DEPARTMENT OF MATHEMATICS

INTRODUCTION

Outcome-Based Education is incorporated into the curriculum based on the requirements of NAAC and UGC – Quality Mandate (2018). To fulfill these requirements, the Programme Educational Objectives (PEOs), Programme Specific Outcomes (PSOs) and Course Outcomes (COs) were framed for all programmes in alignment with the Vision and Mission of the respective departments and in-turn with the Vision, Mission, Educational Objectives and Programme Outcomes of the College.

PROGRAMME OBJECTIVES (POs)

Education at Lady Doak College is designed to develop young women become intellectually mature, morally upright, socially responsible and spiritually inspired citizens. On competition of the education programme at Lady Doak College, the student will be able to

- possess contemporary and comprehensive knowledge of an academic speciality along with cultural and general knowledge
- apply the acquired skill set to analyse, design and solve problems
- develop linguistic competence and communication skills to articulate ideas coherently, clearly and effectively
- possess the acumen of creative and critical thinking
- acquire an ardent spirit of inquiry and be a liberated lifelong learner capable of creating new knowledge
- to work, serve and lead as a team player and to make healthy living a lifestyle
- be a responsible global citizen with a keen of civility, ethics and an open mind

B.Sc. Mathematics

Programme Specific Outcomes (PSOs)

Upon completion of B.Sc., Mathematics programme, the student will be able to

PSO1: apply the logical reasoning, arithmetic, aptitude and communication skills

PSO2: work efficiently in interdisciplinary projects with competency and Mathematical rigour

PSO3: foster the sense of civic responsibility for the social upliftment of the community

PSO4: solve algebraic, analytic and numerical problems with enhanced speed and accuracy

PSO5: communicate Mathematics effectively to both lay and expert audience using appropriate ICT Tools

PSO6: use current techniques, skills and necessary tools which are relevant and appropriate to different fields

B. Sc. MATHEMATICS

B.Sc. (Spl.) MATHEMATICS – AIDED

COURSE PROFILE

From 2020 batch onwards

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
	PART I	TAMIL / HINDI / FRENCH	TH	6		3 / 4	AV2014	ALLM	TAM/ HIN/ FRE

I	PART II	ENGLISH	TH	6		3 / 4	AV2014	ALLM	ENG
	MAT1301FM	**TRIGONOMETRY AND THEORY OF EQUATIONS**	**TH**	**4**		**3**		**AUMAT**	**MAT**
	MAT1502CM	**ADVANCED CALCULUS I**	**TH**	**5**		**5**		**AUMAT**	**MAT**
		ALLIED COURSE	TH	5		4		AUMAT	PHY
	MAT1202FS	**COMMUNICATION SKILLS THROUGH MATHEMATICS**	**TH**	**2**		**2**		**AUMAT**	**MAT**
	VBC1101FV	HEALTHY TRANSITION FROM ADOLESCENCE TO ADULTHOOD	TH	2		1	BA2018	ALLM	Centre for VE
	UIV1101FI	BIBLICAL ESSENTIALS FOR EMERGING ADULTS						AUCH / SUCH	
		TOTAL		**30**		**21 / 23**			
II	PART I	TAMIL / HINDI / FRENCH	TH	6		3 / 4	AV2014	ALLM	TAM/ HIN/ FRE
	PART II	ENGLISH	TH	6		3 / 4	AV2014	ALLM	ENG
	MAT2402CM	**SEQUENCES AND SERIES**	**TH**	**4**		**4**		**AUMAT**	**MAT**
	MAT2403CM	**ANALYTICAL GEOMETRY OF 3D**	**TH**	**4**		**4**		**AUMAT**	**MAT**
	MATQ2402AA /COMQ2401AA	**NUMERICAL ANALYSIS / FUNDAMENTALS OF ACCOUNTING**	**TH**	**5**		**4**		**AUMAT**	**MAT** **COM**
	MAT2201FS	**COMMUNICATION SKILLS FOR MATHEMATICS**	**TH**	**2**		**2**		**AUMAT**	**MAT**
		ENVIRONMENTAL ELECTIVES	**TH**	**2**		**2**		**ALLM**	**CES**
	VBC0102FV / VBC0103FV	CIVIC EDUCATION / FAMILY LIFE EDUCATION	TH	1		1	AV2014	ALLM	Centre for VE
	UIV2101FI	BIBLICAL FOUNDATION FOR FAMILY LIFE					BA2018	AUCH / SUCH	
		TOTAL		**30**		**23 / 25**			

COURSE OFFERED TO STUDENTS OF OTHER DEPARTMENTS

ALLIED COURSES

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
I	**MAT1421AA**	**ALGEBRA, TRIGONOMETRY AND VECTORS**	**TH**	**5**		**4**		**AUCHE**	**MAT**

II	MAT2412AA	CALCULUS AND SPECIAL FUNCTIONS	TH	5		4		AUPHY	MAT
	MAT2421AA	CALCULUS	TH	5		4		AUCHE	MAT

SELF-LEARNING COURSES

Sem.	Course Code	Course Title	Course Type	Credits	Passed in Academic Council	Offered to	Offered by
II	MAT0401CD	NUMBER THEORY	TH	4		ALLM	MAT
	MAT0404CD	SET THEORY AND NUMBER SYSTEM	TH	4		ALLM	MAT
	MAT0408CD	DISCRETE MATHEMATICS	TH	4		ALLM	MAT

MAT1301FM TRIGONOMETRY AND THEORY OF EQUATIONS

(THEORY)

COURSE OUTCOMES: **4 hrs./wk.**

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

CO1:find trigonometrical expansion of sin nθ, cos nθ and tan nθ and prove results

CO2: solve problems involving hyperbolic and inverse hyperbolic functions

CO3: relate the sum of the powers of the roots with the coefficients of an equation

CO4: apply appropriate transformations to solve equations

CO5: examine the appropriate value of roots of an equation by examine and determine them approximately

COURSE CONTENT:

UNIT I: EXPANSIONS **15hrs.** Expansions of sinnθ , cos nθ , tan nθ – powers of sines and cosines of θ in terms of functions of multiples of θ – expansions of sinθ and cosθ in a series of ascending powers of θ

UNIT II: HYPERBOLIC FUNCTIONS **10 hrs.**

Relation between hyperbolic functions – inverse hyperbolic functions.

UNIT III: THEORY OF EQUATIONS **15 hrs.**

Remainder Theorem – relations between the roots and coefficients of equations – symmetric functions of the roots – sum of the powers of the roots of an equation – Newton's Theorem on the sum of the powers of the roots.

UNIT IV: TRANSFORMATIONS OF EQUATIONS **10 hrs.**

Roots with signs changed – roots multiplied by a given number – reciprocal equations – increase or decrease the roots of a given equation by a given quantity – removal of terms.

UNIT V: NATURE OF ROOTS **10 hrs.**

Descartes' Rule of signs – Rolle's Theorem – Horner's method.

TEXTBOOK(S):

ManicavachagomPillay T.K., Natarajan S.& Ganapathy, (2003). *Algebra,* Volume I, Chennai: S. ViswanathanPrinters and Publishers Pvt. Ltd.Print. Chapter: VI (Section: 1 to19, 24, 25, 30).

Narayanan S.&Manicavachagom Pillay T.K., (2003). *Trigonometry*, Chennai: S. Viswanathan Printers and Publishers Pvt. Ltd.Print. Chapter: III and IV.

REFERENCE BOOK(S):

Vittal P.R, (2004). *Trigonometry*, Chennai: Marghan Publications.Print.

Mary Jane Sterling, (2014). *Trigonometry for dummies, (2nd ed.),* New Jersey: John Wiley and Sons Inc. Print.

Lalji Prasad, (2016). *Theory of equations,* Patna: Paramount Publications, Print.

Course Code & Title: MAT1301FM TRIGONOMETRY AND THEORY OF EQUATIONS	
Class: I B.Sc. Mathematics	**Semester: I**
Cognitive Level	K-1Remember
	K-2Understand
	K-3Apply
	K- 4Analyze
	K-6 Create

MAPPING: COs consistency with PSOs

Course Code & Title: MAT1301FM TRIGONOMETRY AND THEORY OF EQUATIONS						
CO/PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	3	2	0
CO2	3	2	1	3	2	0
CO3	3	2	1	3	2	1
CO4	3	2	1	3	2	1
CO5	3	2	1	3	2	2

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1), No correlation (0)

MAT1502CM ADVANCED CALCULUS – I

(THEORY)

COURSE OUTCOMES: **5 hrs./wk.**

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

CO1:apply suitable properties and reduction formulae to evaluate definite integrals

CO2: evaluate double and triple integrals using change of variables

CO3: find thearea, volume and surface area using double and triple integrals

CO4: determine limits of functions by applying appropriate results

CO5: examine the continuity and differentiability of functions and prove related results

COURSE CONTENT:

UNIT I: INTEGRALS **15 hrs.**

Properties and evaluation of definite integrals – reduction formulae.

UNIT II: MULTIPLE INTEGRALS **15 hrs.**

Double and triple integrals – change of variables – Jacobian of two and three variables.

UNIT III: APPLICATIONS OF MULTIPLE INTEGRALS **15 hrs.**

Area – surface area and volume using double and triple integrals.

UNIT IV: LIMITS **15 hrs.**

Limits – limit of a function – basic theorems on limit – infinite limits – standard limits.

UNIT V: CONTINUITY AND DIFFERENTIABILITY **15 hrs.**

Definitions of continuity – algebra of continuous functions – types of discontinuities – differentiability.

TEXTBOOK(S):

Arumugam S. & Isaac A, (2001). *Calculus*, Palayamkottai: New Gamma Publishing House, Print. Chapters: Part II: (Chapter: II (2.6,2.8), III).

Arumugam S. & Isaac A, (1999). *Calculus,* Volume I, Palayamkottai: New Gamma Publishing House, Print. (Chapters: I, II (2.0 - 2.3), III (3.1)).

Arumugam S. & Isaac A, (2001). *Calculus* Volume II, Palayamkottai: New Gamma Publishing House, Print. (Chapters: IV (4.4), VI (6.2, 6.5, 6.6)).

REFERENCE BOOK(S):

Mohanty R.K., (2004). *Integral Calculus*, New Delhi: Anmol Publications Pvt. Ltd., Print.

Narayanan S. &Manicavachagom Pillay T.K., (2011).*Calculus,* Volume II, Chennai: Viswanathan Printers and Publishers Pvt. Ltd. Print.

Narayanan S. &Manickavachagom Pillay T.K., (1993). *Calculus,* Volume I, Chennai: Viswanathan Printers and Publishers Pvt. Ltd. Print.

Course Code & Title: MAT1502CM ADVANCED CALCULUS – I	
Class: I B.Sc. Mathematics	**Semester: I**
Cognitive Level	K-1Remember
	K-3Apply
	K- 4Analyze
	K-5Evaluate

MAPPING: COs consistency with PSOs

Course Code & Title: MAT1502CM ADVANCED CALCULUS – I						
CO/PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	2	1	2	2	1
CO2	2	2	1	2	1	1
CO3	1	2	1	2	1	1
CO4	3	1	1	2	1	1
CO5	2	2	1	2	2	1

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1), No correlation (0)

MAT1202FS COMMUNICATION SKILLS THROUGH MATHEMATICS

(THEORY)

COURSEOUTCOMES:2 hrs./wk.

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

CO1:identify the symbols and convert verbal statements into expressions and vice versa

CO2: prove simple mathematical statements by applying different types of proofs and present Mathematicalconcepts orally

CO3: find answers and frame questions from the given passage

CO4: classify and represent a data pictorially

COURSE CONTENT:

UNIT I: VOCABULARY **4 hrs.**

Introduction of the basic mathematical terms

UNIT II: LISTENING AND SPEAKING **10 hrs.**

Exercise on pronouncing mathematical symbols and mathematical terms – different types of proofs –listen to a mathematical concept and answer questions based on it – oral presentation on any mathematical concept.

UNIT III: READING AND WRITING **10 hrs.**

Comprehension on mathematical concepts.

UNIT IV: GRAPHICAL REPRESENTATION **6 hrs.**

Express the given data graphically as bar charts – line graphs – histogram – pie charts.

REFERENCE BOOK(S):

Irfan Alikhan& Atiya Khanum, (2004). *Fundamentals of Biostatistics*, Hyderabad: Ukaaz Publications, Print.

Kevin Houston, (2013). *How to Think Like a Mathematician*, UK: Cambridge University Press, Print.

Zubair P.P., *Encyclopeadia of Mathematics (Set of 2 Volumes) Teaching of Mathematics Volume I*, New Delhi: APH Publishing Corporation, Print.

Zubair P. P, (2012).*Encyclopeadia of Mathematics (Set of 2 Volumes) World's Great Mathematicians, Volume II*, New Delhi: APH Publishing Corporation, Print.

E-BOOK(S):

HoThi Phuong&Le ThiKieu Van, (2003). *English for Mathematics*, Ho Chi Minh City University of Education, Foreign Language Section, e–book.

Course Code & Title: MAT1202FS COMMUNICATION SKILLS THROUGH MATHEMATICS	
Class: I B.Sc. Mathematics	**Semester: I**
Cognitive Level	K-1Remember
	K–2 Understand
	K–3 Apply
	K– 4 Analyze
	K– 5 Evaluate

MAT2403CM ANALYTICAL GEOMETRY OF 3D

(THEORY)

COURSE OUTCOMES: **4 hrs./wk.**

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

CO1: identifythe equation of plane and solve problems

CO2: find the equation of straight line in symmetrical form and solve problems

CO3: determine the condition for coplanarity, shortest distance between two lines, intersection of three planes and the volume of a tetrahedron and solve problems

CO4: find the equation of a sphere, circle and tangent plane

CO5: find the equation of right circular cone and right circular cylinder

COURSE CONTENT:

UNIT I: CARTESIAN CO-ORDINATES AND PLANE **13 hrs.**

Rectangular cartesian co-ordinates: direction cosines of a line – equation of a plane – intercept form – normal form – angle between the planes – equation of a plane through the line of intersection of two given planes – length of the perpendicular from a point on the plane – equation of the planes bisecting the angle between the planes.

UNIT II: STRAIGHT LINE **12 hrs.**

Equation of a straight line in symmetrical form – planes and straight lines.

UNIT III: COPLANAR LINES **15 hrs.**

Coplanar lines – shortest distance between two lines – intersection of three planes – volume of a tetrahedron.

UNIT IV: SPHERE **12 hrs.**

General equation of a sphere – length of the tangent from the point to the sphere – planesection of a sphere – intersection of two spheres – equation of a tangent plane to the sphere at a point.

UNIT V: CONE AND CYLINDER **8 hrs.**

Cone –rightcircular cone – cylinder – right circular cylinder – simple problems.

TEXTBOOK(S):

Manicavachagom Pillay T.K. & Natarajan T, (2008). *A textbook of Analytical Geometry, Part II – 3 dimensions*, Chennai: S. Viswanathan Printers & Publishers Pvt. Ltd. Print. (Chapter: I, II, III (Page 46 to 71, 84 to 91), IV, V (Page 115 to 123, 134 to 139)).

REFERENCE BOOK(S):

Dipak Chatterjee, (2003). *Analytic solid geometry*, New Delhi: Prentice Hall of India, Print.

Duraipandian P., Laxmi Duraipandian&Muhilan D, (1998). *Analytical Geometry (3-D),* Chennai: Emerald Publishers, Print.

Mathew K.C., Veeraragavan S. &Ragavan T., (1984). *A textbook of Co-ordinate Geometry of Two and Three Dimensions*, New Delhi: Chand S and Company Ltd. Print.

