DEPARTMENT OF MATHEMATICS (UG)

About the department

The Department of Mathematics of G.T.N. Arts College established in the year 1964 is well known for imparting quality education. The Post graduate and Under Graduate programs (Self supporting courses) were started in the academic year 2016-17. The Department has experienced,` dedicated, committed and highly qualified faculty members with various specializations. Our staff members have written many books and published more than 100 research articles in National & International journals of repute. It has got its alumni well placed in India and abroad. The Department is consistently conducting Workshops, Seminars and other academic activities in every year. Under the able guidance and dedication of faculty members, our students have registered remarkable achievements in various academic activities.

PRINCIPAL

Dr. P. Balagurusamy, M.A., M.Phil., M.Ed., P.G.D.C.A., Ph.D.,

STAFF MEMBERS

Aided

1. Tmt. N. Sakunthala, M.Sc., M.Phil., B.Ed., PGDCA	**Associate Professor and Dean of Student's Affairs (Women)**
2. Dr. S. Ramachandran, M.Sc., M.Phil., Ph.D.,	**Assistant Professor and Head**
3. Dr. C. Subramani, M.Sc., M.phil., SET., Ph.D.,	**Assistant Professor**
4. Dr. J. KaligaRani, M.Sc., M.Phil., Ph.D.,	**Assistant Professor**
5. Dr. P. Pandiammal, M.Sc., M.Phil., Ph.D.,	**Assistant Professor**

Self Supporting PG

1. K.Sujatha, M.Sc., M.Phil.,	**Assistant Professor and Head**
2. N.Sumathi, M.Sc., M.phil.,	**Assistant Professor**
3. Dr. A. Mohamed Ali, M.Sc., M.phil., Ph.D., PGDCP.,	**Assistant Professor**
4. A. Bhaalamurugan M.Sc., M.Phil., B.Ed.,	**Assistant Professor**

Self Supporting UG

1. A.Theeba.,M.Sc., M.Phil., B.Ed.,	**Assistant Professor and Head**
2. S.Rajkumar, M.Sc., M.Phil.,	**Assistant Professor**
3. M.Devi Priya, M.Sc., M.Phil., M.Ed.,	**Assistant Professor**
4. G.A.Pradheepa, M.Sc., M.Phil.,	**Assistant Professor**
5. S.Divya Priya, M.Sc., M.Phil.,	**Assistant Professor**
6. P. Sathya, M.Sc., M.Phil., B.Ed.,	**Assistant Professor**
7. V. Kasivisalakshi Praveena, M.Sc., M.Phil., PGDCA	**Assistant Professor**
8. K. Sankar, M.Sc., M.Phil., B.Ed.,	**Assistant Professor**
9. S. Tharani M.Sc., M.Phil.,	**Assistant Professor**

Programme Outcomes for Science

On successful completion of the B.Sc. programme, the graduates will be able to,

1. Apply the knowledge acquired in the respective disciplines and also have a multidisciplinary perspective towards the study of sciences.
2. Attain skills like analytical reasoning, critical thinking and problem solving to evince interest in higher education and research for offering solutions to societal and environmental problems.
3. Communicate articulately and effectively and interpret the results obtained from scientific studies and put forth innovative ideas to carve a niche in their domain.
4. Instill the principles and ethics learnt from the field of study and exhibit the qualities like leadership, entrepreneurship and teamwork for discharging their duties as responsible citizens.
5. Utilize the growing advancements in Information and Communication Technology and embrace digital learning to become life-long learners

Program Specific Outcomes (PSOs)

After the completion of three year under graduation programme of Mathematics, the students will be able to

PSO1: Exhibit the acquired knowledge of mathematical concepts in various domains of science and technology.

PSO2: Interpret the constructed theoretical concepts of mathematics and its contemporary.

PSO3: Apply the strategies of mathematics effectively to obtain (designing) optimal solutions.

PSO4: Develop the skills of problem solving, analytic reasoning and logical thinking.

PSO5: Interpret and generate information with mathematical concepts and statistics.

PSO6: Identify the applications of Mathematics in various disciplines

PSO7: Defend the various levels of competitive examinations.

PSO8: Acquire computation, programming and software skills to get empowered with Employability and Entrepreneurial skills

PSO9: Gaining Language of grammatical, conventions, varities, formulations, courses and culture becoming competent to face competitive examination through development of language skills.

PSO10: Acquire knowledge of the emerging environmental challenges and provide the possible contribution in sustainable development that integrates environment, economy and employment.

PSO11: Exemplify the human values, morals and be socially responsible citizen of this country.

PSO12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Under Choice Based Credit System (CBCS)
Under Graduate Courses

G.T.N. Arts College (Autonomous), a pioneer in higher education institution in India, strives to work towards the academic excellence. The new Outcome Based Education (OBE) system allows enhanced academic mobility and enriched employability for the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric curriculum designing and skill imparting. This new system will work concertedly to achieve and accomplish the following objectives:

1. Optimal utilization of resources both human and material for the academic flexibility leading to exemplary outcome.
2. Students experience or enjoy their choice of courses and credits for their horizontal mobility.
3. The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit- Transfer Across the Disciplines (CTAD) – a uniqueness of the Choice Based Credit System.

Course Pattern for B.Sc., (Mathematics)

The Undergraduate degree course consists of five vital components. They are as follows:
Part I Language (Tamil / French)
Part II English
Part III Core Course (Theory, Practical, Core Electives, Allied).
Part IV Skill Based, Self Paced, Non Major Electives, Soft Skills, Environmental Studies and Value Education.
Part V Physical Education (Practical) and Extension Activities.

