Semester	First
Cognitive Level	Knowing the types of matrices (K1) Understanding the binomial, exponential and logarithmic series (K2) Application of differential calculus in velocity and acceleration oriented problems (K3) Analyzing the properties of definite integral (K4) Evaluate the radius of curvature and centre of curvature. (K5)		
Course Objectives	To impart different concepts of algebra and calculus		
UNIT	**Content**		**No. of Hours**
I	Binomial series, Exponential series and Logarithmic series – problems related to series		14 hours
II	Types of Matrices: Symmetric and Skew symmetric matrices – Rank of a matrix – Test of Consistency of Equations using ranks – Characteristic equation - Cayley – Hamilton theorem – Evaluation of eigen values and eigen vectors		14 hours
III	Successive Differentiation – Leibnitz's theorem and its application – Applications of Differential Calculus: Rate of change of variables – Velocity and Acceleration – Maxima and Minima		12 hours
IV	Curvature – Radius of Curvature and Centre of Curvature –		12 hours

	Evolutes and Involutes	
V	Properties of definite integral – Integration by parts – Reduction formulae –Integration as process of summation. Evaluation of double, triple integral (simple problems only)	12 hours
References	**Text Books:** 1. Arumugam& Isaac, **Ancillary Mathematics**, New Gamma Publishing House,Palayamkottai, 2002. 2. S. Narayanan & T.K. ManickavasagamPillai, **Ancillary Mathematics**, S.Viswanathan Pvt. Ltd., Chennai, 2002. **References:** 1. S. Narayanan & T.K. ManickavasagamPillai, **Calculus**, Vol. I, S.Viswanathan Pvt. Ltd., Chennai, 2003. 2. T. K. ManickavasagamPillai,T. Natarajan & K.S. Ganapathy, **Algebra**, Vol. I,S.Viswanathan Pvt. Ltd., Chennai, 2003.	
Course out comes	After successful completion of the course students will be able to CO1: Evaluate binomial series and exponential series CO2: Assess basic knowledge of Types of Matrices and Evaluation of Eigen values and Eigen vectors CO3: Discuss the successive Differentiation CO4: Explain the applications of Curvature, Evolutes and Involutes CO5: Analyze the properties of definite integral	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	3	2	1	2	2	3	2	2	3	1	2.6
CO2	2	2	3	2	3	2	2	2	2	2	2.2
CO3	3	2	2	3	2	3	3	1	3	2	2.4
CO4	3	3	2	3	3	3	2	1	3	2	2.2
CO5	3	3	1	2	2	3	3	2	1	1	2.2
Mean overall score											**2.3**

Course Code and Title	**18MATU01A3 / ALLIED MATHEMATICS-I (NEW COURSE)**		
Class	B.Sc. Applied Geology	Semester	First
Cognitive Level	Understanding the basic concepts of sets and functions (K1 & K2-Remembering and understanding). Identifying straight lines circles in planes and characterizing it (K4-Analyzing). Identifying parabolas and ellipses in planes and characterizing it (K4-		

	Analyzing).
	Understanding the basic concepts of matrices and classify its types (K2 & K4– Understanding and Analyzing).
	Solving system of equations by applying matrix theory (K2& K3- Understanding and Applying).
Course Objectives	To learn the techniques of fundamentals of mathematics

UNIT	Content	No. of Hours
I	Sets: Introduction- Concept of a Sets- and their representations- empty set- subsets-Power set- universal set- union and intersection of sets- difference of sets- complement of a set. Relations: Definition of relation - Types of relations: reflexive- symmetric- transitive and equivalence relations. Functions: Definition and Examples- Types of functions-one to one – onto- Composition of functions	12 hours
II	Co-ordinate Geometry: Co-ordinate system- straight lines- slope of straight lines-straight lines passing through given two points- angle between two lines and related problems- Circles: General equation of a circle- tangent to a circle- Related problems	13 hours
III	Conics: General equation of a conic- Standard equation of a parabola-Tangent to a parabola- Ellipse – Standard equation of an ellipse-Tangent to an ellipse-Related problems	13 hours
IV	Matrices: Concept- notation- order- equality- types of matrices- zero matrix- transpose of a matrix- symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices- Related problems	14 hours
V	Determinants: Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants- Adjoint and inverse of a square matrix-Solving system of linear equations in two or three variables using inverse of a matrix	12 hours
References	**Text Books:** 1. P.R. Vittal, **Business Mathematics,** Margham Publications, Chennai 1995. Unit-1 : Chapter -1 Unit-2 : Chapter -12 (Page No. 338-385) Unit-3 : Chapter -12 (Page No. 886-416) Unit-4 : Chapter-14 (Page No. 595-623) Unit-5 : Chapter-14 (Page No. 623-653) **Reference Books:** 1. Seymour Lipschutz, Set theory & Related Topics, Schaum's outlines, 2nd Edition, Tata McGraw Hill, New Delhi, 2005. 2. Arumugam&Issac, Classical Algebra, New gamma Publishing house, Tirunelveli, 2003. 3. S. Narayanan & T. K. Manickavasagam Pillai, Analytical Geometry 2D,