Course Code & Title: MAT2403CM ANALYTICAL GEOMETRY OF 3D	
Class: I B.Sc. Mathematics	**Semester: I**
Cognitive Level	K-1 Remember
	K-3 Apply
	K- 5 Evaluate

MAPPING: COs consistency with PSOs

Course Code & Title: MAT2403CM ANALYTICAL GEOMETRY OF 3D						
CO/PSO	PSO					
	1	2	3	4	5	6
CO1	2	1	1	2	2	1
CO2	2	1	1	2	2	1
CO3	2	1	1	2	2	1
CO4	2	1	1	2	2	1
CO5	2	1	1	2	2	1

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1), No correlation (0)

MAT2402CM SEQUENCES AND SERIES

(THEORY)

COURSE OUTCOMES: **4 hrs./wk.**

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

CO1: find the limit of the sequences and prove related theorems

CO2:explain the properties of convergent and divergent sequencesand solve problems

CO3: recall and apply the concepts of Cauchy sequences to prove related results

CO4: test the behaviour of series using appropriate methods and prove related results via theorems

CO5:prove absolute convergence of alternating series

COURSE CONTENT:

UNIT I: SEQUENCES **15 hrs.**

Bounded– monotonic– convergent – divergent and oscillating sequences– algebraof limits.

UNIT II: BEHAVIOUR OF SEQUENCES **10 hrs.**

Behaviour of monotonic sequences– Cauchy's limit theorem – subsequences – limit points.

UNIT III: CAUCHY SEQUENCE **10 hrs.**

Cauchy sequence– Cauchy's general principle of convergence.

UNIT IV: SERIES **15 hrs.**

Convergence and divergence of series– comparison test– Kummer's test.

UNIT V: TEST FOR CONVERGENCE OF SERIES **10 hrs.**

Root test– condensation test– integral test– alternating series– absolute convergence.

TEXTBOOK(S):

Arumugam S. & IsaacA., (2010).*Sequences and Series*, Palayamkottai: New Gamma Publishing House. Print. Chapters: III (Sections 1 to 11), IV, V (Sections 1 and 2).

REFERENCE BOOK(S):

Bhupendra Singh, RimplePandir& Sudhir K. Pundir, (2003).*Analysis I*, Meerut: PragatiPrakashan. Print.

Sadhan Kumar Mapa, (2004). *Introduction to Real analysis*, Calcutta: Sarat Book Distributors, Print.

Khanna M.L. and Varshney, (2014). *Real Analysis*, Meerut: Jai Prakash Nath & Co., Print.

Course Code & Title: MAT2402CM SEQUENCES AND SERIES	
Class: I B.Sc. Mathematics	**Semester: II**
Cognitive Level	K-1 Remember
	K-2 Understand
	K-5 Evaluate
	K-6 Create

Mapping:COs consistency with PSOs

Course Code & Title: MAT2402CM SEQUENCES AND SERIES						
CO\PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	1	0	2	2	1
CO2	2	1	0	2	2	1
CO3	2	1	0	2	2	1
CO4	2	1	0	2	2	1
CO5	2	1	0	2	2	1

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1), No correlation (0)

MAT2201FS COMMUNICATION SKILLS FOR MATHEMATICS

(THEORY)

COURSE OUTCOMES: **2 hrs. /wk.**

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

CO1: formulate a mathematical problem

CO2: solve numerical problems with accuracy

CO3:interpret data from graphs and solve problems

COURSE CONTENT:

UNIT I: COMPREHENDING SKILL **5 hrs.**

Read and understand a Mathematical problem and formulate it.

UNIT II: NUMERICAL SKILLS **15 hrs.**

H.C.F. and L.C.M. of numbers– simplification of decimal fractions– square roots– cube roots– average– problem on numbers– problems on ages– percentage– profit and loss– ratio and proportion– permutations and combinations– probability.

UNIT III: GRAPHICAL INTERPRETATION **10 hrs.**

Bar charts– line graphs– histogram– pie charts.

REFERENCE BOOK(S):

Aggarwal R.S., (2010). *Quantitative Aptitude*, New Delhi: S. Chand and Company Limited, Print.

Gupta P.K. &Manmohan, (2007). *Problems in Operations Research*, New Delhi: Sultan Chand and Son Educational Publishers, Print.

Course Code & Title: MAT2201FS COMMUNICATION SKILLS FOR MATHEMATICS	
Class: I B.Sc. Mathematics	**Semester: II**
Cognitive Level	K-3 Apply
	K-5 Evaluate
	K-6 Create

MAT1421AA ALGEBRA, TRIGONOMETRY AND VECTORS

(Offered to B.Sc. CHEMISTRY)

(THEORY)

COURSE OUTCOMES: **5hrs./wk.**

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

CO 1: apply the concept of scalar and vector products to solve related problems

CO 2:formulate and solve quadratic equations, find the middle term and the coefficient of a term in the binomialexpansion

CO 3:identifydifferent types of matrices, find the eigen values and vectors of a matrix, inverse of a matrix using Cayley-Hamilton theorem

CO 4:solve problems involving trigonometric and hyperbolic functions

CO 5:find the sum of a series using appropriate method

COURSE CONTENT:

UNIT I: VECTORS **15 hrs.**

Vector products – scalar and vector products – triple products – scalar and vector triple products

UNIT II: ALGEBRA **10 hrs**.

Formation and solution of quadratic equations – binomial expansions

UNIT III: MATRICES **20 hrs.**

Matrices – types of matrices – eigen values – eigen vectors – Cayley Hamilton theorem – inverse of a matrix using Cayley Hamilton theorem.

UNIT IV: TRIGONOMETRY **20 hrs.**

Trigonometric functions – inverse trigonometric functions – hyperbolic functions – inverse hyperbolic functions.

UNIT V: SUMMATION OF SERIES: **10 hrs.**

Trigonometrical series – exponential series – logarithmic series.

TEXTBOOK(S) :

Arumugam S &Thangapandi Isaac A, (2008). *Modern Algebra*, Palayamkottai: New Gamma Publishing House. Print. (Chapters: VII (7.0 - 7.2,7.7,7.8) (Theorems statement only)).

Narayanan S &Manicavachagom Pillay T. K, (2003). *Trigonometry*, Chennai: S. Viswanathan Pvt. Ltd.Print. (Chapters: I (pages 6 - 13), IV (pages 93 -108), VI (Pages 131-148)).

Narayanan S &ManicavachagomPillay T. K, (1995). *Vector Algebra and Analysis*, Madras: S. Viswanathan Printers and Publishers Pvt. Ltd. Print. (Chapters: II (1 - 13)).

Sundaresan V &Jeyaseelan S. D**,** (2003). *An Introduction to Business Mathematics*, New Delhi: S. Chand and Company Ltd.Print. (Pages 380-386, 407-412).

REFERENCE BOOK(S) :

Pandey H.D., Gupta K.K. and Srivastava R.J, (2011). *A textbook of Algebra and Trigonometry*, New Delhi: Wisdom Press. Print.

Rajkumar, (2007). *Vectors*, New Delhi: Campus Books International. Print.

Course Code & Title: MAT1421AA ALGEBRA, TRIGONOMETRY AND VECTORS	
Class: I B.Sc. Chemistry	**Semester: I**
Cognitive Level	K-1Remember
	K-3Apply
	K-6 Create

MATQ2402AA NUMERICIAL ANALYSIS

(Offered to B.Sc. MATHEMATICS)

(THEORY)

COURSE OUTCOMES: **5 hrs./wk.**

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

CO1: find approximate real roots of algebraic and transcendental equations

CO2: derive the identities involving different operators and find the sum of a given series using them

CO3: find the values from the given data by applying interpolation formulae

CO4: apply various interpolation formulae to find the derivatives of a tabulated function and compute integrals using numerical techniques

CO5: solve first order ordinary differential equations numerically

COURSE CONTENT:

UNIT I: NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS **15 hrs.**

The Bisection method – iteration method – method of false position – Newton-Raphson method.

UNIT II: FINITE DIFFERENCES **15 hrs.**

First and higher differences – operators– differences of a polynomial – factorial polynomial – summation of series –Montmort's theorem.

UNIT III: INTERPOLATION WITH EQUAL AND UNEQUAL INTERVALS **17 hrs.**

Linear interpolation– Gregory-Newton's forward and backward interpolation formulae – equidistant terms with one or more missing values –central differences – Gauss's forward and backward interpolation formulae – Stirling's formula – Bessel's formula – Laplace-Everett formula – relation between Bessel's and Everett's formulae – divided differences – properties – Newton's divided difference formula – Lagrange's interpolation formula – inverse interpolation.

UNIT IV: NUMERICAL DIFFERENTIATION AND INTEGRATION **14 hrs.**

Newton's forward and backward difference formulae to compute derivatives – derivative using Stirling's formula – maxima and minima of a tabulated function – Numerical integration: general quadrature formula for equidistant ordinates– Trapezoidal rule – Simpson's one-third rule– Simpson's three-eighths rule.

UNIT V: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER **14 hrs.**

Power series approximations – solution by Taylor series – Picard's method of successive approximations– Euler's method– improved Euler's method– modified Euler's method.

TEXTBOOK(S):

Kandasamy P., ThilagavathyK.,&GunavathyK., (2006). *Numerical Methods,* New Delhi: S. Chand & company Ltd. (Chapter: 3 (3.1.1 – 3.4.3),5(5.1-5.4,5.7,5.8),6 (6.1– 6.3,6.7), 7,8(8.1-8.7),9(9.1-9.9,9.13,9.14), 11(11.1–11.5,11.8-11.11).

REFERENCE BOOK(S):

Goel & Mittal, (2006). *Numerical Analysis,* Meerut: Pragati Prakashan Educational Publisher. Print

Gupta, B.D., (1995). *Numerical Analysis*, Delhi: Konark Publishers Pvt. Ltd. Print.

Sastry, S.S., (2012). *Introduction Methods of Numerical Analysis,* New Delhi: Prentices Hall of India Pvt. Ltd. Print.

Course Code & Title: MATQ 2402AA NUMERICIAL ANALYSIS	
Class: I B.Sc. Mathematics	**Semester: II**
Cognitive Level	K-1 Remember
	K-2 Understand
	K-3 Apply
	K- 4 Analyze

MAT2421AA CALCULUS

(Offered to B.Sc. CHEMISTRY)

(THEORY)

COURSE OUTCOMES: **5 hrs./wk.**

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

CO1:find the derivatives of given functions

CO2:find second order partial derivatives and maxima or minima of functions using partial differentiation

CO3:evaluate integrals using appropriate methods

CO4:evaluate double integrals and find area and surface area using the same

CO5:formulate and solve first order ordinary and partial differential equations

COURSE CONTENT:

UNIT I: DIFFERENTIATION **15 hrs.**

Differentiation: Algebra of derivatives – derivatives of standard functions – chainrule fordifferentiation – differentiation of inverse functions – logarithmic differentiation.

UNIT II: PARTIAL DIFFERENTIATION **15 hrs.**

Second order derivatives – partial derivatives – second order partial derivatives – applications of Differentiation – maxima and minima.

UNIT III: INTEGRATION **15 hrs.**

Integration: Integrals of standard function – substitution method – integration by parts – definite integrals – properties – evaluation

UNIT IV: DOUBLE INTEGRALS **15 hrs.**

Double integrals – change of variables – Jacobian – applications of double integrals – area – surface area.

UNIT V:DIFFERENTIAL EQUATIONS **15 hrs.**

Formation of differential equations – solving differential equations of first order and first degree – variable separable – linear equations – applications of differential equations of first order – growth and decay – partial differential equations – formation and solution using Lagrange's method.

TEXTBOOK(S) :

Arumugam S. &Thangapandi Isaac A., (2008). *Differential Equations and Applications*, Palayamkottai: New Gamma Publishing House, Chapters: I (Sections 1.1, 1.2 (Type A), 1.5), Ch. IV (Sections 4.1, 4.3), Ch. VI (Section 6.2), Print.

Arumugam S. &Thangapandi Isaac A., (1994). *Calculus - Volume II*, Palayamkottai: New Gamma Publishing House, Chapters: IV (Sections 4.4, 4.5), Ch. VI (Section 6.2, 6.6), Print.

Arumugam S. &Thangapandi Isaac A., (2001). *Calculus*, Palayamkottai: New Gamma Publishing House, Chapters: Part I: Chapter. II (Sections 2.1 – 2.5, 2.7, 2.11, 2.14), Chapter III - (Section 3.7) (Theorems statements only). Part II: Chapter II (Section 2.1, 2.2, 2.6, 2.7), Chapter III (Sections 3.1, 3.2), Print.

REFERENCE BOOK(S) :

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

Bali N.P., (2009). *Integral Calculus*, New Delhi: Firewall Media, Print.

Narayanan S&Manicavachagom Pillay T K ,(2013). *Calculus Volume I*, Chennai: S.Viswanathan Printers and Publishers Pvt. Ltd., Print.

NarayananS&Manicavachagom Pillay T K ,(2015). *Calculus Volume II*, Chennai: S.Viswanathan Printers and Publishers Pvt. Ltd., Print.

Narayanan ,S&Manicavachagom Pillay T K ,(2008). *Calculus Volume III*, Chennai: S.Viswanathan Printers and Publishers Pvt. Ltd., Print.

Course Code &Title: MAT2421AACALCULUS	
Class: I B.Sc. Chemistry	**Semester: II**
Cognitive Level	K-1 Remember
	K-5 Evaluate
	K-6 Create

MAT2412AA CALCULUS AND SPECIAL FUNCTIONS

(Offered to B.Sc. PHYSICS)

(THEORY)

COURSE OUTCOMES: **5 hrs./wk.**

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

CO1: apply suitable techniques to evaluate standard integrals

CO 2:evaluate the integrals using properties of definite integrals and reduction formulae

CO 3: solve first order ordinary differential equations by appropriate methods

CO 4: determine the solutions of differential equations

CO 5: analyse special functions and their recurrence relations using appropriate methods

COURSE CONTENT:

UNIT I: INTEGRAL CALCULUS **15 hrs.**

Some standard integrals – substitution method – integration of rational functions – integration of irrational functions.

UNIT II: DEFINITE INTEGRALS **15 hrs.**

Evaluation of definite integrals – integration by parts – reduction formulae (only problems).

UNIT III: DIFFERENTIAL EQUATIONS OF FIRST ORDER **15 hrs.**

Introduction – equations of first order and first degree – variable separable – Homogeneous and non-homogeneous equations of first order and first degree – exact differential equations.

UNIT IV: DIFFERENTIAL EQUATIONS OF HIGHER ORDER **15 hrs.**

Linear equations with constant coefficients – methods of finding complementary functions – methods of finding particular integrals.

UNIT V: SPECIAL FUNCTIONS **15 hrs.**

Special functions – Legendre differential equation – generating function – orthogonal properties and recurrence formulae of Legendre's polynomials – Hermite equation – generating function – orthogonal properties and recurrence formulae of Hermite polynomials.

TEXTBOOK(S):

Arumugam. S. & Isaac, A., (2001). *Calculus*, Palayamkottai: New Gamma Publishing House. Print. Chapters: Part II – Chapter:II(Sections: 2.1-2.4,2.6,2.7),2.8(problemonly).

Arumugam. S.& Isaac, A., (2008). *Differential Equations and Applications*, Madras: S. Viswanathans Pvt. Ltd. Print. Chapter:I(Sections1.1-1.3),Chapter:II(Sections: 2.1-2.3)(problemsonly).