Objectives

The Syllabus for B.Sc.,(Mathematics). Degree under semester system has been designed on the basis of Choice Based Credit System (CBCS), which would focus on job oriented programmes and value added education. It will be effected from June 2020 onwards.

Eligibility

Candidates should have passed the Higher Secondary Examination, Government of Tamil Nadu or any other examination accepted by the syndicate of Madurai Kamaraj University as equivalent there to.

Duration of the Course

The students who join the B.Sc.., Degree shall undergo a study period of three academic years – Six semesters.

Summary of Hours and Credits
B.Sc Mathematics

Part	Semester	Specification	No. of Courses	Hrs	Credits	Total
I	**I - IV**	**Languages (Tamil / French)**	4	24	12	**12**
II	**I - IV**	**English**	4	24	12	**12**
III	**I – VI**	**Core Courses** Theory Electives Project	 12 2 1	 62 8 2	 54 6 2	**102**
		Allied Courses Theory Practical	 8 3	 38 6	 34 6	
IV	**I & II**	**Non Major Elective Courses**	2	4	4	**20**
	I & II	**1. Value Education** **2. Environment and Gender Studies**	2	4	4	
	V&VI	**Skill Based Courses** Theory Practical	 2 2	 4 4	 4 4	
	III & IV	**Self Study Courses (Soft Skills I & Soft Skills II)**	2	-	4	
V	**II**	**Physical Education - Practical (Non-Semester Course)**	1	-	2	**4**
	IV	**Extension Activities**	1		2	
		Total	**46**	**180**	**150**	**150**

Course Pattern – from 2020-2021 Batch –B.Sc Mathematics

Sem	Part		Course Code	Course Title	Hr./ week	Credit
I	I	Tamil I / French I	20UTAL11/ 20UFRL12	jw;fhy ftpijAk; rpWfijAk; French Language And Civilization I	6	3
	II	English I	20UENL11	English Language through literature I	6	3
	III	Core Course I	20UMAC11	Differential Calculus	4	3
		Core Course II	20UMAC12	Classical Algebra	4	3
		Allied Course I	20UPHA11	Allied Physics - I	6	4
	IV	Non Major Elective Course 1	20UMAN11	Fundamentals of Mathematics	2	2
		Value Education	20UVEV11	Value Education	2	2
				Total	**30**	**20**
II	I	Tamil II / French II	20UTAL21/ 20UFRL22	gf;jp ,yf;fpaKk; GjpdKk; French Language And Civilization II	6	3
	II	English II	20UENL21	English Language Through Literature II	6	3
	III	Core Course III	20UMAC21	Integral Calculus	4	3
		Core Course IV	20UMAC22	Sequences and series	4	3
		Allied Course II	20UPHA21	Allied Physics - II	4	4
		Allied Practical I	20UPHA2P	Allied Physics practical I	2	2
	IV	Non Major Elective Course II	20UMAN21	Statistical Methods	2	2
		Environment and Gender Studies	20UEGS21	Environment and Gender Studies	2	2
	V	Physical Education Practical	20UPEV2P	Physical Education Practical (Non Semester)	-	2
				Total	**30**	**24**
III	I	Tamil III / French III	20UTAL31/ 20UFRL31	fhg;gpa ,yf;fpa Kk; ciueilAk; French Language And Civilization III	6	3
	II	English III	20UENL31	English Language through literature III	6	3
	III	Core Course V	20UMAC31	Mechanics	6	5
		Core Course-	20UMAC32	Analytical	6	5

		VI		geometry 3D and Vector calculus		
		Allied Course III	20UPHA31	Allied Physics - III	6	4
	IV	Self Study Course I	20USSS31	Soft Skills I		2
				Total	**30**	**22**
IV	I	Tamil IV / French IV	20UTAL41 / 20UFRL41	gz;ila ,yf;fpaKk; ehlfKk; / French Language, Culture And Civilization IV	6	3
	II	English	20UENL41	English Language through literature IV	6	3
	III	Core Course VII	20UMAC41	Real Analysis	6	5
		Core Course VIII	20UMAC42	Operations Research	6	5
		Allied Course IV	20UPHA41	Allied Physics - IV	4	4
		Allied Practical II	20UPHA4P	Allied Physics practical II	2	2
	IV	Self Study Course II	20USSS31	Soft Skills II		2
	V	Extension Activities	Common Code	Club Activities		2
				Total	**30**	**26**
V	III	Core Course IX	20UMAC51	Discrete Algebraic Structures	5	5
		Core Course X	20UMAC52	Differential Equations and Laplace transform	5	5
		Allied Course V	20UMAA51	Numerical Methods with C	3	3
		Allied Practical III	20UMAA5P	Numerical Methods with C Programming	2	2
		Allied Course VI	20UMAA52	Mathematical Statistics- I	5	5
		Core Elective Course I	2OUMAE51 20UMAE52 20UMAE53	Fourier Transformation and Z Transformation Combinatorics Formal Languages and Automata	4	3

				Theory		
		Core Project I	20UMAGP5	Project	2	2
	IV	Skill Based Course I	20UMAS51	Trigonometry and Lattice Theory	2	2
		Skill Based Course II	20UMAS5P	MATLAB	2	2
				Total	**30**	**29**
VI	III	Core Course XI	20UMAC61	Linear algebra	6	6
		Core Course XII	20UMAC62	Complex Analysis	6	6
		Allied Course VII	20UMAA61	Graph theory	5	5
		Allied Course VIII	20UMAA62	Mathematical Statistics- II	5	5
		Core Electives Course II	20UMAE61 20UMAE62 20UMAE63	Logic and Boolean Algebra Fuzzy Sets Mathematical Modelling	4	3
	IV	Skill Based Course III	20UMAS61	Number Theory and Inequality	2	2
		Skill Based Course IV	20UMAS6P	R Programming	2	2
				Total	**30**	**29**
				Total	**180**	**150**

Allied Courses

There will be Eight Allied courses (Physics and Mathematics) to fulfill the B.Sc., (Mathematics) programme during three years.