	S. Viswanathan Pvt. Ltd., Chennai, 2001. 4. R. Jayaprakasa Reddy and Y. Mallikarjuna Reddy, A Text Book of Business Mathematics, Ashish Publishing House, New Delhi, 2002.
Course out comes	After successful completion of the course students will be able to CO1: Explain the basic concepts of set theory and functions CO2: Describe the basic concepts of straight lines and circles as a 2 dimensional objects CO3: Interpret parabola and ellipse as a 2 dimensional objects CO4: Assess the problems in matrices and determinants

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	2	1	3	3	1	1	3	1	2	1.7
CO2	1	2	1	1	3	1	1	3	1	1	1.5
CO3	1	2	1	1	3	1	1	3	1	1	1.5
CO4	2	2	2	1	3	2	2	2	1	2	1.9
CO5	2	1	2	1	2	2	2	2	1	2	1.7
Mean overall score											**1.66**

Course Code and Title	**18MATU02A2 / ALLIED MATHEMATICS – II (NEW COURSE)**		
Class	B.Sc. (Physics / Chemistry)	Semester	Second
Cognitive Level	Knowing trigonometry function (K1) Understanding the hyperbolic functions (K2) Applying the differential equations in Laplace & their inverse transforms (K3) Analysing the differential equation of first order and higher degree(K4) Evaluating the integrals using Gauss's stokes' and green's theorem(K5)		
Course Objectives	To impart different concepts of trigonometry, differential equation and vector calculus.		
UNIT	**Content**		**No. of Hours**
I	Trigonometry: Expansion of functions $\sin n\theta, \cos n\theta, \tan n\theta$ – Series for $\sin x, \cos x, \tan x, \sin^n x$ and $\cos^n x$ – simple applications and problems		14 hours
II	Hyperbolic functions – simple problems – Logarithm of a		14 hours

	Complex number – simple applications	
III	Differential equations of first order and higher degree (Equation solvable for p, x, y, including Clairaut's form) – Second order linear equations with constant coefficients (particular integrals of functions of the type $X^m, X^m e^{ax}, e^{ax} cosbx$ and $e^{ax} sinbx$ only).	12 hours
IV	Laplace transforms – Standard forms – Inverse transforms – Applications to solutions of differential equations	12 hours
V	Vector Calculus: Gradient, Curl and Divergence of vector – Gauss's, Stoke's and Green's theorems (without proof) and evaluation of integrals using these theorems	12 hours
References	**Text Books:** 1. P.R. Vittal, **Business Mathematics,** Margham Publications, Chennai 1995. Unit-1 : Chapter -1 Unit-2 : Chapter -12 (Page No. 338-385) Unit-3 : Chapter -12 (Page No. 886-416) Unit-4 : Chapter-14 (Page No. 595-623) Unit-5 : Chapter-14 (Page No. 623-653) **Reference Books:** 1. Seymour Lipschutz, Set theory & Related Topics, Schaum's outlines, 2nd Edition, Tata McGraw Hill, New Delhi, 2005. 2. Arumugam & Issac, Classical Algebra, New gamma Publishing house, Tirunelveli, 2003. 3. S. Narayanan & T. K. Manickavasagam Pillai, Analytical Geometry 2D, S. Viswanathan Pvt. Ltd., Chennai, 2001. 4. R. Jayaprakasa Reddy and Y. Mallikarjuna Reddy, A Text Book of Business Mathematics, Ashish Publishing House, New Delhi, 2002. **Web Resources:** https://nptel.ac.in/courses/111105035/ https://nptel.ac.in/courses/122101003/ https://nptel.ac.in/courses/122107037/ https://nptel.ac.in/courses/111106083/ https://nptel.ac.in/courses/122103012/7#
Course out comes	After successful completion of the course students will be able to CO1: Evaluate series of trigonometric functions CO2: Determine the hyperbolic functions and Logarithm of Complex numbers CO3: Identify and solve different types of ODEs CO4: Apply Laplace and Inverse Laplace transforms to solve ODE CO5: Compute vector integrals using Gauss's, Stoke's and Green's theorems