Sharma, J.N. & Gupta, R.K., (2000). *Special Functions,* Meerut: Krishna Prakashan Media (P) Ltd. Print. Chapters: II (Sections 2.1, 2.3 - 2.8), Chapter VI (Sections 6.1, 6.3 - 6.8).

REFERENCE BOOK(S):

Chakrabarthi, A., (2002). *Elements of Ordinary Differential Equations and Special Functions*, New Delhi: New Age International (P) Limited Publishers. Print.

Gupta & Malik, (2000). *Mathematical Methods,* Meerut: Pragati Pragashan Publishers. Print.

Khanna, M.L., (2002). *Differential Equations*, Meerut: Jai Prakash Nath and Co. Print.

Course Code & Title: MAT2412AA CALCULUS AND SPECIAL FUNCTIONS	
Class: I B.Sc Physics	**Semester: II**
Cognitive Level	K-3 Apply
	K-4Analyze
	K- 5Evaluate

Sem.	Course Code	Course Title	Course Type	Hrs./ Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	L				
III	**MAT3401CM**	**VECTOR ANALYSIS AND DIFFERENTIAL GEOMETRY**	**TH**	**4**		**4**		**AUMAT**	MAT
	MAT3501CM	**MODERN ALGEBRA**	**TH**	**6**		**5**		**AUMAT**	MAT
	MAT3502CM	**STATISTICS**	**TH**	**6**		**5**		**AUMAT**	MAT
	MAT3504CM	**DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**	**TH**	**6**		**5**		**AUMAT**	MAT
	MAT3401AT	**PROGRAMMING IN C**	**LT**	**3**	**2**	**4**		**AUMAT**	AUMAT
		NON-MAJOR ELECTIVE	**TH**	**2**		**2**			
		Vocational Course				2			
	VBC0102FV / VBC0103FV /	CIVIC EDUCATION / FAMILY LIFE EDUCATION	TH	1		1	AV2014	ALLM	Centre for VBC / IVBC
	UIV3101FI	CIVICS AND THE BIBLE					BB2019	AUCH / SUCH	
		TOTAL		**30**		**28**			
IV	MAT4501CM	LINEAR ALGEBRA	TH	**6**		**5**	AV2014	AUMAT	MAT
	MAT4503CM	REAL ANALYSIS	TH	6		5	AV2014	AUMAT	MAT
	MAT4504CM	ADVANCED STATISTICS	TH	6		5	BA2018	AUMAT	MAT
	MATQ4501CT/ MATQ4502CT	OBJECT ORIENTED PROGRAMMING WITH C++/ OBJECT ORIENTED PROGRAMMING WITH JAVA	LT	4	2	5	BB2019	AUMAT	AUMAT
	MAT4201SS	QUANTITATIVE APTITUDE	TH	2		2	AV2014	AUMAT	MAT
	NON-MAJOR ELECTIVE		TH / LA	2		2			

	VBC0202FV / VBC0203FV /IVBC	HUMAN RIGHTS AND DUTIES / FOUNDATION COURSE ON WOMEN'S STUDIES	TH	2		1	AV2014 / AY2016	ALLM	Centre for VE
	UIV4201FI	HUMAN RIGHTS IN THE BIBLE					BB2019	AUCH/ SUCH	

COURSES OFFERED TO OTHER DEPARTMENTS

ALLIED COURSES

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	L				
I	MATQ3433AA	ESSENTIALMATHEMATICS FOR BIOLOGISTS	T	5		4		AUZOO	MAT
II	MATQ3434AA	BASIC MATHEMATICS FOR BIOLOGISTS	T	5		4		AUZOO	MAT
II	MAT3412AA	PARTIAL DIFFERENTIAL EQUATIONS, STATISTICS AND COMPLEX ANALYSIS	T	5		4		AUPHY	MAT

NON-MAJOR ELECTIVE COURSES

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
III	COMA3201EI /CRMA3201EI	FOUNDATION COURSE IN MATHEMATICS AND COMMERCE FOR COMPETITIVE EXAMINATIONS	TH	2		2		ALLM	COM MAT
	ECMA3201EI	BASICS OF PERSONAL FINANCE	TH	2		2		ALLM	ECO MAT
	ENMA3201EI	BASIC COURSE IN MATHEMATICS AND ENGLISH FOR COMPETITIVE EXAMINATIONS	TH	2		2		ALLM	ENG MAT

Sem.	Course Code	Course Title	Course Type	Credits	Passed in Academic Council	Offered to	Offered by
III, V	MAT0406CD	ASTRONOMY	TH	4		ALLM	MAT
	MAT0407CD	NUMERICAL METHODS	TH	4		ALLM	MAT
	MAT0410CD	FORMAL LANGUAGES AND AUTOMATA	TH	4		ALLM	MAT

MAT3401CM VECTOR ANALYSIS AND DIFFERENTIAL GEOMETRY

(THEORY)

COURSE OUTCOMES:

4 hrs./wk.

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

CO1: find the derivatives, curl and divergence of vector valued function

CO2: evaluate line, volume and surface integrals

CO3: apply Gauss divergence theorem in evaluating the integrals

CO4: make use of the appropriate theorems in the evaluation of integrals

CO5: prove the related results involving curvature and torsion of curves

COURSE CONTENT:

UNIT I: VECTOR DIFFERENTIATION **15 hrs.**

Gradient – curl – divergence – solenoidal – irrotational – operators involving ∇ twice.

UNIT II: VECTOR INTEGRATION **10 hrs.**

Line integrals – volume Integrals – surface integrals.

UNIT III: GAUSS DIVERGENCE THEOREM **10 hrs.**

Gauss divergence theorem – Green's theorem in space.

UNIT IV: STOKES'S THEOREM **10 hrs.**

Stoke's theorem – Green's theorem in plane and its applications.

UNIT V: DIFFERENTIAL GEOMETRY **15 hrs.**

Tangent – principal normal – binormal – osculating plane – curvature – torsion – Serret-Frenet formulae.

TEXTBOOK(S):

Narayanan S. & Manicavachagom Pillay T.K., (2016). *Vector Algebra and Analysis,* Madras: Viswanathan printers and publishers private limited. Print. (Chapters: 4 to 6).

REFERENCE BOOK(S):

Arumugam S. & Thangapandi Isaac.A., (2011). *Analytical Geometry of 3D and Vector Calculus,* Palayamkottai: New gamma publishing House. Print.

Mittal S.C. & Aggarwal D.C., (2003). *Differential Geometry,* Meerut: Krishna Prakasham media (P) Ltd. Print.

Seymour Lipschutz– Dennis Spellman– Murray R. Spiegel, (2009). *Vector Analysis***,** New Delhi: Tata McGraw Hill Education Private Ltd. Print.

WEBLINK(S):

Michael Corral. (2020). *Vector Calculus*. Retrieved from https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Vector_Calculus_(Corral). CC BY-NC-SA 3.0.

Anthony Christy Melson. (2020, May 6). *Curl of a vector* [Video file]. Retrieved from https://www.youtube.com/watch?v=15m3bgtpQXc. CC BY license.

Khan Academy. (2010, February 25). *Introduction to the line integral – Multivariable Calculus* [Video file]. Retrieved from https://www.youtube.com/watch?v=_60sKaoRmhU&feature=youtu.be. CC BY license.

NP-TEL. (2014, August 12). *Vector Calculus in Geometry* [Video file]. Retrieved from https://www.youtube.com/watch?v=My_RCvKdHys&t=732s. CC BY license.

MAT3401CM VECTOR ANALYSIS AND DIFFERENTIALGEOMETRY	
Class: II B.Sc. Mathematics	**Semester: III**
Cognitive Level	K-1 Remember
	K-3 Apply
	K-5 Evaluate

MAPPING: COs consistency with PSOs

MAT3401CM VECTOR ANALYSIS AND DIFFERENTIALGEOMETRY						
CO/PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	2	1	1	1	2
CO2	2	2	1	1	1	2
CO3	1	2	1	2	2	2
CO4	1	2	1	2	2	1
CO5	2	2	1	2	1	1

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1)

MAT3501CM MODERN ALGEBRA

(THEORY)

COURSE OUTCOMES: **6 hrs./wk.**

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

CO1: prove results related to groups, subgroups, permutations, cyclic groups and order of an element

CO2: apply the concept of cosets in quotient groups, normal subgroups and in related theorems

CO3: prove results of different types of maps in groups

CO4: explain the properties of rings and ideals and solve problems

CO5: demonstrate theorems on ring homomorphism and field of quotients of an integral domain

COURSE CONTENT:

UNIT I: GROUPS **18 hrs.**

Definition and examples – permutations – subgroups – cyclic groups – order of an element of a group.

UNIT II: COSETS AND LAGRANGE'S THEROREM 18 hrs.

Cosets and Lagrange's theorem – normal subgroups – quotient groups.

UNIT III: ISOMORPHISM 18 hrs.

Isomorphism – automorphism – homomorphism – fundamental theorem of homomorphism on groups.

UNIT IV: RINGS 18 hrs.

Examples – properties – isomorphism – types of rings –characteristicof a ring –subrings – Ideals – quotient rings – maximal and prime ideals.

UNIT V: FUNDAMENTAL THEOREM OF HOMOMORPHISM IN RINGS 18 hrs.

Homomorphism of rings – Fundamental theorem of homomorphism in rings – field of quotients of an integral domain.

TEXTBOOK(S):

Arumugam S. & Thangapandi Isaac A., (2008). *Modern Algebra*, Chennai: Scitech Publication Pvt Ltd. Print. Chapter:3 (3.1, 3.4 to 3.11), Chapter 4 (4.1 to 4.11).

REFERENCE BOOK(S):

Joseph A.Gallian, (2017). *Contemporary Abstract Algebra***,** USA: Cengage Learning, Inc. Print.

Santiago M.L., (2001). *Modern Algebra*, New Delhi: Tata McGraw-Hill Publishing Co. Ltd. Print.

Surjeet Singh & QaziZameeruddin, (2012).*Modern Algebra*, Noida: Vikas Publishing House Pvt. Ltd. Print.

Vasishtha A.R. & Vasishtha A.K., (2006).*Modern Algebra*, Delhi: Krishna Prakashan Media (P) Ltd. Print.

WEBLINK(S):

The Audiopedia (2016, November 29). *What is RING THEORY? What does RING THEORY mean? RING THEORY meaning, definition & explanation* [Video file]. Retrieved from https://youtu.be/4Rx7gDi78oA. CC BY license.

Center of Math. (2015, November17). *Groups and Subgroups* [Video file].Retrieved from https://youtu.be/ptRmr8LFfc4.CC BY license.

Juan Klopper. (2018, February 20). *Quotient group example* [Video file]. Retrieved from https://youtu.be/c8L-qRELI5c.CC BY license.

Juan Klopper. (2018, February 19). *Lagrange theorem* [Video file]. Retrieved from https://youtu.be/CzbPMflYICw. CC BY license.

Juan Klopper. (2018, May10). *Group automorphismexample*[Video file]. Retrieved from https://youtu.be/HD4seuoEE7o.CC BY license.

MA Classes. (2018, December 1). *Proper and Improper Ideals, Simple Rings & Theorem* [Video file]. Retrieved from https://youtu.be/USGUBpaYf2I. CC BY license.

Richard E. BORCHERDS (2020, June 24). *Group theory 6: normal subgroups and quotient groups.*[Video file].Retrieved from https://youtu.be/AtApf9MnRIQ. CC BY license.

Vipul's Classroom. (2013, May 8). *Examples of groups* [Video file]. Retrieved from https://youtu.be/VVbr-VEjVC8. CC BY license.

MAT3501CM MODERN ALGEBRA	
Class: II B.Sc Mathematics	**Semester: III**
Cognitive level	K-2 Understand
	K-3 Apply
	K-5 Evaluate

MAPPING: COs consistency with PSOs

MAT3501CM MODERN ALGEBRA					
CO/PSO	**PSO**				
	1	**2**	**3**	**4**	**5**
CO1	1	1	1	1	1
CO2	2	2	1	1	2
CO3	2	2	1	1	2
CO4	1	1	1	1	1
CO5	1	1	1	1	1

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1)

MAT3502CM STATISTICS

(THEORY)

COURSE OUTCOMES:

6 hrs./wk.

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

CO1:classify the data and compute the measures of central tendency

CO2: determine the measures of dispersion, skewness and Kurtosis

CO3: make use of principle of least squares for curve fitting and estimation

CO4: find correlation, rank correlation and the equation of lines of regression for the given data

CO5: solve and prove results in probability theory

COURSE CONTENT:

UNIT I: FREQUENCY DISTRIBUTIONS AND MEASURES OF CENTRALTENDENCY 20 hrs.

Frequency distributions – graphic representation of a frequency distribution – measures of central tendency –requisites for an ideal measure of central tendency – arithmetic mean – median – mode – geometric mean – harmonic mean – selection of an average – partition values.

UNIT II: MEASURES OF DISPERSION, SKEWNESS AND KURTOSIS 25 hrs.

Dispersion – characteristics for an ideal measure of dispersion – measures of dispersion – range – quartile deviation – mean deviation– standard deviation and root mean square deviation – coefficient of dispersion – moments – Pearson's β and γcoefficient – skewness – kurtosis.

UNIT III: CURVE FITTING AND PRINCIPLE OF LEAST SQUARES **10 hrs.**

Curve fitting – most plausible solution of a system of linear equations – conversion of data to linear form.

UNIT IV: CORRELATION AND REGRESSION **15 hrs.**

Bivariate distribution – correlation – scatter diagram – Karl Pearson's coefficient of correlation – calculationof the correlation coefficient for a bivariate frequency distribution – probable error of correlation coefficient – rank correlation – regression.

UNIT V: THEORY OF PROBABILITY AND MATHEMATICAL EXPECTATION **20 hrs.**

Introduction – short history – definitions of various terms – Mathematical tools: preliminary notion of sets –axiomatic approach to probability – probability – Mathematical notion – law of multiplication or theorem of compound probability – Baye's theorem – Mathematical expectation – addition theorem of expectation – multiplication theorem of expectation – co–variance – expectation of linear combination of random variables – variance of a linear combination of random variables – expectation of a continuous random variable – conditional expectation and conditional variance.

TEXTBOOK(S):

Gupta S.C & Kapoor V.K., (2009). *Elements of Mathematical Statistics,* New Delhi: Sultan Chand and Sons. Print. (Chapter: 2, 3, 4, 6 (6.1 to 6.8) 9, 10).

REFERENCE BOOK(S):

Arumugam S. & Thangapandi Isaac A., (2007). *Statistics,* Palayamkottai: New Gamma Publishing House. Print.

Gupta S.P., (2006). *Statistical Methods*, New Delhi: Sultan Chand and sons. Print.

WEBLINK(S):

Data mining in CAE. (2015, August 30). *Introduction to simple linear regression* [Videofile]. Retrieved from https://youtu.be/owI7zxCqNY0.CC BY license.

Don't memorise. (2015, June 14) *What is Skewness?* [Videofile]. Retrieved from https://youtu.be/XSSRrVMOqIQ. CC BY license.

Maggard (June 5, 2009) *What is Correlation?* [Videofile]. Retrieved from https://youtu.be/Ypgo4qUBt5o. CC BY license.

GraphPad software. (2020, April 8). *How to choose between regression and correlation?.* [Videofile]. Retrieved from https://youtu.be/NI2LwVDWVmc. CC BY license.

Kevin Dunn. (2015, February 5). *Least squares-04- The math behind the Least squares model.* [Videofile]. Retrieved from https://youtu.be/8d_pbx4vnsI . CC BY license.