Subject	Maximum Marks	Year of Study
Allied Physics I	100	I
Allied Physics II	100	I
Allied Physics Practical I	100	I
Allied Physics III	100	II
Allied Physics IV	100	II
Allied Physics practical II	100	II
Numerical Methods with C	100	III
Numerical Methods with C Programming	100	III
Graph theory	100	III
Mathematical Statistics- I	100	III
Mathematical Statistics- II	100	III

The Syllabus for the Allied Courses can be obtained from the Allied Departments.

Courses offered to Non-major students by the Department of Mathematics (UG)

Supportive:

Sem.	Part	Course Code	Course Title	For the Department	Hr/ wk	Cr.	Marks
I	III	20UMAA11	Allied Mathematics - I	B.Sc(Physics & Chemistry)	6	5	100
I	III	20UMAA12	Discrete Mathematics	B.Sc., (CS & IT) , BCA	4	4	100
II	III	20UMAA21	Allied Mathematics - II	B.Sc(Physics & Chemistry)	6	5	100
II	III	20UMAA22	Operations Research	B.Sc (CS & IT), BCA	4	4	100
III	III	20UMAA31	Allied Mathematics - III	B.Sc(Physics and Chemistry)	6	5	100
III	III	20UMAA32	Business Statistics	BBA	6	4	100
III	III	20UMAA33	Numerical Methods	B.Sc,. (CS &IT)	4	4	100
IV	III	20UMAA41	Allied Mathematics - IV	B.Sc. (Physics & Chemistry)	6	5	100
IV	III	20UMAA42	Business Mathematics	BBA	6	4	100
IV	III	20UMAA43	Quantitative Aptitude	B.Sc.(CS & IT)	4	4	100

Practicals

Record Note Book	:	10 marks
Internal	:	30 marks
External examination	:	60 marks
Total	:	100 mark

Value Added Courses (with effect from the academic year 2021-22 onwards)

The Department of Mathematics has offered the following Value Added Courses for UG students.

(i) Mathematics for competitive examinations I
(ii) Mathematics for competitive examinations II
(iii) Mathematics for competitive examinations III
(iv) Mathematics for competitive examinations IV

Value Added Courses

The Department of Mathematics is offering the following Value Added Courses for thirty hours for all the UG students with no prejudice to the Under Graduate programme results.

Sl.No.	Semester	Course Code	Course Title
1.	III	20CMAT31	Developing Quantitative Aptitude I
2	IV	20CMAT41	Developing Quantitative Aptitude II

Value Added Courses (with effect from the academic year 2022-23 onwards)

Under DBT Star College Scheme, the following Value Added Courses are introduced with effect from the academic year 2022-23 onwards by the Department of Mathematics.

Sl.No.	Semester	Course Code	Course Title
1.	III	20CMAT3P	Python Programming
2	IV	20CMAT4P	SAGEMATH (20CMAT4P)
3	V	20CMAT5P	Office Automation (20CMAT5P)
4	VI	20CMAT6P	LATEX (20CMAT6P)

Extra Credit Self Paced Courses for Advanced Learners:

(i) Discrete Mathematics – I
(ii) Discrete Mathematics – II
(iii) Resource Management Techniques – I
(iv) Resource Management Techniques – II

Programme	**B.Sc.(Mathematics)**	**Programme Code**	**UMA**
Course Code	**20UMAC11**	**No. of Hrs per cycle**	**4**
Semester	**I**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
Core Course I			
Course Title	**Differential Calculus**		
Cognitive level: Upto K3			

Preamble

To provide fundamentals of differentiation and show their significant role in upper level maths, science, engineering, physical, economical and industrial world.

Unit I **12 Hours**

Successive differentiation – n^{th} derivative – standard results – trigonometric transformations. Formation of equations involving derivatives – Leibnitz Formula for the n^{th} derivatives of a product Meaning of a derivative – geometrical interpretation- meaning of the sign of the differential co-efficient – Rate of change of variable - velocity and acceleration.

Unit II **12 Hours**

Total differential co-efficient – Implicit functions –Jacobians – maxima and minima of functions of two variables – sub tangent and sub normal – Differential coefficient of the length of an arc of $y = f(x)$

Unit III **12 Hours**

Polar co-ordinates.-Angle between the radius vector and the tangent – Slope of the tangent – Angle of intersection of two curves. Polar sub tangent and polar subnormal – length of arc in polar co-ordinates.- Envelopes

Unit IV **12 Hours**

Curvatures – circle radius and centre of curvature – Cartesian formula for the radius of the curvature – Parametric and implicit form of the radius of the curvature - the co-ordinates of the centre of curvature.