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	1	2	3	2	2	3	1	2	3	3	2.2
CO2	3	2	3	2	1	3	2	2	2	1	2.1
CO3	3	2	3	3	1	3	3	2	2	1	2.3
CO4	3	2	2	3	2	3	2	3	2	1	2.3
CO5	3	2	3	2	1	3	2	3	2	1	2.2
Mean overall score											**2.2**

Course Code and Title	**18MATU02A4 / ALLIED MATHEMATICS – II (NEW COURSE)**		
Class	B.Sc. Applied Geology	Semester	Second
Cognitive Level	Understanding the basic concepts of statistics (K1 & K2-Remembering and understanding). Understanding the basic concepts of derivatives and interpret it geometrically (K2 & K4 –Understanding and Analyzing). Understanding the basic concepts of integration of functions and evaluate its integral value (K2 & K5 – Understanding and Evaluating). Understanding the fundamentals of LPP and apply them to solve real life problems (K2 & K3 – Understanding and Applying). Understanding the fundamentals of Numerical methods and apply them to solve real life problems (K2 & K3 – Understanding and Applying).		
Course Objectives	To learn the fundamentals of statistics, calculus, linear programming and numerical methods.		
UNIT	**Content**		**No. of Hours**
I	Statistics: Measures of central tendency – Mean, Median, Mode – Geometrical mean, Harmonic mean - Properties - Measures of Dispersion – Moments, Skewness and Kurtosis – Properties.		13 hours
II	Differentiation: Limits of functions- Definition of derivative – Differentiation of trigonometric, inverse trigonometric and logarithmic functions-Differentiation of Implicit functions-Parametric Differentiation- Successive Differentiation		14 hours
III	Integration: Definition of integration-Standard rules on integration-Integration by substitution-Integration of rational functions- Integration by partial fractions-Integration by parts.		13 hours
IV	Linear Programming: Feasible and optimal solution-Solution		12 hours

	by graphical method- Simplex Method-Related problems	
V	Numerical Methods: Interpolation- Finite differences- Newton's forward formula-Binomial method-Lagrange's formula-Related problems	12 hours

References	**Text Books:**
	
	1. S. C. Gupta and V. K. Kapoor, **Fundamentals of Mathematical statistics,** Sultan Chand & Sons, New Delhi, 1994.
	    Unit 1 : Chapter -2
	2. P.R. Vittal, **Business Mathematics**, Margham Publications, Chennai 1995.
	    Unit - 2 : Chapter 13 (Page No. 434-502)
	    Unit – 3 : Chapter 13 (Page No. 535-579)
	    Unit – 4 : Chapter 16 (Page No. 676-729)
	    Unit – 5 : Chapter 22.
	Reference Books:
	1. S. Arumugam& A. Thangapandi Isaac, Statistics, New Gamma Publishing House, 2006.
	2. George B. Thomas, JR & Ross L.Finney, Calculus and Analytic Geometry, Sixth edition, Narosa Publishing House, New Delhi, 1986.
	3. R. Jayaprakasa Reddy and Y. Mallikarjuna Reddy, A Text Book of Business Mathematics, Ashish Publishing House, New Delhi, 2002.	

Course out comes	After successful completion of the course students will be able to CO1: Demonstrate basic knowledge of fundamentals of statistics CO2: Discuss the differentiation and its applications CO3: Acquire basic knowledge of integration CO4: Formulate a linear programming problem and solve them graphically and simplex method CO5: Apply numerical techniques to solve interpolation problems	

Mapping of COs with PSOs & POs:

CO/PO	PO					PSO					Mean Score of COs
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	2	2	3	2	1	1	1	1	3	2	1.8
CO2	2	2	1	2	2	2	3	2	2	1	1.9
CO3	2	2	1	2	2	2	3	2	2	1	1.9
CO4	3	3	2	3	2	3	1	1	3	2	2.2
CO5	2	3	1	3	1	3	1	1	3	2	2
Mean overall score											**1.96**