Nptelhrd. (2015, February 19). *Expectation of discrete random variable expectation over different spaces* [Videofile]. Retrieved from https://youtu.be/A7gGARBVDOs. CC BY license.

Onlinestatbook. (2011, October 3). *Probability: Basic concepts* [Videofile]. Retrieved from https://youtu.be/F5TDpbPSy1w. CC BY license.

Simple Learning Pro. (2015, October16).*Bar charts, Piecharts, Histograms, Stemplots, Timeplots.*[Videofile]. Retrieved from https://youtu.be/uHRqkGXX55I. CC BY license.

Simple Learning Pro. (2015, October 16).*Mode, Median, Mean, Range and Standard deviation.*[Videofile]. Retrieved from https://youtu.be/mk8tOD0t8M0 . CC BY license.

Six Sigma Pro Smart. (2017, October 25).*Range, Quartiles, Standard deviation, Measures of dispersion Part I* [Videofile]. Retrieved from https://youtu.be/Q7cGhY4wTUE. CC BY license.

WakeTech Business Analytics. (2016, August 8).*Kurtosis and asymmetrical analytics.* [Videofile].Retrieved from https://youtu.be/v2VJurVYUEc. CC BY license.

MAT3502CM STATISTICS	
Class: II B.Sc. Mathematics	**Semester: III**
Cognitive Level	K-1 Remember
	K-3 Apply
	K-4 Analyze
	K-5 Evaluate
	K-6 Create

MAPPING: COs consistency with PSOs

MAT3502CM STATISTICS						
CO/PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	2	2	2	2	2
CO2	2	2	1	2	2	2
CO3	2	2	1	2	2	2
CO4	2	2	1	2	2	2
CO5	2	2	1	2	2	2

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1)

MAT3504CM DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

(THEORY)

COURSE OUTCOMES:

6 hrs./wk.

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

CO1: find the solution of first order ordinary differential equations by appropriate methods

CO2: apply first order differential equations in real life situations

CO3: determine the general solution for linear differential equations of higher order

CO4: evaluate the Laplace and inverse transforms and solve differential equations using them

CO5: solve first order partial differential equationsusing suitable methods

COURSE CONTENT:

UNIT I: DIFFERENTIAL EQUATIONS OF FIRST ORDER **15 hrs.**

Exact differential equations – integrating factors – equations of first order and higher degree.

UNIT II: APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS **15 hrs.**

Dynamics of tumor growth – problem of epidemiology – mixture problem – one dimensional heat flow – flow of water from an orifice – orthogonal trajectories.

UNIT III: LINEAR EQUATIONS OF HIGHER ORDER **20 hrs.**

Linear equations with variable co-efficient – equation reducible to the linear equations – linear equations of the second order – complete solution given a known integral – reduction to the normal form – change of the independent variable – variation of Parameters.

UNIT IV: LAPLACE TRANSFORMS **20 hrs.**

Laplace transforms – inverse Laplace transforms – solution of differential equations using Laplace transforms.

UNITV: PARTIAL DIFFERENTIAL EQUATIONS **20 hrs.**

Partial differential equations of first order – formation of first order partial differential equations – solving first order partial differential equations – Lagrange's Method – some standard forms – Charpit's method.

TEXTBOOK(S):

Narayanan, S. Manicavachagom Pillay, T.K., (2012). *Differential Equations and its Applications*, Chennai: S. Viswanathan Pvt. Ltd. Print. (Chapter: II (Section 6), IV, V (Sections 5 and 6), VIII (Sections 1,2,3,4), IX (Sections 1 to 11) XII).

Zafar Ahsan, (2004). *Differential Equations and its Applications*, New Delhi: Prentice Hall of India Pvt. Ltd. Print. (Chapter: IV (Sections 4.1,4.2, 4.9. 4.11, 4.15, 4.19 (only 'flow of liquid from a small orifice'),4.20)).

REFERENCE BOOK(S):

Arumugam, S. & Isaac, A., (2008). *Differential Equations*, Palayamkottai: Gamma Publishing House. Print.

Sankarappan, S. & Kalavathy, S., (2005). *Differential Equations and Laplace transforms*, Chennai: Vijay Nicole Imprints Private Ltd. Print.

Vasishtha, A.R., Sharma, S.K., & Sukhendra Singh, (1992–93). *Differential Equations*, Meerut: U.P. Krishna Prakasan Mandir. Print.

Venkatraman, M.K. & Manorama Sridhar, (2004). *Differential Equations and Laplace Transforms*, Chennai: The National Publishing Company. Print.

WEBLINK(S):

Centum Academy. (2020, February 5). *History and prehistory: Differential Equations Introduction part 1* [Video file]. Retrieved from https://youtu.be/g-LPv9oWSdg. CC BY license.

Dr. Sucheta Moharir. (2020, July 30). *History and prehistory: Application of First Order Differential Equations -Exponential Growth Part 1*[Video file]. Retrieved from https://youtu.be/xk4Puz6lRn8.CC BY license.

Learning Institute Pandeypur. (2020, June 01). *History and prehistory: Higher Order Differential Equation with Constant Coefficient -Part 2* [Video file]. Retrieved from https://youtu.be/hkKYATS5VOA.CC BY license.

Mahadevan V. (2020, April 05). *History and prehistory: Partial Differential Equations* [Video file]. Retrieved from https://youtu.be/kMAL5BNmRc4. CC BY license.

Mathispower4u.(2012, April 30). *History and prehistory: The origin of humans and human societies* [Video file]. Retrieved from https://youtu.be/HDP0_6lODgU.CC BY license.

MAT3504CM DIFFERENTIAL EQUATIONS AND LAPLACE

TRANFORMS	
Class: II B.Sc. Mathematics	**Semester: III**
Cognitive Level	K-1 Remember
	K-3 Apply
	K-5 Evaluate
	K-6 Create

MAPPING: COs consistency with PSOs

MAT3504CM DIFFERENTIAL EQUATIONS AND LAPLACE TRANFORMS						
CO/PSO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	2	1	3	2	1
CO2	3	3	1	3	2	2
CO3	2	3	1	3	2	2
CO4	2	3	1	3	2	2
CO5	2	3	1	3	2	2

Strongly correlated (3), Moderately correlated (2), Weakly correlated (1)

MAT3401AT PROGRAMMING IN C

(Offered to B.Sc. MATHEMATICS)

(LAB CUM THEORY)

COURSE OUTCOMES:

3T + 2L hrs./wk.

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

CO 1: identify various tokens, construct expressions and write simple programs using input and output operations

CO 2: apply branching and looping statements in C programming

CO 3: adapt the concepts of arrays, functions, recursion, structure, union, string functions in C programming

CO 4: make use of pointers in arrays and functions

CO 5: create files and handle data using files

COURSE CONTENT:

UNIT I: INTRODUCTION TO C **5T + 2L hrs.**

Introduction – constants – variables and data types – operators and expressions – input and output operations

UNIT II: DECISION MAKING, BRANCHING AND LOOPING **10T+10L hrs.**

Control statements – if – if else – switch – goto – break – for – while – do while.

UNIT III: ARRAYS AND FUNCTIONS **15T+10L hrs.**

Arrays – functions – recursion – structure – union – bit fields – string functions.

UNITIV: POINTERS **10T + 6L hrs.**

Pointer declaration – pointer arithmetic – pointer arrays – pointers with functions.

UNITV: FILES **5T + 2L hrs.**

Defining and opening a file – closing a file – input/output operations on files.

TEXTBOOK(S):

Balagurusamy E., (2011). *Programming in ANSIC*, New Delhi: Tata McGraw Hall Publishing Company Ltd. Print. Chapters: 1,2,3,4,5,6,7 (Sections 7.1 to 7.7), 8, 9 (Sections 9.1 to 9.18), 10 (Sections 10.1 to 10.8, 10.10 to 10.12, 10.14), 11(Sections 11.1 to 11.16), 12 (Sections 12.1 to 12.4).

REFERENCE BOOK(S):

Pandiyaraja P., (2005). *Programming in C*, Chennai: S.Vishwanathan Printers and Publishers Ltd. Print.

YashavantKanetkar, (2007). *Let us C*, New Delhi: BPB Publications. Print.

WEBLINK(S):

Mouna Naravani. (2017, March 20). *Branching Statements in C - Part 1 - Simple if Statement*[Video file]. Retrieved from https://youtu.be/Q77DRji11SM. CC BY license.

Mouna Naravani.(2017,April15). *Difference between while and do while loop*[Video file]. Retrieved from https://youtu.be/g6w2sZPyYU0. CC BY license.

Sanjay Gupta. (2019, February 9). *How to define multiple functions in C programming* [Video file]. Retrieved from https://youtu.be/ADPNsIhBKhQ. CC BY license.

Sanjay Gupta. (2018, March 28). *Passing array of structure into function in C programming* [Video file]. Retrieved from https://youtu.be/yggto0VVMX0 . CC BY license.

Sanjay Gupta. (2018, March 4). *How Array and pointer works in C programming language* [Video file]. Retrieved from https://youtu.be/A9NX5v_0nik . CC BY license.

Spoken- Tutorial Bombay. (2014, November 14). *File Handling In C* [Video file]. Retrieved from https://youtu.be/GYf6AwK1VQU. CC BY license.

Tech Educators. (2017, November 12). *Introduction to C programming* [Video file]. Retrieved from https://youtu.be/i7bmKbSp164. CC BY license.

MAT3401AT PROGRAMMING IN C	
Class: II B.Sc. Mathematics	**Semester: III**
Cognitive Level	K-3 Apply
	K-6 Create

MAT3412AA PARTIAL DIFFERENTIAL EQUATIONS, STATISTICS AND COMPLEX ANALYSIS

(Offered to Physics Students)

(THEORY)

COURSE OUTCOMES:

5 hrs./wk.

On successful completion of this course students will be able to

CO1: solve first order partial differential equations

CO2: evaluate various measures of central tendencies and dispersion

CO3: prove results in probability and apply the same in real life problems

CO4: find the conjugate, modulus, square root of a complex number and represent it geometrically

CO5: prove results and find solutions of related problems on complex functions

COURSE CONTENT:

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS

15 hrs.

Formation of partial differential equations – first order partial differential equations – methods of solving first order partial differential equations – Charpit's method.

UNIT II: MEASURES OF CENTRAL TENDENCIES AND DISPERSION

15 hrs.

Arithmetic mean – median – mode – quartiles – deciles – percentiles – range – quartile deviation – mean deviation – standard deviation – coefficient of variation.

UNIT III: PROBABILITY

15 hrs.

Probability – conditional probability – Baye's theorem – Boole's inequality.

UNIT IV: COMPLEX ANALYSIS

15 hrs.

Complex numbers – conjugation and modulus – inequalities – square root – geometrical representation of complex numbers – nth roots of complex numbers.

UNIT V: ANALYTIC FUNCTIONS

15 hrs.

Introduction – functions of a complex variable – limits – theorems on limits – continuous functions – differentiability – Cauchy-Riemann equations – analytic functions – harmonic functions.

TEXTBOOK(S):

Arumugam S & Thangapandi Isaac A.,(2003).*Differential Equations and Applications*, Palayamkottai: New Gamma Publishing House.Print. (Chapter: 4(Sections 4.1 –4.3-& 4.5)).

Arumugam S & Thangapandi Isaac A.,(2007). *Statistics*,Palayamkottai: New Gamma Publishing House. Print. (Chapter: 2(2.0 – 2.3), 3 (3.0 -3.1), 11).

ArumugamS & Thangapandi Isaac. A.,(2002). *Complex Analysis*, Palayamkottai: New Gamma Publishing House. Print. (Chapter: 1: 1.0 - 1.6, 2 : 2.0- 2.5, 2.6, 2.7, 2.8)(Theorems statement only).

REFERENCE BOOK(S):

Venkatachalapathy S.G., (2006). *Complex Analysis*, Chennai:Margham Publications.Print.

Vital P.R., (2009).*Mathematical Statistics*,Chennai:Margham Publications.Print.

WEBLINK(S):

Chitkara University. (2020, April28).*Introduction to partial differential equations* [Video file]. Retrieved from https://youtu.be/3dIvJGLfUJg. CC BY license.

Greg port. (2012, March 27). *Introduction to probability* [Video file]. Reteieved from https://youtu.be/2SLZAi8kBsA. CC BY license.

John Rossiter (2014, January 6). *Square root of a complex number* [Video file].Retrieved from https://youtu.be/6KvVD2fz7fY. CC BY license.

Niossenior Secondary courses (2018, April 18), *Measures of central tendency-Arithmetic* mean,mode [Video file].Retrieved from https://youtu.be/Un8c6Zzzsmo.CC BY license.

WIT Solapur- Professional learning community (2019, Feb 5). *Cauchy-Riemann Equations* [Video file]. Retrieved from https://youtu.be/U_YgOaY29Q0. CC BY license.

MAT3412AA PARTIAL DIFFERENTIAL EQUATIONS, STATISTICS AND COMPLEX ANALYSIS	
Class: II B.Sc. Mathematics	**Semester: III**
Cognitive Level	K-1 Remember
	K-3 Apply
	K-5 Evaluate
	K-6 Create

MATQ3433AA ESSENTIAL MATHEMATICS FOR BIOLOGIST

(Offered to Zoology Students with +2 Mathematics and Bio-Technology students)

(THEORY)

COURSE OUTCOMES:

5 hrs./ wk.

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

CO1: explain the applications of various mathematical functions in biology

CO2: identify the types of matrices and perform operations on matrices

CO3: evaluate integrals and solve first order differential equations

CO4: construct different diagrams for the given data

CO5: determine various measures of central tendencies, measures of dispersion and probability for real life problems

COURSE CONTENT:

UNITI: FUNCTIONS AND FIBONACCI SEQUENCE **15 hrs.**

Linear functions – exponential functions – logarithmic functions – trigonometric functions – periodic functions – inverse functions – Fibonacci sequence – recurrence relation and applications.

UNITII: MATRICES **12 hrs.**

Addition and multiplication of matrices – types of matrices – adjoint of a matrix – inverse of a matrix.

UNITIII: INTEGRATION AND DIFFERENTIAL EQUATIONS **18 hrs.**

Standard elementary integrals – method of substitution – method of partial fractions – integration by parts – solving differential equations of first order and first degree by variable separable method – applications in biology.

UNITIV: DIAGRAMMATIC REPRESENTATION OF DATA **15 hrs.**

Line diagram – bar diagram – simple bar diagram – divided bar diagram – percentage bar diagram – multiple bar diagram – pie diagram – histogram.

UNITV: STATISTICS **15 hrs.**

Probability – sample spaces and events – addition rule – multiplication rule – applications in genetics – measures of central tendencies – mean – median – mode – standard deviation – coefficient of variation.

TEXTBOOK(S):

Bataschelet. E., (1975). *Introduction to Mathematics for life Scientists*, New Delhi: Narosa Publishing house. Print. (Chapter: 8 (8.5)).

Irfan Alikhanand Atiya Khanum, (2004). *Fundamentals of Biostatistics*, Hyderabad: Ukaaz Publications. Print. (Chapters: 3(3.2, 3.5.1), 4: (4.2.1- 4.3.1- 4.4.1), 5: (5.3.3.1-5.3.3.4))6: (6.3.1-6.3.2).

Jagdish C. Arya & Robin W. Lardner, (1979). *Mathematics for the Biological Sciences*, New Delhi: Prentice Hall International Edition. Print. (Chapters: 1(1.4) ,3 (3.1- 3.2), 5 (5.1- 5.4- 5.5), 6 (6.1,6.2, 6.4, 6.6),10 (10.1,10.2, 10.3)).