Unit V **12 Hours**

Evolute –Properties of evolute- involute – polar coordinates – radius of curvature in polar co-ordinate – p-r-equation; pedal equation of curves – chord of curvature passing through the poles.

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion andQuiz

Text Books

1. T K M. Pillay & S.Narayanan (2008), Differential Calculus, Volume I, Vishwanathan Pvt.Ltd Chennai.
2. Vittal & V.Malini. P.R,(2010), Calculus, Margham Publications Chennai.

Reference Books

1. Arumugam. S. (2011) Calculus New Gamma publications Palayamkottai.
2. Veerarajan .T. (2012) Engineering Mathematics for I year ,Tata McGraw-Hill publications New Delhi
3. Venkataraman. M.K (2010) Engineering Mathematics Volume I The National Publishing Company Chennai.

E-Resources

IIT Lectures, UGC GyanDharshan videos

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org

- https://nptel.ac.in/course.html

Course outcomes

At the end of the course, students would be able to:

CO 1	Find n^{th} derivative and understand the geometrical meaning of a derivative and rate of change of variable
CO 2	Develop problem solving skills using total differential coefficient and know the concept of maxima and minima
CO 3	Acquire knowledge in polar sub tangent and subnormal
CO 4	Solve problems in radius center and circle of curvature.
CO 5	Learn to solve problems in evolute and p-r equations of curves

Mapping of Programme specific outcomes with Course Outcomes

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO1 0**	**PSO1 1**	**PSO1 2**
CO 1	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO 2	**3**	**3**	**2**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO 3	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO 4	**3**	**3**	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO 5	**2**	**3**	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**

1-Low 2-Moderate 3-High

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/Or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers.
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice	Section B (Either/or)	Section C (open choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	40	-	45	45%	45%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I	Successive differentiation & n^{th} derivative	1	Lecture ,Chalk & Talk
	Standard results	2	Chalk & Talk
	Trigonometric transformations	1	Chalk & Talk
	Formation of equations involving derivatives	1	Chalk & Talk
	Leibnitz Formula for the nth derivatives of a product	3	Chalk & Talk
	Meaning of a derivative & geometrical interpretation	1	Chalk & Talk
	Meaning of the sign of the differential co-efficient	1	Chalk & Talk
	Rate of change of variable & velocity and acceleration	2	Chalk & Talk
II	Total differential co-efficient	2	Chalk & Talk
	Implicit functions	2	Chalk & Talk
	Jacobians	2	Chalk & Talk
	Maxima and minima of functions of two variables	3	Chalk & Talk
	Sub tangent and sub normal	2	Chalk & Talk
	Differential coefficient of the length of an arc of y = f(x)	1	Chalk & Talk
III	Polar coordinates	1	Chalk & Talk
	Angle between the radius vector and the tangent	2	Chalk & Talk
	Slope of the tangent	1	Chalk & Talk
	Angle of intersection of two curves	1	Chalk & Talk
	Polar sub tangent and polar subnormal	2	Chalk & Talk
	Length of arc in polar co-ordinates	2	Chalk & Talk
	Envelopes	3	Chalk & Talk
IV	Curvatures	1	Lecture, Chalk & Talk
	Circle radius and centre of curvature	2	Chalk & Talk
	Cartesian formula for the radius of the curvature	3	Chalk & Talk
	Parametric and implicit form of radius of curvature	2	Chalk & Talk
	Co-ordinates of the centre of the curvature	4	Chalk & Talk
V	Evolute& Properties of evolute	4	Chalk & Talk
	Involute & Polar coordinates	2	Chalk & Talk
	Radius of curvature in polar coordinates	2	Chalk & Talk
	p-r-Equation - Pedal equation of curves	3	Chalk & Talk
	Chord of curvature passing through the poles	1	Chalk & Talk

Course Designed by, Prof. N. Sakunthala

Programme	B.Sc.(Mathematics)	Programme Code	UMA
Course Code	20UMAC12	No. of Hrs per cycle	4
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Course II			
Course Title	Classical Algebra		
Cognitive Level: Up to K3			

Preamble:

The students are introduced to the different methods of solving polynomials with real coefficients and acquire sound knowledge in Inequality.

Unit I **12 Hours**

Theory of Equations – Reminder Theorem - Fundamental theorem of algebra - Symmetric function of roots - Sum of the powers of the roots of an equation-Newton's theorem on sum of the powers of the roots - Transformation of equations - Roots with signs changed - Roots multiplied by the given number

Unit II **12 Hours**

Reciprocal equation –To increase or decrease the roots by given quantity-- Horner's method – Removal of terms

Unit III **12 Hours**

Transformation in general – Nature and position of roots – Descarte's rule – Roll's theorem - Multiple roots – Solutions of numerical equations – Integral roots – Newton's method of divisors.

Unit IV **12 Hours**

Sturm's Theorem – Sturm's function – Solution of cubic equation – Cardon's method – Bi-quadratic equation-Ferrari's method

Unit V **12 Hour**

Inequalities - Triangular inequalities - Arithmetic, Geometric and Harmonic mean - Cauchy Schwarz inequalities – Wierstrass inequalities- simple problems.

Pedagogy

Class Room lectures, ICT, Participatory method of teaching, Group discussion and Quiz

Text Books

1. Narayanan.S & Manickavasagampillai .T.K, (2011), *Algebra Volume I* S.Viswanathan Publication, Chennai
2. Arumugam.S, and Issac. A.T., (2011), Classical *Algebra*, New Gamma Publications house, Chennai.