Wilson M., (2018).*Business Mathematics, Mumbai*: Himalaya Publishing House. Print. (Chapter:9 (Page 215-231)).

REFERENCE BOOK(S):

Arumugam S & Isaac. A., (1999). *Differential equations and applications*, Palayamkottai: New Gamma Publishing House. Print.

Arumugam S & Isaac. A., (2006). *Ancillary Mathematics PAPER III*, Palayamkottai: New Gamma Publishing House. Print.

Pradeep Parihar and Leena Parihar, (2005). *Biostatistics and Biometry*, Jodhpur: Student Edition. Print.

WEBLINK(S):

EducompMathguru. (2011, July 15). Example: *Finding Inverse of a Matrix* (Elementary Transformation) [Video file].Retrieved fromhttps://youtu.be/FJd0Fa9UK7Y. CC BY license.

FuseSchool-Global Education. (2017, August 13). *What Is AFunction|Algebra|Maths|FuseSchool*[Video file].Retrieved from https://youtu.be/GbQl0Ve_cH4. CC BY license.

FuseSchool-Global Education. (2020, February6). *Probability|Algebra|Maths|FuseSchool*[Video file].Retrieved

from https://youtu.be/QfKk3sxgOOY. CC BY license.

Math 065[old]-Dr.Masaros. (2016, November 27). 15.2 – *Linear or Exponential* [Video file]. Retrieved fromhttps://youtu.be/GLCtKCWqG9g. CC BY license.

NIOSSeniorSecondaryCourses. (2017, November 22). *Operation of Matrices(Sr.Sec*) [Video file]. Retrieved fromhttps://youtu.be/pneZSHNn0Yk. CC BY license.

NIOSSeniorSecondaryCourses(2018, August 13). *Standard Deviation*[Video file]. Retrieved from https://youtu.be/VJgmN7zdqjY. CC BY license.

OCLPhase2. (2012, May 2).*Bar graphs for categorical data Transformation*) [Video file]. Retrieved from https://youtu.be/vwxKf_O3ui0. CC BY license.

MATQ3433AA ESSENTIAL MATHEMATICS FOR BIOLOGISTS	
Class : II B.Sc Zoology	**Semester: III**
Cognitive level	K-1 Remember
	K -2 Understand
	K- 3 Apply
	K- 5 Evaluate

MATQ3434AA BASIC MATHEMATICS FOR BIOLOGISTS

(Offered to Zoology Students without +2 Mathematics)

(THEORY)

COURSE OUTCOMES:

5 hrs./ wk.

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

CO1: explain the applications of various mathematical functions in biology

CO2: identify the types of matrices and perform operations on matrices

CO3: find derivatives, maxima and minima of a given function

CO4: construct different diagrams for the given data

CO5: determine various measures of central tendencies, measures of dispersion and probability for real life problems

COURSE CONTENT:

UNIT I: FUNCTIONS AND FIBONACCI SEQUENCE **15 hrs.**

Linear functions – exponential functions – logarithmic functions – trigonometric functions – periodic functions – inverse functions – Fibonacci sequence – recurrence relation and applications.

UNIT II: MATRICES **12 hrs.**

Addition and multiplication of matrices – types of matrices – adjoint of a matrix – inverse of a matrix.

UNIT III: DIFFERENTIATION **18 hrs.**

Derivatives of power functions – products – quotients and composite functions – second derivative – analysis of curves – maxima and minima with applications.

UNIT IV: DIAGRAMMATIC REPRESENTATION OF DATA **15 hrs.**

Line diagram – bar diagram – simple bar diagram – divided bar diagram – percentage bar diagram – multiple bar diagram – pie diagram – histogram.

UNIT V: STATISTICS **15 hrs.**

Probability – sample spaces and events – Addition rule – multiplication rule – applications in genetics – measures of central tendency – mean – median – mode – standard deviation –Coefficient of variation.

TEXTBOOK(S):

Batschelet E., (1975). *Introduction to Mathematics for life Scientists*, New Delhi: Narosa Publishing house. Print.(Chapter: 8: 8.5)

IrfanAlikhan and AtiyaKhanum, (2004).*Fundamentals of Biostatistics*,Hyderabad:UkaazPublications. Print.(Chapters:6: (6.3.1,6.3.2), 3(3.2, 3.5.1) 4: (4.2.1, 4.3.1, 4.4.1),5: (5.3.3.1-5.3.3.4))

Jagdish C. Arya and Robin W. Lardner, (1979).*Mathematics for the Biological Sciences*, New Delhi: Prentice Hall International Edition. Print. (Chapters:1(1.4), 2 (2.5, 2.6, 2.7, 2.8, 2.9), 3 (3.1, 3.2), 4 (4.1., 4.2, 4.3), 5 (5.1, 5.4, 5.5).

Wilson M.,(2018). *BusinessMathematics,Mumbai*: Himalaya Publishing House. Print. (Chapter:9 (Page 215-231)

REFERENCE BOOK(S):

ArumugamS.& Isaac.A., (2006).*Ancillary Mathematics PAPER III*, Palayamkottai: New Gamma Publishing House.

Print.

ArumugamS .& Isaac.A., (1999).*Differential equations and applications*,Palayamkottai: New Gamma Publishing House. Print.

Pradeep & Leena Parihar, (2005). *Biostatistics and Biometry*, Jodhpur: Student edition. Print.

WEBLINK(S):

AdamBeatty.(2011, July 14). *Differentiation: What is a derivative*[Video file]. Retrieved from https://youtu.be/9S4Vk-8gya8. CC BY license.

EducompMathguru. (2011, July 15). *Example: Finding Inverse of a Matrix (ElementaryTransformation)* [Video file].Retrieved fromhttps://youtu.be/FJd0Fa9UK7Y. CC BY license.

FuseSchool-Global Education. (2017, August 13). *What Is AFunction|Algebra|Maths| FuseSchool*[Video file].Retrieved from https://youtu.be/GbQl0Ve_cH4. CC BY license.

FuseSchool-Global Education. (2020, February6).*Probability|Algebra|Maths|FuseSchool* [Video file].Retrieved from https://youtu.be/QfKk3sxgOOY. CC BY license.

Math 065[old]-Dr.Masaros. (2016, November 27). *15.2 – Linear or Exponential* [Video file]. RetrievedfromhttpS://youtu.be/GLCtKCWqG9g. CC BY license.

NIOSSeniorSecondaryCourses. (2017, November 22). *Operation of Matrices(Sr.Sec)* [Video file]. Retrieved fromhttps://youtu.be/pneZSHNn0YkCC. CC BY license.

NIOSSeniorSecondaryCourses. (2018, August 13). *Standard Deviation*[Video file].Retrieved from https://youtu.be/VJgmN7zdqjY. CC BY license.

OCLPhase2. (2012, May 2).*Bar graphs for categorical data Transformation)* [Video file]Retrieved from https://youtu.be/vwxKf_O3ui0. CC BY license.

MATQ3434AA BASIC MATHEMATICS FOR BIOLOGISTS	
Class: II B.Sc. Zoology	**Semester: III**
Cognitive Level	K-1 Remember
	K-2 Understand
	K-3 Apply

	K-5 Evaluate
	K-6 Create

MAT0406CD ASTRONOMY

(THEORY)

COURSE OUTCOMES:

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

CO1: define various terms associated with celestial sphere

CO2: derive various results associated with planetary motion

CO3: discuss the various characteristics of the moon

CO4: find the number of occurrences of solar and lunar eclipses in a year and prove related results

CO5: list the types of calendars and discuss different time zones

COURSE CONTENT:

UNIT I: CELESTIAL SPHERE

Sphere – great circle – axis – distance between two points on the sphere – secondarys – angular radius – spherical

triangle – sine formula – cosine formula – cotangent formula – celestial sphere – diurnal motion – celestial axis and equator – celestial horizon – zenith and nadir – celestial meridian – celestial points – northern and southern hemispheres – eastern and western hemispheres – visible and invisible hemispheres – eclination circles – verticals – parallactic angle – rising and setting – transit or culmination – due east – due west – due north – due south – annual motion of the sun – ecliptic – obliquity – first point of aries – first point of libra – equinoxes and solstices – colure – celestial coordinates – to trace the changes in the co-ordinates of the sun in the course of a year – sidereal time – latitude of a place – to find the hour angle of a body at rising or setting – to trace the changes in the azimuth of a star in the course of a day – to find the duration of day time – morning and evening stars – circumpolar stars – diagram of a celestial sphere.

UNIT II: THE EARTH

The zones of the earth – to trace the variations in the duration of day and night during the year at different stations –Terrestrial Latitudes and Longitudes – definition and effects of Dip –Twilight – Refraction - Kepler′ s laws of planetary motion.

UNIT III: THE MOON

Sidereal month – synodic month – elongation – conjunction – opposition – quadratures – daily motion of the moon – successive phases of the moon – moon exhibits the same side to the earth – Metonic cycle –Golden number – Epact – Sunday letter – surface structure of Moon – Earth shine – tides.

UNIT IV: ECLIPSES

Lunar – solar eclipses – Penumbral regions – Ecliptic limits – maximum and Minimum number of eclipses in a year – Solar and lunar eclipses compared – occultation.

UNIT V: CALENDAR

Different kinds of years – civil year – Julian calendar – Gregorian calendar – Julian date – Standard times – I. S.T.= G.M.T. + 5h 30m – Recent developments in space research.

TEXTBOOK(S):

KumaraveluS., &KumaraveluSusheela, (2004). *Astronomy*, Nagercoil: SKV Publications. Print. Chapters:I (All definitions),II (All articles except 65, 84, 85),III (sections: 1– except art 90, 2 – Definitionsof terrestrial latitude &longitude, 5, 6 (art 111, 112)),IV (All articles except 127, 131, to 134),VI (art. 146 to 151),VII (3),XII (All articles except 243 to 249, 253),XIII (All articles except 260 to 268, 276 to 282).

REFERENCE BOOK(S):

Patrick Moore Obe,(1970). The atlas of the universe. Bombay: The Tulsi Shah enterprises. Print

WEBLINK(S):

Exam race. (2018, Sep 30).*GMT and Timezone Calculations (Moving East and West)*[Video file]. Retrieved fromhttps://youtu.be/zjXLH1p1F0U.CC BYlicense.

Michen van Bizen. (2014, Sep 16).*Motion of the moon(9 of 12) Difference between sidereal and synodic month*. [Videofile]. Retrieved fromhttps://youtu.be/lAocHt3xro0. CC BYlicense.

Michen van Bizen. (2014, Aug 30).*Astronomy- Understanding the Night Sky*.[Video file]. Retrieved from https://youtu.be/tPtG8fTpTIE. CC BYlicense.

National Geographic. (2017, Aug 17). Sola*r Eclipse 101*[Video file]. Retrieved fromhttps://youtu.be/VW2xRR75lKE. CC BYlicense.

National Geographic. (2018, Jan 31).*Lunar Eclipse 101*[Video file]. Retrieved fromhttps://youtu.be/VW2xRR75lKE.CC BYy license.

Physics High. (2017, Jan 22).*Kepler's three laws explained.* [Video file]. Retrieved fromhttps://youtu.be/kyR6EO_RMKE. CC BYlicense.

Science Monkey. (2014, Jan 19).*Celestial Sphere*[Video file]. Retrieved from https://youtu.be/FHDq5LvPUIo. CC BYlicense.

MAT0406CD ASTRONOMY	
Class: All Major	**Semester**
Cognitive Level	K-1Remember
	K-2 Understand
	K-4 Analyze
	K-6 Create

MAT0407CD NUMERICAL METHODS

(THEORY)

COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: solve algebraic and transcendental equations by appropriate iterative methods

CO2: find numerical solutions by forward and backward difference formulae for the given data

CO3: make use of different interpolation formulae to solve problems with unequal intervals

CO4: apply different formulae to differentiate and integrate the given function numerically

CO5: solve first order differential equations numerically

COURSE CONTENT:

UNIT I: NUMERICAL SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Bisection method – Regulafalsi method – Iteration method – Newton - Raphson method.

UNIT II: INTERPOLATION WITH EQUAL INTERVALS

Newton's forward and backward formulae – Gauss 's forward and backward formulae – Stirling 's formula – Bessel 's formula – Laplace – Everett's formula.

UNIT III: INTERPOLATION WITH UNEQUAL INTERVALS

Newton's divided difference formula – Lagrange 's Interpolation formula – Inverse Interpolation.

UNIT IV: NUMERICAL DIFFERENTIATION & INTEGRATION

Newton's formula – Stirling 's formula – Numerical Integration: Trapezoidal rule – Simpson 's rule.

UNIT V: SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Taylor – Picard and Euler methods.

TEXTBOOK(S):

KandasamyP.,Thilagavathy K.,&GunavathiK., (2016).*Numerical Mehods(1st ed.),*New Delhi: Sultan Chand and Sons. Print. (Chapter:3(3.1-3.4),6,7,8,9(9.1-9.9,9.13),11(11.1-11.5,11.8-11.11).

REFERENCE BOOK(S):

Venkataraman M.K., (2003).*Numerical methods in Science and Engineering (5th ed.).* Chennai: The National Publishing Company. Print.

BalagurusamyE., (1998).*Computer oriented Statistical & Numerical methods*,New Delhi: Macmillan India Limited. Print.

Gupta, B.D., (1995).*Numerical Analysis,* Delhi: Konark Publishers Pvt. Ltd. Print.

Sasthry, S.S., (1989). *Introduction Methods of Numerical Analysis*, New Delhi: Prentice Hall of India Pvt ltd.

WEBLINK(S):

Bhagwan Singh Vishwakarma.(2018,December 17). Euler's method [Video file] Retrieved from https://youtu.be/LTKYiWuBuxU?t=46 . CC BY license.

Easy Maths Easy Tricks.(2020,May 26). Lagrange's formula [Video file]. Retrieved from https://youtu.be/UtcYo_e3Cik. CC BYlicense.

GajendraPurohit.(2018,December 17). Numerical integration [Video file] Retrieved from https://youtu.be/iviiGB5vxLA. CC BYlicense.

MKS Tutorials by ManojSir. (2018,May 22). Newton's forward and Backward interpolation formula [Video file] Retrieved fromhttps://youtu.be/OreSw2zPW-g .CC BYlicense.

YSREdu Tech. (2017,July 9) Bisection method[Video file] Retrieved from https://youtu.be/7LL70V1509o.CC BYlicense.

MAT0407CD NUMERICAL METHODS	
Class: All Major	**Semester: III**
Cognitive Level	K-1 Remember
	K-3 Apply
	K-6 Create

MAT0410CD FORMAL LANGUAGES AND AUTOMATA

(THEORY)

COURSE OUTCOMES:

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

CO1:define finite automata and check the acceptability of a language by a finiteautomaton

CO2:inspect the properties of NFA and able to convert NFA to FA in terms of algorithms

CO3:explain the properties of regular sets and find monoid of a finite state machine

CO4:construct grammars for languages and convert it to various normal forms

CO5: construct Greibach normal form grammar for a given grammar.

COURSE CONTENT:

UNIT I: FINITE AUTOMATA (FA)

Definition – representation of a finite automaton – acceptability of a string and language accepted by a finite automaton.

UNIT II: NON-DETERMINISTIC FINITE AUTOMATA (NFA)

Definition – acceptability of a string by NFA – equivalence of FA and NFA – procedure for finding a FA equivalent to a given NFA.

UNIT III: REGULAR SETS

Properties of regular sets – decision algorithms for regular sets –finite state machines – monoid of a finite state machine – machine of a monoid.

UNIT IV: PHRASE STRUCTURE GRAMMARS

Definition and examples – Chomsky hierarchy of languages – derivation trees for context free grammars – normal forms for context free grammars – ambiguity– parsing and polish notation – simple precedence grammar – algorithm.

UNIT V: FINITE AUTOMATA AND REGULAR LANGUAGES

Construction of a regular grammar – derivation trees for context-free grammars – normal forms for context-free grammars – Greibach normal form.

TEXTBOOK(S):

Venkataraman M.K., Sridharan N. and Chandrasekaran N., (2001). *Discrete Mathematics*, Chennai:The National Publishing Company. Print. (Chapter XII (1-20)).

REFERENCE BOOK(S):

Peter Linz, (2008). *An Introduction to Formal Languages and Automata*, New Delhi: NarosaPublishing House. Print.

Sundaresan V., Ganapathy Subramanian K.S. & Ganesan K., (2001). *Discrete Mathematics*, Sirkali: A.R. Publications. Print.

WEBLINK(S):

DigiiMento: GATE, NTA NET & Other CSE Exam Prep. (2016, December 12). Converting NFA to DFA [Video file]. Retrieved from https://youtu.be/i8ucJEYGaRw. CC BY license.

Nptelhrd . (2014, Juene 27). Mod-01 Lec-11 Regular expressions, they denote regular languages [Video file]. Retrieved from https://youtu.be/37Yr4fS0-po. CC BY license.

Nptelhrd. (2014, June 27). Mod-01 Lec-31 Introduction to pushdown automata (pda) [Video file].Retrieved from https://youtu.be/7ZbDEfnYwAo. CC BY license

Nptelhrd. (2015, January 2).Mod-01 Lec-19 Phrase Structure [Video file]. Retrieved from https://youtu.be/HAU_lLjcVRM. CC BY license.

Uoulive. (2019, June 3). *Introduction to formal languages.* [Video file]. Retrieved from https://youtu.be/Y7fsKnxiIT8. CC BY license.

MAT0410CD FORMAL LANGUAGES AND AUTOMATA	
Class: All Major	**Semester: III**
Cognitive Level	K-1 Remember
	K-2 Understand
	K-3 Apply
	K-4 Analyze
	K-5 Evaluate

Sem.	Course Code	Course Title	Course Type	Hrs./ Wk.		Cr.	New / Revised course	% of revision	Passed in AC	Offered to	Offered by
				TH	LA						
V	MAT5501CM	ADVANCED CALCULUS – II	TH	6		5			BI2021	AUMAT	MAT
	MAT5503CM	OPERATIONS RESEARCH – I	TH	6		5			BI2021	AUMAT	MAT
	MAT5504CM	GRAPH THEORY	TH	6		5			BI2021	AUMAT	MAT
	MAT5202CM	INTRODUCTION TO RESEARCH METHODOLOGY	TH	2		2			BI2021	AUMAT	MAT
	MAT0602LM	APPLICATIONS OF MATHEMATICAL TOOLS FOR HUMAN LIFE ENHANCEMENT		4		-			BI2021	AUMAT	MAT
	INTERDISCIPLINARY COURSE		TH	4		4					
	VBC0203FV/ VBC0202FV / UIV5201FI	FOUNDATION COURSE ON WOMEN'S STUDIES	TH	2		1				ALLM / AUACH SUACH	Centre for VE

		/ HUMAN RIGHTS AND DUTIES / BIBLICAL PERSPECTIVES ON WOMEN									
		TOTAL		**30**		**22**					
VI	**MAT6501CM**	**COMPLEX ANALYSIS**	**TH**	**5**		**5**				**AUMAT**	**MAT**
	MAT6502CM	**OPERATIONS RESEARCH – II**	**TH**	**6**		**5**				**AUMAT**	**MAT**
	MAT6503CM	**MECHANICS**	**TH**	**6**		**5**				**AUMAT**	**MAT**
	MATQ6401CM / MATQ6402CM	**FUZZY SETS / COMBINATORICS**	**TH**	**4**		**4**				**AUMAT**	**MAT**
	MAT0602LM	**APPLICATIONS OF MATHEMATICAL TOOLS FOR HUMAN LIFE ENHANCEMENT**		**4**		**6**				**AUMAT**	**MAT**
	INTERDISCIPLINARY COURSE		**TH**	**4**		**4**					
	VBC6101FV/ UIV6101FI	ENHANCING SOCIAL GRACE/ BIBLICAL PERSPECTIVES ON LEADERSHIP	TH	**1**		**1**				ALLM / AUACHS UACH	Centre for VBC / IVBC
		Total		**30**		**30**					

*Total number of credits (2020 batch) - 52

MAT6501CM COMPLEX ANALYSIS

(THEORY)

COURSE OUTCOMES: **5 hrs. / wk.**

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

CO1: describe the concepts of complex numbers, represent the extended plane geometrically and apply concepts of

CR equations

CO2: discuss different types of bilinear transformations

CO3: make use of suitable theorems to evaluate line integrals

CO4: write the expansion of Taylor's series and classify the singularities

CO5: evaluate definite integrals

COURSE CONTENT:

UNIT I: COMPLEX NUMBERS AND ANALYTIC FUNCTIONS **15hrs.**

Circles and straight lines – regions in the complex plane – extended complex plane – functions of a complex variable – limits - continuous functions – differentiability – Cauchy Riemann's equations – analytic functions – harmonic functions – conformal mapping.

UNIT II: BILINEAR TRANSFORMATIONS **15hrs.**

Elementary transformations – bilinear transformations – cross ratio – fixed points of bilinear transformations – some special bilinear transformations

UNIT III: COMPLEX INTEGRATION **15hrs.**

Definite integral – Cauchy 's theorem – Cauchy 's integral formula – higher derivatives.

UNIT IV: SERIES EXPANSIONS **15 hrs.**

Taylor's series – Laurent 's series – zeros of an analytic function – singularities.

UNIT V: CALCULUS OF RESIDUES **15 hrs.**

Residues – Cauchy 's residue theorem – argument theorem – Rouches theorem – fundamental theorem of algebra – evaluation of definite integrals.

TEXTBOOK(S):

Arumugam, S., Thangapandi Isaac, A. and Somasundaram, A. (2005). *Complex Analysis*. Chennai: SciTech Publications (India) Pvt. Ltd. Print. (Unit I: Chapters - 1 (1.7 to 1.9), 2, Unit II: Chapter -3, Unit III: Chapter - 6, Unit IV: Chapter - 7, Unit V: Chapter - 8)

REFERENCE BOOK(S):

Shanti, N. (2001). *Theory of functions of a complex variable,* New Delhi: Chand. S and Company Ltd. Print.

Churchill, V. (1960). *Theory of complex variable*s, Oxford: McGraw Hill University Press. Print.

Copson, E.T. (1960). *An introduction to the theory functions of a complex variable,* London: Oxford University Press. Print.

WEBLINK(S):

MatheMagician. (2017, August 15). *Residues* [Video file]. Retrieved fromhttps://youtu.be/_KAsSxsmQeE. CC BY license.

Nptelhrd. (2014, August 20). *Integration of Complex Functions* [Video file]. Retrieved from https://youtu.be/ceYSD97IILk. CC BY license.

Sandip Chatterjee. (2020, September 02). *Analytic function* [Video file]. Retrieved from https://youtu.be/R3U28o8eTuQ. CC BY license.

Sandip Chatterjee. (2020, October 06). *Harmonic function* [Video file]. Retrieved fromhttps://youtu.be/s41vUpGmius. CC BY license.

WIT Solapur. (2019, July 31). *Expansion of functions -Taylor's Series* [Video file]. Retrieved from https://youtu.be/MOqlo4dVp2Y. CC BY license.

CO's cognitive level and mapping with PSO's

MAT6501CM COMPLEX ANALYSIS							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K2 - Understand	1	1	2	1	2	2
CO2	K2 - Understand	1	2	1	2	2	2
CO3	K2 - Understand	1	2	1	1	2	2
CO4	K3 - Apply	1	2	2	1	2	2
CO5	K6 - Create	1	2	2	1	2	2

MAT6502CM OPERATIONS RESEARCH - II

(THEORY)

COURSE OUTCOMES: **6hrs./wk.**

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

CO1: identify the optimal strategies for the players in a two person zero sum game

CO2: justify the replacement of an equipment that deteriorates gradually

CO3: compare the various queueing situations

CO4: solve the inventory problems with and without the shortages

CO5: plan and determine the minimum time for completion of projects

COURSE CONTENT:

UNIT I: GAMES AND STRATEGIES **18 hrs.**

Two-person zero sum games – basic terms – maximin-minimax principle – games without saddle point – mixed strategies – graphic solution of 2 x n and m x 2 games – dominance property – general solution of m x n rectangular games.

UNIT II: REPLACEMENT PROBLEM **18 hrs.**

Replacement of equipment / asset that deteriorates gradually – replacement policy when value of money does not change with time – replacement policy when value of money changes with time.

UNIT III: QUEUEING THEORY **18 hrs.**

Queueing system – elements of queueing system – operating characteristics of queueing system – probability distribution in queueing systems – classification of queueing models – definition of transient and steady states – Poisson queueing system – Models: (M/M/1): (infinity/FIFO) – (M/M/1):(N/FIFO) – (M/M/C): (infinity/FIFO).

UNIT IV: INVENTORY CONTROL **18 hrs.**

The inventory decisions – costs associated with inventories – factors affecting inventory control – economic order quantity (EOQ) – deterministic inventory problems with no shortages – deterministic inventory problem with shortages.

UNIT V: NETWORK SCHEDULING BY PERT/CPM **18 hrs.**

Network and basic components – logical sequencing – rules of network construction – critical path analysis – probability consideration in PERT.

Experiential Learning:

Problems involving PERT/CPM

TEXTBOOK(S):

Mohan, M., Swarup, K., and Gupta, P.K. (2006). Operations Research, New Delhi: Sultan Chand & Sons. Print. (Unit I: Chapter: 17(17.1 – 17.7, 17.9(LP method only)), Unit II: Chapter 18(18.1,18.2), Unit IV: Chapter19(19.1-19.11), Unit III: Chapter 21(21.1 – 21.6). Unit V: Chapter 25(25.1-25.7).

REFERENCE BOOK(S):

Gupta, P.K., Mohan, M. (2003). Problems in Operations Research, New Delhi: Sultan Chand &sons. Print.

Hamdy, A.T. (1987). Operations Research, New York: Macmillan Publishing Company. Print.

WEBLINK(S):

Srinivasan kesav. (2018, December 31). *Introduction to Queueing theory* [Video file]. https://youtu.be/2nYCpIoJi9E Retrieved from. CC BY license.

Wise. (2020, May 6). *Replacement problem in operation research* [Video file]. Retrieved from https://youtu.be/vKVkOpNDZ2s. CC BY license.

WIT Solapur-Professional and Learning Community. (2018, September 14). *Basics of inventory control* [Video file]. Retrieved from https://youtu.be/slgdgwC-WRc. CC BY license.

Santosh S. Gaidhankar. (2020, May 21). [Video file] Retrieved fromhttps://youtu.be/fnJD4o8u2uA .CC BY license.

CO's cognitive level and mapping with PSO's

MAT6502CMOPERATIONS RESEARCH II							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K2 - Understand	1	2	1	1	2	2
CO2	K3 - Apply	1	2	1	2	2	2
CO3	K5 - Evaluate	1	2	1	1	2	1
CO4	K5 - Evaluate	1	1	2	2	2	2
CO5	K6 - Create	1	2	1	1	2	1

MAT6503CM MECHANICS

(THEORY)

COURSE OUTCOMES: **6hrs./wk.**

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

CO1: solve problems in terms of resolved parts

CO2: apply the concepts of couples, moments, coplanar forces to solve problems

CO3: make use of coefficient of friction to solve related problems

CO4: discuss the motion of a projectile

CO5: discuss the collision of elastic bodies to solve problems

COURSE CONTENT:

UNIT I: FOCES ACTING AT A POINT, PARALLEL FORCES AND MOMENTS 20 hrs.

Parallelogram of forces – triangle of forces – perpendicular triangle of forces – Lami's theorem – resolution of a force – conditions of equilibrium of any number of forces acting upon a particle. Parallel forces – moment of a force about a point.

UNIT II: COUPLES, EQUILIBRIUM OF THREE FORCES ACTING ON A RIGID BODY AND COPLANAR FORCES 20 hrs.

Couples: Varignon's theorem on moments, couples – related theorems – Equilibrium of three forces acting on a rigid body: Trigonometrical Theorems (Statement only) and related problems – Coplanar forces: Reduction of coplanar forces – reduction of a system of forces to a single force or to a couple – equation to the line of action of the resultant and related problems.

UNIT III: FRICTION 15 hrs.

Definition – Statical and Limiting 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 any force – equilibrium of a body on a rough inclined plane under a force parallel to the plane and related problems.

UNIT IV: PROJECTILES 18 hrs.

Path of a projectile is a parabola – characteristics of the motion of a projectile – range on an inclined plane and related problems.

UNIT V: COLLISION OF ELASTIC BODIES 17hrs.

Definitions – Fundamental laws of impact – Newton's experimental law – principle of conservation of momentum – impact of a smooth sphere on a fixed smooth plane – direct impact of two smooth spheres – loss of kinetic energy due to direct impact of two smooth spheres – oblique impact of two smooth spheres – loss of kinetic energy due to oblique impact of two smooth spheres

TEXTBOOK(S):

Venkataraman, M.K. (2005). *Dynamics*, Trichy: Agasthiar Book Depot. Print.

Unit IV: Chapter 6 (6.1 – 6.16), Unit V: Chapter 8 (8.1 -8.8).

Venkataraman, M. K. (2005). *Statics*, Trichy: Agasthiar Book Depot. Print. Unit I: Chapters 2, 3(3.1-3.13),

Unit II: Chapters 4, 5 (5.1-5.6 (upto pg. no. 122),5.7), 6(6.1 – 6.13), Unit III: Chapter 7(7.1 - 7.13 (upto pg. no. 251)).

REFERENCE BOOK(S)

Duraipandian, P., Duraipandian, L., Pragasam, M.J. (2006). *Mechanics*, New Delhi, Chand. S & Company Ltd. Print.

Loney, S.L. (1989). *The Elements of Statics and Dynamics Part I statics*, Delhi, Surjeet

Publications. Print.

Loney, S.L. (1989). *The Elements of Statics and Dynamics Part II Dynamics*, Delhi, Surjeet Publications. Print.

WEBLINK(S):

Calvin Rans. (June 26, 2020) *What is a Moment?* [Video file]. Retrieved from https://youtu.be/hD4ZdE1UIDw. CC by license.

Lincoln Learning solutions. (September 28, 2018) *Types of friction?* [Video file]. Retrieved from https://youtu.be/H877C_5BMkI. CC by license

MohanveluPalaniswamy. (May 25, 2016) *Parallelogram law of forces Practice problem* [Video file]. Retrieved from https://youtu.be/IRMOrCXOLgg.CC by license.

Majestic Mech (Oct 15, 2017) *Varignon's theorem* [Video file]. Retrieved from https://youtu.be/UABd38mEzsw .CC by license.