Reference Books

1. Arumugam.S, and Issac. A.T., (2011), Theory of Equation, New Gamma Publications house, Chennai,
2. Vittal .P.R and Malini (2009) Algebra Analytical Gemometry and Trigonomentry Classical Algebra , Margham Publications. Chennai,
3. Venkataraman.M. K, (2013), Engineering mathematics, Volume II, National Publishing company, Chennai.

E-resources:

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcome

At the end of the course, students would be able to:

CO 1	Find the roots of an equation using various technique
CO 2	Apply various method to solve reciprocal equation & Find the approximation roots by Horner's method
CO 3	Acquire sound knowledge in finding nature and position of roots
CO 4	Develop problem solving skill in Cardon's method and Ferrari's method
CO 5	Acquire sound knowledge in inequalities

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**	**PSO 11**	**PSO 12**
CO 1	3	2	1	2	1	2	2	1	1	1	1	1
CO 2	3	1	2	1	1	2	2	1	1	1	1	1
CO 3	3	2	1	3	1	2	2	1	1	1	1	1
CO 4	3	1	2	2	1	1	2	1	1	1	1	1
CO 5	3	1	3	2	1	2	3	1	1	1	1	1

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/Or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K2	2(K3&K3)	1(K2)
2	CO2	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1 & K2	2(K3&K3)	1(K3)
5	CO5	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/ or)	Section C (Either/ or)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5	5
K2	5	24	10	39	39	39
K3	-	16	40	56	56	56
Total Marks	10	40	50	100		100%

Lesson Plan

Unit	Description	Hours	Mode
I	Theory of Equations, Reminder Theorem	2	Lecture ,Chalk & Talk
	Fundamental theorem of algebra	1	Chalk & Talk
	Symmetric function of roots	2	Chalk & Talk
	Sum of the powers of the roots of an equation- Newton's theorem on sum of the powers of the roots	4	Chalk & Talk
	Transformation of equations, Roots with signs changed, Roots multiplied by the given number	3	Chalk & Talk
II	Reciprocal equation	2	Chalk & Talk
	To increase or decrease the roots by given quantity	2	Chalk & Talk
	Horner's method	4	Chalk & Talk
	Removal of terms	4	Chalk & Talk
III	Transformation in general	2	Chalk & Talk
	Nature and position of roots, Descarte's rule	2	Chalk & Talk
	Roll's theorem	2	Chalk & Talk
	Multiple roots	2	Chalk & Talk
	Solutions of numerical equations, Integral roots	1	Chalk & Talk
	Newton's method of divisors	3	Chalk & Talk
IV	Sturm's Theorem, Sturm's function	4	Lecture, Chalk & Talk
	Solution of cubic equation, Cardon's method	4	Chalk & Talk
	Bi-quadratic equation, Ferrari's method	4	Chalk & Talk
V	Inequalities - Triangular inequalities	2	Chalk & Talk
	Arithmetic, Geometric and Harmonic mean	4	Chalk & Talk
	Cauchy Schwarz inequalities	2	Chalk & Talk
	Wierstrass inequalities, simple problems	4	Chalk & Talk

Course Designed by, Mrs. N. Sakunthala, Dr. S. Ramachandran, Dr. P.Pandiammal,

Programme	**B.A/B/Sc/B.Com**	**Programme Code**	**UMA**
Course Code	**20UMAN11**	**Number of Hours/ Cycle**	**2**
Semester	**I**	**Max. Mark**	**50**
Part	**IV**	**Credit**	**2**
Non Major Elective Course I			
Course Title	**Fundamentals of Mathematics**		
Cognitive level Up to K3			

Preamble:

The aim of this course is to introduce the basic concepts in mathematics which are relevant for students of humanities, arts and science the course deals with matrices, indices and surds, Differential calculus, simple interest, set language.

Unit I **6 Hours**

Theory of Matrices –types of matrices –operations on them - Addition, Multiplication of two matrices.

Unit II **6 Hours**

Theory of indices, properties-simple problems –theory of Surds - properties-simplification –simple problems.

Unit III **6 Hours**

Differential calculus –differentiating addition subtraction of two functions – product rule - (Simple problems)

Unit IV **6 Hours**

Simple Interest – Compound Interest – Growth – Depreciation of investment – simple problems.

Unit V **6 Hours**

Set Language- Theory of sets – Venn diagrams – Demorgan ‘s laws-cardinality – power set-simple problems.

Pedagogy

Class Room lectures, ICT, Participatory method of teaching, Group discussion and Quiz

Text Books

1. Manoharan .M., Elango.C and Eswaran K.L, (2007), Business mathematics, Paramount publications – Bodi

Reference Books

1. Vittal.R.R .,(2014), Business Mathematics, Maragam Publications, Chennai.
2. Balakrishnan.R, (2010), Quantitative Aptitude, Pavai Publications, Chennai.
3. Ranganathan.C, (2003),Business Mathematics, Himalayan publication, Chennai.