CO's cognitive level and mapping with PSO's

MAT6503CM MECHANICS							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K3 - Apply	1	2	1	1	2	2
CO2	K3 - Apply	1	2	1	1	2	2
CO3	K3 - Apply	1	2	1	1	2	2
CO4	K6 - Create	1	2	1	1	2	2
CO5	K6 - Create	1	2	1	1	2	2

MATQ6401CM FUZZY SETS

(THEORY)

COURSE OUTCOMES: **4 hrs./wk.**

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

CO1: compare fuzzy sets and crisp sets

CO2: represent fuzzy sets in terms of α - cuts

CO3: discuss various operations on fuzzy sets

CO4: employ arithmetic operations on fuzzy sets

CO5: discuss fuzzy relations

UNIT I: FUZZY SETS **10 hrs.**

Crisp sets – fuzzy sets: Basic types and concepts – characteristics and significance of the paradigm shift.

UNIT II: FUZZY SETS VERSUS CRISP SETS **10 hrs.**

Properties of α - cuts – representation of fuzzy sets.

UNIT III: OPERATIONS ON FUZZY SETS **15 hrs.**

Types of operations – fuzzy complements – fuzzy intersections – fuzzy unions.

UNIT IV: FUZZY ARITHMETIC **10 hrs.**

Fuzzy numbers – linguistic variables – arithmetic operations on intervals – arithmetic operations on fuzzy numbers.

UNIT V: FUZZY RELATIONS **15 hrs.**

Crisp versus fuzzy relations – projections and cylindric extensions – binary fuzzy relations – binary relations on a single set – fuzzy equivalence relations.

TEXTBOOK(S):

George J.Klir Bo Yuan. (2000). *Fuzzy sets and Fuzzy logic theory and applications*, New Delhi: Prentice Hall of India. Print. Unit I: Chapter 1, Unit II: Chapter 2, Unit III: Chapter 3(3.1 -3.4), Unit IV: Chapter 4(4.1 -4.4), Unit V: Chapter 5(5.1-5.5).

REFERENCE BOOK(S):

Zimmermann, H. J. (2006). *Fuzzy set theory and its applications*, New Delhi: Springer International Edition. Print.

John, Y., Langari, R. (2003). *Fuzzy logic intelligence, control and information*, India: Pearson Education. Print.

Kwang, H. L. (2005). *First Course on Fuzzy Theory and Applications,* New Delhi: Springer International Edition. Print.

Ganesh, M. (2011). *Introduction to Fuzzy Sets and Fuzzy Logic*, New Delhi: PHI Learning Pvt. Ltd. Print.

WEBLINK(S):

Atta KodallaVantillu. (2019, April 1). *FL – Classical Relations – Operations and Properties* [Video file]. Retrieved from https://youtu.be/DzyCBHPTyIk.CC BY license.

Mohamed Salih Mukthar. (2020, May 6). *Fuzzy Sets – Basic concepts* [Video file]. Retrieved from https://youtu.be/ RrseZK1obA. CC BY license.

Muhammad Adam Fahmil 'Ilmi. (2018, March 11). *Fuzzy Logic Application in Real Life – Robotics* [Video file]. Retrieved from https://youtu.be/DW1eegaH6Ys. CC BY license.

Welcome Engineers. (2019, September 25). *Introduction to Graph in Tamil* [Video file]. Retrieved from https://youtu.be/iH5PYVhX-Ks. CC BY license.

Zax Ong. (2016, March 5). *Fuzzy Logic in Real Life concepts* [Video file] Retrieved fromhttps://youtu.be/v_IauIkyBCQ .CC BY license.

CO's cognitive level and mapping with PSO's

MATQ6401CM FUZZY SETS							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K2 - Understand	1	1	2	1	2	2
CO2	K2 - Understand	2	2	1	1	1	2
CO3	K2 - Understand	1	2	1	1	2	1
CO4	K3 - Apply	1	2	1	1	1	2
CO5	K6 - Create	1	2	1	2	2	2

MATQ6402CM COMBINATORICS

(THEORY)

COURSE OUTCOMES: **4 hrs./wk.**

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

CO1: apply the pigeonhole principle and Ramsey theory in practical problems

CO2: make use of permutations and combinations to solve problems

CO3: prove and apply principles of inclusion and exclusion

CO4: solve homogeneous and non-homogeneous recurrence relations

CO5: formulate and solve generating functions

COURSE CONTENT:

UNIT I: THE PIGEONHOLE PRINCIPLE **12 hrs.**

Simple form – strong form – theorem of Ramsey.

UNIT II: PERMUTATIONS AND COMBINATIONS **15 hrs.**

Four basic counting principles – permutations of sets – combinations of sets – permutations of multisets – combinations of multisets.

UNIT III: THE PRINCIPLE OF INCLUSION AND EXCLUSION **12 hrs.**

The inclusion – exclusion principle – combinations with repetitions – derangements – permutations with forbidden positions – another forbidden position problem.

UNIT IV: RECURRENCE RELATIONS **12 hrs.**

Solution of finite order homogenous relations – solution of non-homogenous relations.

UNIT V: GENERATING FUNCTIONS **9 hrs.**

Generating functions – recurrences and generating functions.

TEXTBOOK(S):

Richard, A. B. (2011). I*ntroductory Combinatorics*, (4th ed.), Noida: Pearson Education. Print.

(Unit I: Chapter - 2, Unit II: Chapter - 3, Unit III: Chapter 6 (6.1 to 6.5), Unit V: Chapter 7(7.4, 7.5)).

Venkataram, M. K., Sridharan, N., Chandrasekaran, N. (2001). *Discrete Mathematics*, Chennai: The National Publishing Company. Print. (Unit IV: Chapter: 5(Sections 3, 4, 5)).

REFERENCE BOOK(S):

Tucker, A. (2010). *Applied Combinatorics*, (5thed.), U.K.: John Wiley and Sons. Print.

Apte, D.P. (2007). *Probability and Combinatorics*, New Delhi: Anurag Jain for Excel Books. Print.

Balakrishnan, V.K. (1995). *Theory and Problems of Combinatorics*, Singapore: Schaum's outline series, McGraw Hill Inc. Print.

BhismaRao, G.A.S, (2010). *Discrete Structures and Graph Theory*, Chennai: SciTech Publications. Print.

Geetha, P. (2007). *Discrete Mathematics*, Chennai: SciTech Publications. Print.

Sundaresan, V., Ganapathy, K. (2002). Discrete Mathematics, Sirkali: A.R. Publications. Print.

WEBLINK(S):

David Guichard. (2021, August 18). *Combinatorics and Graph Theory*. Retrieved from https://math.libretexts.org/Bookshelves/Combinatorics_and_Discrete_Mathematics/Combinatorics_and_Graph_Theory_(Guichard). CC BY-SA 3.0.

Santiago Beck E. (2014, January 8). *Ramsey Theory 1: A Motivating Example*. Retrieved from Video https://www.youtube.com/watch?v=7p76yYMth5A. CC BY License.

CO's cognitive level and mapping with PSO's

MATQ6403CM COMBINATORICS							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K3 - Apply	2	2	1	2	1	1
CO2	K3 - Apply	2	2	2	2	2	2
CO3	K5 - Analyze	2	2	1	2	1	1
CO4	K6 - Create	2	2	1	2	2	2
CO5	K6 - Create	2	2	1	2	2	2

MAE6402CT OBJECT ORIENTED PROGRAMMING II

LAB CUM THEORY

COURSE OUTCOMES: **3T+2L hrs./wk.**

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

CO 1: write programs using control statements, operators, and expressions

CO 2: explain the significance of classes, arrays, strings, and its associated parameters in a program

CO 3: develop programs using inheritance and interfaces

CO 4: identify the appropriate packages to develop a program

CO 5: make use of graphics class to create applets

COURSE CONTENT:

UNIT I: OVERVIEW OF JAVA **10T + 5L hrs.**

Fundamentals of OOP concepts – basics of Java: history – Java features – Java environment – Java tokens –constants – variables – data types – operators – expressions – control statements.

Experiential Learning:

Programs dealing with decision making and branching.

UNIT II: CLASSES, ARRAYS AND STRINGS **10T + 10L hrs.**

Classes and objects: defining a class – methods – creating objects – accessing class members – constructors – methods overloading – static members – nesting of methods – arrays: one dimensional array – creating an array – two-dimensional array – strings: string arrays – string methods.

Experiential Learning:

Programs for designing a class.

Programs which read process and display different data types.

Programs designed to read and process single and multidimensional arrays.

UNIT III: INHERITANCE AND INTERFACES **5T + 5L hrs.**

Inheritance: defining a subclass – multilevel inheritance – hierarchical inheritance – overriding methods – final variables and methods – final classes – finalizer methods – abstract methods and

classes – visibility control. Interfaces: defining interface – extending interface –implementing interface – accessing interface variables.

Experiential Learning:

Programs which deal with Inheritance, Interfaces and finalizer

UNIT IV: PACKAGES, EXCEPTIONS AND MULTITHREADING

15T+ 5L hrs.

Packages: Java API packages – system packages – naming conventions – creating and accessing a package – adding class to a package – hiding classes. Exception: types of errors – basics of exception handling – multiple catch statements – finally statement – user defined exception. Multithreading: creating threads – life cycle of a thread – thread methods – thread exceptions – thread priority – implementing runnable interface.

Experiential Learning:

Programs involving applications using pre-defined Java exceptions.

Programs involving predefined packages and user defined packages.

UNIT V: APPLET

5T + 5L hrs.

Introduction – applet life cycle – creating and executing an applet. Graphics: drawing and filling lines – rectangles – polygon – circles – arcs – line graphs.

Experiential Learning:

Programs involving graphics using Applet.

TEXTBOOK(S):

Balagurusamy, E. (2008). *Programming with Java*, (5thed.), NewDelhi: Tata McGraw-Hill publishing

Company limited. Print. (Unit I: Chapter: 1, 2(2.1, 2.2, 2.9), 3 (3.2,3.6), 4, 5, 6, 7,Unit II : Chapter: 8(8.1 – 8.16,8.18), 9(9.1 – 9.5), Unit III : Chapter:10, Unit IV : Chapter: 11(11.1 -11.9),12(12.1 – 12.8,12.10), 13,Unit V : Chapter: 14, 15(15.1 – 15.7)).

REFERENCE BOOK(S):

Strocker, C.,Plew,G.T. (2002). *Java Programming*, Galgotia Publications. Print.

Schildt, H. (2008). *The complete Reference Java*2, (5thed.) New Delhi: Tata McGraw – Hill publishing company limited. Print.

Naughton, P. (2002). *Java Handbook*, New Delhi: Tata McGraw Hill. Print.

Willtrain, (2000). *Java1.2*, New Delhi: BPB Publications. Print.

Xavier, C. (2006). *Projects on Java*, Chennai: Scitech Publications. Print.

WEBLINKS:

CatComputerTeacher. (2012, February 3). *Applet-Drawing Polygons* [Video file]. Retrieved from https://youtu.be/bh15DiZPeH8. CC By license.

CatComputerTeacher. (2012, February 8). *Applet-Mouse Events* [Video file]. Retrieved from https://youtu.be/s7MUcQU1ygI. CC By license.

DMKV Freelancer. (2018, May 2). *classes and object in java* [Video file]. Retrieved from https://youtu.be/IYAzZSvkhGQ. CC By license.

InfoQ. (2013, April 3). *Classes: Constructors-Dart Tips, Ep 11* [Video file]. Retrieved from https://youtu.be/k2R_HwZzogQ. CC By license.

Internet-class. (2016, October 27). *What was a Java applet?* [Video file]. Retrieved from https://youtu.be/nPrjwnoAaFY. CC By license.

ARUL SUJU D. (2018, October 13). *User Defined Packages in Java,* [Video file]. Retrieved from https://youtu.be/32yghENlk0g. CC By license.

CO's cognitive level and mapping with PSO's

MAE6402CT OBJECT ORIENTED PROGRAMMING II							
Class: III B. Sc. Mathematics			**Semester: VI**				
CO/PSO	**Cognitive level**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	K6 - Create	1	2	1	1	2	2
CO2	K2 - Understand	1	2	1	1	2	2
CO3	K2 - Understand	1	2	1	1	2	2
CO4	K3 - Apply	1	2	1	1	2	2
CO5	K3 - Apply	1	2	1	1	2	2

INTERDISCIPLINARY COURSES (Aided Course)

Sem	**Course Code**	**Course Title**	**Course Type**	**Hrs./ Wk.**		**Cr.**	**New / Revised course**	**% of revision**	**Passed in AC**	**Offered to**	**Offered by**
				TH	**LA**						
VI	**BOMA6402DM**	**MATHEMATICAL APPLICATIONS IN LIFE SCIENCES**	**TH**	**4**		**4**		**30%**		**AUMAT & AUBOT**	**MAT & BOT**
	CHMA6402DM	**APPLICATIONS OF GRAPH THEORY IN CHEMISTRY**	**TH**	**4**		**4**		**5%**		**AUMAT & AUCHE**	**CHE&. MAT**
	MAPH6401DT	**DIFFERENTIAL EQUATIONS FOR COMPUTATIONAL PHYSICS**	**LT**	**3**	**1**	**4**				**AUMAT & AUPHY**	**MAT & PHY**

BOMA6402DM MATHEMATICAL APPLICATIONS IN LIFE SCIENCES

(THEORY)

Class: III B.Sc. Botany & III B.Sc. Mathematics	**Semester:** VI	**Hours per week**: 4 hrs.
Cos	**COURSE OUTCOMES**	**COGNITIVE LEVEL**
On successful completion of the course, the student will be able to		
CO1	relate Fibonacci sequence and biological logarithm in life science	K1 Remember
CO2	explain the basic concepts of heredity and applications of probability	K2 Understand
CO3	calculate the correlation and regression coefficients for the given data	K3 Apply
CO4	examine the association of attributes	K4 Analyze
CO5	analyze the data using chi-square test	K4 Analyze

COURSE CONTENT:

UNIT I: FIBONACCI SEQUENCE AND BIOLOGICAL LOGARITHMS

12 hrs.

Phyllotaxy and inflorescence – applications of Fibonacci sequence – golden ratio – fractals basics of logarithms – growth phase of bacteria – plant cell division (mitosis and meiosis) – preparation of solutions – Molarity – Molality – Normality – Percentage and ppm solution

UNIT II: POPULATON GENETICS AND APPLICATIONS OF PROBABILITY

12 hrs.

Cells – chromosomes – genes – alleles – genome – probability in genetics – mono, dihybrid cross – blood grouping – mendelian population – gene pool – gene frequency – Hardy-Weinberg law – calculation of gene frequencies – quadrat method

UNIT III: CORRELATION AND REGRESSION

12 hrs.

Correlation: Introduction – significance of correlation– types of correlation – measures of correlation: scatter diagram– Karl Pearson's correlation coefficient – Regression: objectives – types of regression analysis – regression equations – regression coefficient. (Biological examples)

UNIT IV: THEORY OF ATTRIBUTES

12 hrs.

Introduction – notations – dichotomy – classes – class frequencies – order of classes – class frequencies – relation between class frequencies – class symbols as operators – consistence of data – conditions of consistency of data – Independence of attributes – criterion of Independence –

Symbols $(AB)_0$ and δ association of attributes – Yule's coefficient of association – coefficient of colligation.

UNIT V: CHI – SQUARE TEST

12 hrs.

Chi-square test – assumptions of validity – applications – Chi-square test as a test of independence – as a test of homogeneity – as a test of detect linkage. *Biological problems

TEXTBOOK(S):

Gupta, S.C., and Kapoor, V.K. (2015). *Elements of Mathematical Statistics*, (3rd ed.). New Delhi, Sultan Chand & Sons. Print. (Unit IV: Chapter 11).

Hartl, D.L., and Jones, E.W. (2000). *Genetics Analysis of Genes and Genomes*, (5th ed.), USA: Jones and Bartlett Publishers. Print.

Khan and Khanum. (2006). *Fundamentals of Biostatistics*, (3rd ed.). Hyderabad, Ukaaz Publications. Print. (Unit V: Chapter 8.1-8.4(8.4.2 – 8.4.4)).

Rastogi, V.B. (2011). Ane's student edition, *Fundamentals of Biostatistics*, (2nd ed.). New Delhi: Ane Books Pvt. Ltd. Print. (Unit III: Chapter 10 (pages: 210 - 224, 231 – 236)).

Verma, P.S., and Agarwal, V. K. (2009). *Genetics*, (9th ed.), New Delhi: S. Chand and Company Ltd. Print.

REFERENCE BOOK(S):

Arumugam, S., and Thangapandi, I. A. (2013). *Statistics,* Palayamkottai: New Gamma Publishing House. Print.

Rastogi, V. B. (2011). *Fundamentals of Biostatistics,* (2nd ed.), New Delhi: Ane Books Pvt. Ltd. Print.

Stansfield, D. W. (1986). *Theory and Problems of Genetics, (*2nd ed.), New Delhi: Tata McGraw Hill Publishing Company Limited. Print.

WEBLINK(S):

e-BOOK(S):

Baugade A N. (2019). *Module 5: Attributes.* Retrieved from http://www.gkgcollege.com/uploads/snstatistics/Module%205%20%20Attributes%20(1).pdf CC BY license.

VIDEO(S):

Doubtnut. (2020, Jun 7). *Calculate coefficient of correlation between series X and Y*. Retrieved from https://www.youtube.com/watch?v=-AZQ2qkgQyw. CC BY license.

L Hub (2014, Sep. 24). Linear regression and correlation 09 Regression line example. Retrieved from

https://www.youtube.com/watch?v=LJ3T0xinUIU. CC BY license.

Shakehand with Life. (2020, Jul 3). Hypothesis Testing Statistics: Chi Square Test as 'Goodness of Fit' Example Problem. Retrieved from https://www.youtube.com/watch?v=zrEKEarHUVY. CC BY license.

WORDENVISION 420 (2015, Dec 7) The Fibonacci Planet - Nature and Reality. [Video File] Retrieved from https://youtu.be/YnmncRECnfQ. CC BY License.

CHMA 6402DM APPLICATIONS OF GRAPH THEORY IN CHEMISTRY

(THEORY)

Class: III B.Sc. Chemistry& III B.Sc. Mathematics	**Semester:** VI	**Hours per week**: 4 hrs.
Cos	**COURSE OUTCOMES**	**COGNITIVE LEVEL**
On successful completion of the course, the student will be able to		
CO1	define the basic terms of graph theory	K1 Remember
CO2	apply the IUPAC rules for naming the hydrocarbons	K3 Apply
CO3	construct molecular graphs for organic compounds and chemical reactions	K3 Apply
CO4	discuss concepts in connectedness and apply Polya's enumeration theorem	K2 Understand
CO5	predict the properties of chemical compounds using topological indices	K6 Create

COURSE CONTENT:

UNIT I: INTRODUCTION TO GRAPH THEORY **12 hrs.**

Definitions and examples: vertices – edges – graphs – adjacent – incidence – degree – loop – types of Graphs – multiple graphs – pseudo graphs – complete graphs – bigraphs – complete bigraph – degree – isolated points – regular graphs – subgraphs – spanning subgraphs – induced subgraph – isomorphism – complementary graphs – Operation on graphs– union – sum – product – composition of graphs –Matrices– Planar graphs.

UNIT II: NOMENCLATURE, STRUCTURE AND ISOMERISM OF ORGANIC COMPOUNDS **12 hrs.**

IUPAC nomenclature and structure of hydrocarbons – alkanes – alkenes – alkynes (cyclic and acyclic) – Aromatic compounds – substituted – fused – bridged and hetero aromatic compounds – Isomerism – Structural – positional and Geometrical isomers.

UNIT III: CONSTRUCTION OF CHEMICAL GRAPHS **12 hrs.**

Molecular Graphs for alkanes – alkenes – alkynes (cyclic and acyclic) and Aromatic compounds – substituted – fused – bridged and hetero aromatic compounds – Isomerism: constitutional – steric – valence – isomorphic graphs – condensed polycyclic aromatic hydrocarbons – Introduction to Reaction graphs- types of chemical reactions - union of molecular graphs to give products (*eg* Diels-Alder reaction and Intramolecular rearrangements) –Synthon graphs**.**

UNIT IV: CONNECTEDNESS AND POLYA'S ENUMERATION THEOREM 12 hrs.

Walk – trials and paths –disconnected graphs- cut points – bridges – block –Trees: tree – eccentricity – radius – center – Polya's enumeration theorem (statement only) – problems related to Polya's enumeration theorem **–**polya enumeration theorem

UNIT V: PREDICTION OF PROPERTIES OF COMPOUNDS 12 hrs.

Prediction of Properties of Compounds using topological indices**–** Definition and Calculation of Weiner Index– Randic and Hosaya index of chemical structures–Prediction of physical and chemical properties of organic compounds–Correlation between Isomorphism and type of isomers.

REFERENCE BOOK(S):

Arumugam, S., and Ramachandran, S, (2003). *Invitation to Graph theory*, Chennai: Scitech Publication (India) Pvt. Ltd. Print. Unit I, IV

Alexandru, T. (1985). *Balaban Applications of Graph Theory in Chemistry J. Chem. Inf. Comput. Sci. Print*. Unit V

Mehta, B., Mehta, M. (2005). *Organic Chemistry*, (1st ed.), PHI Learning Pvt.Ltd. Print. Unit II

Bonchev. (1991). *Chemical Graph Theory: Introduction and Fundamentals (Mathematical Chemistry) Vol 1*, Taylor & Francis Ltd, Print.Unit III and V

IvanciucOvidiu ,*Graph Theory in Chemistry and Drug Design*, United Sates:Taylor& Francis Ltd.Print. Unit III and IV

Johann Gasteiger(ed.), Thomas Engel(ed.),(2003). *Chemoinformatic: A Textbook*, Wiley VCH, Weinheim. Print. Unit III and IV

WEBLINK(S):

Videos:

ATARC Chennai. (2021, Oct 1). *Crossing into Quantum.* [Video file]. Retrieved from https://www.tutorialspoint.com/graph_theory/graph_theory_quick_guide.htm. CC BY license.

Kimberly. (2008, Aug 1). *Chemical Graph theory.* [Video file]. Retrieved from https://www.maa.org/external_archive/joma/Volume8/Burch/index.html. CC BY license.

MAPH6401DT DIFFERENTIAL EQUATIONS FOR COMPUTATIONAL PHYSICS

(LAB CUM THEORY)

Class: III B.Sc. Physics & III B.Sc. Mathematics	**Semester:** VI	**Hours per week:** 3T +1L hrs.

COs	**COURSE OUTCOMES**	**COGNITIVE LEVEL**
On successful completion of the course, the student will be able to		
CO1	solve first order homogeneous and non-homogeneous differential equations with constant coefficients	K3 Apply
CO2	solve differential equations using Laplace transforms	K3 Apply
CO3	apply Laplace transforms to solve dynamical systems	K3 Apply
CO4	identify the SymPy commands for computations in Physics	K1 Remember
CO5	analyze the solutions of dynamical systems using Python	K4 Analyze

COURSE CONTENT:

UNIT I: ORDINARY DIFFERENTIAL EQUATIONS **11 T hrs.**

Differential equations – problems associated with differential equations – linear equations of first order – the equation y'+ay=0 – the equation y'+ay=b(x) – the general linear equation of the first order

UNIT II: LAPLACE TRANSFORMS **11 T hrs.**

Applications to differential equations – derivatives and integrals of Laplace transforms – convolutions – Abel's mechanical problem – the unit step and impulse functions

UNIT III: APPLICATIONS OF LAPLACE TRANSFORMS **11 T hrs.**

Response of an RC circuit to a single rectangular wave – response of an RLC circuit to a sinusoidal input – mass spring system under a square wave – hammer blow response of a mass-spring system.

UNIT IV: SYMBOLIC PYTHON (SymPy): BASICS **12 T hrs.**

Introduction to computing with Python – the Python environment – plotting and visualization using Matplotlib – importing modules – calculus using SymPy – Laplace transform of standard functions – symbolic solution to ordinary differential equations – solving ordinary differential equations using Laplace transformations.

UNIT V: LAPLACE TRANSFORM SIMULATIONS USING SYMPY **15 L hrs.**

SymPy: Laplace and inverse Laplace transform of simple functions – applications to differential equations and graphing the solutions: Newton's law of cooling – analysis of RC and RLC circuits – damped harmonic oscillator.

TEXTBOOK(S):

Earl, A. C. (2003). *An Introduction to ordinary differential equations*, New Delhi: Prentice Hall of India Ltd. Print. Chapter 1, Unit I

Dhanorkar, G., and Sonawane, D. (2014). *Simulation of Laplace transforms with Python*, *International Journal of Mathematical Archive*5(8), 30-35.

Johansson, R. (2015). *Numerical Python a practical techniques approach for industry,* New York: Apress.

Chapters: 1 (pg. 1-10), 4 (89-97), 9 (207-214,217-219)

Krantz, S. G. and Simmons, G. F. (2014). *Differential equations*: Theory, technique, and practice. Boca Raton: Chapman & Hall/CRC. Print. Chapter 7, Unit II

Kreyszig, E. (2013). *Advanced engineering mathematics,* (9th ed.), UK: John Wiley & Sons. Print.

Chapters: 6.3 (pg. 237-239), 6.4 (pg. 243-244), Unit V

REFERENCE BOOK(S):

Srivastava, A. N., Ahmad, M. (2012). Integral Transforms and Fourier Series, New Delhi: Narosa Publishing House. Print.

Grewal, B.S (2015), Higher Engineering Mathematics, New Delhi: Khanna Publishers. Print

Raisinghana, M.D. (1997), Ordinary and Partial Differential Equations, S. New Delhi: Chand & Company Ltd., Print.

WEBLINK(S):

eBook:

Jeremy Tatum. (2021). *Laplace Transforms*. Retrieved from https://phys.libretexts.org/Bookshelves/Electricity_and_Magnetism/Book%3A_Electricity_and_Magnetism_(Tatum)/14%3A_Laplace_Transforms. CC BY-NC-SA 3.0 license.

Video:

MechanicaLEi. (2017, June 27). *What are Laplace Transforms?* [Video file]. Retrieved from https://www.youtube.com/watch?v=HC03r21qFHc . CC BY license.

MAPH6403DM INTRODUCTION TO ASTROPHYSICS

(THEORY)

Class: III B.Sc. Physics with CA & III B.Sc. Mathematics with CA	**Semester:** VI	**Hours per week**: 4 hrs.
Cos	**COURSE OUTCOMES**	**COGNITIVE LEVEL**
On successful completion of the course, the student will be able to		
CO1	apply the appropriate techniques to study the properties of stars	K3 Apply
CO2	explain the basic principles behind the evolution of stars, galaxies and the universe	K2 Understand
CO3	discuss on celestial sphere and its related terms.	K2 Understanding
CO4	explain the successive Phases of the Moon	K5 Evaluate
CO5	describe the sun's atmosphere, energy production and the occurrence of solar and lunar eclipse	K2 Understanding

COURSECONTENT:

UNIT I: TOOLS AND TECHNIQUES IN ASTRONOMICAL MEASUREMENTS 1**2 hrs.**

Refracting telescopes – reflecting telescopes – angular resolution – charged coupled devices – radio telescopes – stellar distances and parallax – apparent brightness and luminosity – magnitude scale – star colors and temperature – Hertzprung – Russell diagram.

UNIT II: STELLAR EVOLUTION, GALAXIES AND COSMOLOGY 1**2 hrs.**

Protostars and dark nebulae – reaching the main sequence – red giants – planetary nebulae – white dwarfs – core-collapse supernovae – classifying galaxies – Hubble law – expanding universe – big bang

UNIT III: CELESTIAL SPHERE 1**2 hrs.**

Celestial sphere – diurnal motion – celestial axis and equator – celestial horizon – zenith and nadir – celestial meridian – cardinal points – northern and southern hemispheres – eastern and western hemispheres – visible and invisible hemispheres – declination circles – verticals – parallactic angle – rising and setting – transit or culmination – due east – due west – due north – due south – annual motion of the Sun – ecliptic – obliquity – first point of Aries – first point of Libra-equinoxes and solstices – colures – celestial co–ordinates – to trace the changes in the co-ordinates of the Sun in the course of a year – sidereal time – latitude of a place – to find the hour angle of a body at rising or setting – to find the duration of day time – morning and evening stars – circumpolar stars – the zones of the Earth – to trace the variations in the duration of day and night during the year at different stations

UNIT IV: THE MOON **12 hrs.**

Sidereal month – synodic month – elongation – conjunction – opposition – quadrature's – daily motion of the moon – Age of moon – Phase of moon – successive phases of the moon – moon exhibits the same side to the earth – Metonic cycle – golden number – epact – Sunday letter – Earth shine.

UNIT V: OUR SUN **12 hrs.**

Photosphere – chromosphere – corona – thermonuclear energy – lunar – solar eclipses – penumbral regions – maximum and minimum number of eclipses in a year

TEXTBOOK(S):

Kumaravel, S.and Susheela Kumaravelu, (2004). *Astronomy,* Nagercoil: SKV Publications. Print.

Unit - III - Chapter–II Articles 39 – 63, 67, 69, 72-73,76-77, 80 – 82, Chap–III Articles 87 – 88.

Unit - IV -Chapter – XII Articles 229 – 242, 250 – 251 and 254

Unit - V - Chapter–XIII Articles 256 – 259, 272 – 274.

Kaufman, W.J., Roger, A. F and Geller, R. M. (2014).*Universe*,10th edition, USA : W.H. Freeman Company. Print.

Chapters:6.1–6.4,6.6,16.1,16.5–16.7,17.1–17.4,17.7,18.3,18.4,19.2,20.3 (Pg No.567–568), 20.4(Pg No. 569 – 570), 20.6 (Pg No. 575 – 577),23.3,23.5,25.2,25.3.

REFERENCE BOOK(S):

Abhayankar, K.D., (2001). *Astrophysics, Stars and Galaxies,* India: Universities Press. Print.

BaidyanathBasu., TanukaChattopadyay., & Sudhindranath Biswas, (2011). *An introduction to Astrophysics, (2nd ed.),* New Delhi: PHI learning private Ltd. Print.

Bhattacharya, Joardar A.B. & Bhattacharya S. R., (2010). Astronomy and Astrophysics, India: Overseas Press Pvt. Ltd. Print.

Seeds, M. A. (2001). *Foundations of Astronomy*, USA: Brooks/Cole Thomson learning. Print. Sasidharan, G.K. (2008). *The Great Universe,* New Delhi: S. Chand & Company Ltd. Print. Srinivasan, G. (2011). *Can stars find peace?* India: Universities Press. Print. Swamy Krishna, K.S. (2007). Astrophysics: *A Modern Perspective*, New Delhi: New Age International(P) Limited. Print.

WEBLINK(S):

Jesse, E. M. (2020) Introductory Astronomy OER. Retrieved from https://www.oercommons.org/courses/introductory-astronomy-oer. CC BY-NC-SA license. Khan, S. (2011, February 20). Cosmology and Astronomy: Scale of the Galaxy [Video file]. Retrievedfromhttps://www.oercommons.org/courses/cosmology-and-astronomy-scale-of-the-galaxy. CC BY- NC-SA 3.0 US license.