E-Resources:

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html
- https://www.economicsdiscussion.net/price/index-number/index-numbers-characteristics formula-examples-types-importance-and-limitations/31211

Course Outcomes

At the end of the course, students would be able to

CO 1	Recall the Concept of Matrices and learn to solve problems using its Operations
CO 2	Apply the properties of Surds, Indices to Solve the problems.
CO 3	Extend the knowledge from calculation to calculus, and summarize the rules of differentiation
CO 4	Calculate simple interest and compound interest and understand about growth and Depreciation
CO 5	Define set and apply the venn diagram to solve real life problem

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**
			Either/Or Choice		**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**
1	CO1	Up to K3	2	(K1 & K1)	1(K3)
2	CO2	Up to K3	2	(K2 & K2)	1(K3)
3	CO3	Up to K3	2	(K2 & K2)	1(K3)
4	CO4	Up to K3	2	(K2 & K2)	1(K3)
5	CO5	Up to K3	2	(K2 & K2)	1(K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total Marks for each Section			15		15

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	**Section A (Either/Or Choice)**	**Section B (Open choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	6	-	6	10.91%	11%
K2	24	-	24	43.64%	44%
K3	-	25	25	45.45%	45%
Total Marks	30	25	55	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I	Matrix: Introduction	1	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Types of Matrices	2	
	Addition and Subtraction	2	
	Matrix multiplication	1	
II	Theory of indices	1	Lecture (Chalk & Talk) PPT ICT
	Properties-simple problems	2	
	Theory of Surds	2	
	Properties	1	
III	Differential calculus: Introduction	1	Lecture (Chalk & Talk) ICT
	Differentiating addition subtraction of two functions	3	
	Product rule	2	
IV	Simple Interest, Compound Interest	3	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Growth	2	
	Depreciation of investment	1	
V	Set Language :Introduction	1	Lecture (Chalk & Talk) PPT ICT
	Venn diagrams	2	
	Demorgan ‘s laws	2	
	Power set	1	

Course Designed by: Dr. S. Ramachandran, Dr. J. Kaligarani

Programme	**B.Sc.(Mathematics)**	**Programme Code**	**UMA**
Course Code	**20UMAC21**	**No. of Hrs per cycle**	**4**
Semester	**II**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
Core Course III			
Course Title	**Integral Calculus**		
Cognitive level Up to K3			

Preamble:

This course is offered for the students to provide a strong foundation on the concepts and Various techniques of integration, beta and gamma functions, Fourier series and to develop the skill of problem solving

Unit I **12 Hours**

Integration by parts- Reduction formulae for $x^n e^{ax}$, $e^{ax}\cos bx$, $x^m(\log x)^n$, $x^n \cos ax$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$ -Problems-Geometric meaning of integration as summation

Unit II **12 Hours**

The Definite integral-Riemann integration- Riemann's definition of integrable function - Darboux's Theorem -Necessary and sufficient condition for integrability-Integrable function-properties of definite integral-The first theorem of Mean value-Fundamental theorem of integral calculus

UnitIII **12 Hours**

Definitions of Beta and Gamma functions – Properties of Beta functions-Relation between Beta and Gamma functions- Recurrence formula for Gamma function-Applications of Gamma functions to multiple integrals

Unit IV **12 Hours**

Multiple integrals: Definitions of double integral-Evaluation of double integrals-Change the order in double integrals- Double integral in polar coordinates- triple integrals-Change of variables in double and triple integrals. Transformation from Cartesian to polar coordinates- Cartesian to Spherical polar coordinates

Unit V **12 Hours**

Fourier series – definition – even and odd functions – expanding f(x) as Fourier series in $(-\pi,\pi)$, $(0,2\pi)$ – half range series – development of cosine and sine series – change of interval – expanding f(x) as Fourier series in $(-l,l)$, $(0,2l)$ and $(0,l)$

Pedagogy

Class Room lectures, ICT, Participatory method of teaching, Group discussion and Quiz

Text Book

1. Manickavasagam Pillai .T.K. &Narayanan.S , (2011), *Calculus*, Volumes II & III. Publishers:
S.Viswanathan, Chennai

Reference Books

1. Arumugam.S, & Thanga Pandi Isaac, (2014), *Calculus*, New Gamma Publishing House, Chennai
2. Dr.Grewal.B.S, (2012), Higher Engineering Mathematics. Khanna Publishers Edition, New Delhi
3. Dr.G. Balaji (2015), "Transform and Partial Differential Equation", Balaji Publications, Chennai.

E-resources

IIT Lectures, UGC Gyan Dharshan videos

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO 1	Understand definite and infinite integration by recalling the concept of integration and develop the skill to learn reduction formulae
CO 2	Summarize about Riemann integral, Geometrical interpretation of Riemann integral and its properties
CO 3	Learn to compare and contrast Beta and Gamma functions
CO 4	Classify double and triple integration and learn about transformation of Cartesian to polar coordinates and transformation of Cartesian to Spherical coordinates
CO 5	Describe the expansion of Fourier series of even or odd functions

Mapping of Programme specific outcomes with Course Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	3	1	2	2	3	2	1	1	1	1	2
CO2	3	2	2	2	1	2	1	1	1	1	1	1
CO3	3	3	2	2	1	3	2	1	1	1	1	1
CO4	3	3	3	3	2	2	2	1	1	1	1	2
CO5	3	3	2	3	1	2	2	1	1	1	1	2

1-Low **2-Moderate** **3-High**

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	**Cos**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
2	**CO2**	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
3	**CO3**	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
4	**CO4**	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
5	**CO5**	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No. of Questions to be asked			10		10	5
No. of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers

K2-Basic understanding of facts and stating main ideas with general answers

K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	40	-	45	45%	45%
K3	--	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I	Integration by parts	1	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Reduction formulae $x^n e^{ax}$, $x^n \cos ax$, $e^{ax}\cos bx$, $x^m(\log x)^n$	4	
	$\sin^m x$, $\cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$	5	
	Integration as summation	2	
II	Definition of Riemann Integral	1	Lecture (Chalk & Talk) ICT
	Darboux's Theorem	2	
	Necessary and sufficient condition	2	
	properties of definite integral	2	
	The first theorem of Mean value	2	
	Fundamental theorem of integral calculus	3	
III	Definitions of Beta and Gamma functions	2	Lecture (Chalk & Talk) PPT ICT
	Properties of Beta functions	3	
	Recurrence formula for Gamma function	3	
	Applications of Gamma functions to multiple integrals	4	
IV	Definitions of double and triple integrals	1	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Evaluation of double integrals	2	
	Change the order in double integrals	2	
	Evaluation of triple integrals	2	
	Change of variables in double and triple integrals	2	
	Transformation from Cartesian to polar, Cartesian to Spherical	3	
V	Definition of Fourier series	1	Lecture (Chalk & Talk) PPT ICT
	even and odd functions	2	
	Expanding f(x) as Fourier series in $(-\pi,\pi)$, $(0,2\pi)$	3	
	Half range series	2	
	change of interval	4	

Course Designed by, Prof. N. Sakunthala, Dr. J. Kaligarani

Programme	**B.Sc.(Mathematics)**	**Programme Code**	**UMA**
Course Code	**20UMAC22**	**No. of Hrs per cycle**	**4**
Semester	**II**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
Core Course IV			
Course Title	**Sequences and Series**		
Cognitive level: Up to K3			

Preamble

This course enable the students to understand the basic concepts in sequence and series . Types and properties of sequence and series of real number have been demonstrated in details

Unit – I **12 Hours**

Sequences – Bounded - Monotonic – Convergent – Divergent and Oscillating sequences Algebra of limits - Problems.

Unit – II **12 Hours**

Behaviour of monotonic sequences – problems - Cauchy's first limit theorem – Cesaro's Theorem Problems

Unit – III **12 Hours**

Cauchy's second limit theorem - Subsequence - Limit points - Cauchy sequences – the upper and lower limit of a sequence – Problems

Unit – IV **12 Hours**

Series of positive terms – Infinite series – Theorems – Cauchy's general principle of convergence – Comparison test – Harmonic series.- Kummer's test

Unit – V **12 Hours**

D'Alembert's ratio test – Raabe's test – De Morgan and Bertrand's test – Gauss's test – Applications to simple problems – Cauchy's root test – Cauchy's condensation test –Alternating series - Absolute convergence .

Pedagogy

Class Room lectures, ICT, Participatory method of teaching, Group discussion and Quiz

Text Book

1. Arumugam. S & ThangaPandi Isaac, (2006), Sequences and Series, New Gamma Publishing House, Palayamkottai.

Reference Books

1. Manicavachagampillai .T.K, Natarajan .T and Ganapathy. K.S., (2008), *Algebra vol I*, S.viswanathan , Pvt. Ltd., Chennai.
2. ChandraSekaraRao K.and.Narayanan,K.S, (2008), *Real Analysis, Volume I* S.ViswanathanPvt.Ltd, Chennai.
3. Balaji. G, (2013), *Engineering Mathematics – I*, G.Balaji Publishers, Chennai.
4. Bali.N.P, Manish Goyal,(2005), *Engineering Mathematics*, University Science Press, Delhi.

E-Resources:

- IIT Lectures, UGC Gyan Dharshan videos
- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course outcomes:

At the end of the course, students would be able to:

CO 1	Demonstrate completely about the sequence and series and their various types
CO 2	I Illustrate and find limit superior and limit inferior properties of real numbers and Determine the convergent of real sequences
CO 3	Utilize and evaluate Cauchy sequence
CO 4	Elucidate the concept of infinite series
CO 5	Deduct the summablity of series of real numbers

Mapping of Programme specific outcomes with Course Outcomes

	PSO1	**PSO**	**PSO**	**PSO**	**PSO5**	**PSO6**	**PSO**	**PSO**	**PSO**	**PSO10**	**PSO11**	**PSO1**
CO1	**2**	**2**	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CO2	**3**	**2**	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CO3	**3**	**2**	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CO4	**2**	**2**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**
CO5	**3**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**

1-Low 2-Moderate 3-High

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	**Cos**	**K – Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/Or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
2	CO2	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1 & K2	2(K3&K3)	1(K3)
4	CO4	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
5	CO5	Up to K3	2	K1 & K2	2(K3&K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers.

K2-Basic understanding of facts and stating main ideas with general answers

K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No of Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	32	30	67	67%	67%
K3	-	8	20	28	28%	28%
Total Marks	**10**	**40**	**50**	**100**	**100%**	**100%**

Lesson Plan

Unit	Description	Hours	Mode
I	Sequences	2	Lecture ,Chalk &
	Bounded and Monotonic Sequences	2	Chalk & Talk
	Convergent, divergent & oscillating	3	Chalk & Talk
	Algebra of limits & Problems	5	Chalk & Talk
II	Behaviour of Monotonic sequences &	4	Chalk & Talk
	Cauchy's first limit theorem	4	Chalk & Talk
	Cesaro;s Theorem & Problem	4	Chalk & Talk
III	Cauchy's second limit theorem	3	Chalk & Talk
	Subsequence	2	Chalk & Talk
	Limit Points	3	Chalk & Talk
	Cauchy Sequences & Problem	4	Chalk & Talk
IV	Series of positive terms - Infinite series	2	Lecture, Chalk &
	Theorem 1 & 2	1	Chalk & Talk
	Cauchy's general principle of convergence	3	Chalk & Talk
	Comparison Test	2	Chalk & Talk
	Harmonic Series	2	Chalk & Talk
	Kummer's test	2	Chalk & Talk
V	D'Alembert's ratio test & Raabe's test	3	Chalk & Talk
	De Morgan and Bertrand's test	1	Chalk & Talk
	Gauss's text	2	Chalk & Talk
	Applications to simple problems	2	Chalk & Talk
	Cauchy's root test	1	Chalk & Talk
	Cauchy's condensation test	1	Chalk & Talk
	Alternating series	1	Chalk & Talk
	Absolute convergence	1	Chalk & Talk

Course Designed by, Prof. N. Sakunthala

Programme	**I B.A., B.Com., & B.Sc.**	**Programme Code**	**UMA**
Course Code	**20UMAN21**	**No. of Hrs per cycle**	**2**
Semester	**II**	**Max. Marks**	**50**
Part	**IV**	**Credit**	**2**
Non Major Elective Course II			
Course Title	**Statistical Methods**		
Cognitive Level	**Up to K3**		

Preamble

The aim of this course is to enable the student to acquire basic tools in statistical methods for solving real life problems in business, industry, agriculture and medicine. This course includes measure of central tendency, measure of dispersion, method of least square, interpolation and curve fitting.

Unit I **6 Hours**

Measures of Central Tendencies - Introduction- Arithmetic Mean - Partition Values (Median, Quartiles, Deciles and Percentiles)

Unit II **6 Hours**

Measures of Dispersion - Introduction- Range - Quartile Deviation - Mean Deviation - Standard Deviation.

Unit III **6 Hours**

Index numbers- Calculation of indices using simple aggregate method and average of price relatives method - Weighted index numbers - Laspeyre‘s, paasche‘s, Fisher‘s, Bowley’s and Edge-worth’s index numbers.

Unit IV **6 Hours**

Curve fitting - Introduction- Method of least squares - linear - polynomial - exponential.

Unit V **6 Hours**

Interpolation - Finite Differences - Newton’s Forward Interpolation formula - Newton’s
Backward Interpolation Formula - Lagrange`s Formula.

Pedagogy

Chalk and talk, Class Room lectures, ICT, Participatory method of teaching and Group discussion

Text Book

1. Arumugam.S, (2009), *Statistics*, New Gamma Publishing House, Palayamkottai.

Reference Books

1. Saxena.H.C, Kapur.J.N, (2009), *Mathematical Statistics*, S.Chand & Company Ltd, New Delhi.
2. Pillai.R.S.N, Bagavathi.V, (2008), *Statistics*, S.Chand & Company Ltd, New Delhi.
3. Vittal.P.R., (2013), *Business Mathematics and Statistics*, Margham Publications, Chennai.
4. Gupta. S.C and Kapoor.V.K,(2001)*Mathematical Statistics*, Sultan Chand and Sons NewDelhi.
5. Manmohan Gupta, (2001),*Statistics*, Sultan Chand and Sons,NewDelhi.

E-references:

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html
- https://www.economicsdiscussion.net/price/index-number/index-numbers-characteristics- formula- examples-types-importance-and-limitations/31211

Course Outcomes

At the end of the course, students would be able to:

CO 1	Define the measures of Central Tendencies and calculate Arithmetic Mean, Median, Quartile Deciles and Percentile
CO 2	Find range, Quartile deviation, Mean deviation and standard deviation
CO 3	Calculate simple index numbers and apply weighted index numbers
CO 4	Applying principle of least square to fit linear, Polynomial and exponential curve
CO 5	Discuss and demonstrate the concept of interpolation , Newton's forward and backward and legrange's method

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

- Students in introductory-level Statistics courses will know fundamental statistical concepts and some of their basic applications in science and society.
- Students shall know how to organize, manage, and present data. Students shall be able to effectively communicate results of statistical analysis.
- The students will gain basic knowledge of the application of mathematics and statistics to business disciplines get the ability to analyze and interpret data to provide meaningful information to assist in making management decisions.
- Gain the knowledge on presentation and tabulation of data, the methods of collecting data and summarizing the data using central tendency
- Acquire the knowledge on various measures of dispersion and the method of measuring it
- Acquire the knowledge of measuring the fluctuation or changes in price and quantity of goods and products using various index numbers.

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**Up to K – Level**	**Section A**		**Section B**
			Either/Or Choice		**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**
1	CO1	K2	2	K2 & K2	1(K2)
2	CO2	K3	2	K2 & K2	1(K3)
3	CO3	K3	2	K2 & K2	1(K3)
4	CO4	K3	2	K2 & K2	1(K3)
5	CO5	K3	2	K2 & K2	1(K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total Marks for each Section			15		15

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1		-			-
K2	30	5	35	63.63	64%
K3	-	20	20	36.36	36%
Total Marks	30	25	55		100%

Lesson Plan

Unit	Description	Hours	Mode
I	Central Tendencies: Introduction	1	Lecture ,Chalk & Talk
	Arithmetic Mean	2	Chalk & Talk
	Median	2	Chalk & Talk
	Quartiles, Deciles and Percentiles	1	Chalk & Talk
II	Measures of Dispersion : Introduction	1	Chalk & Talk
	Range, Quartile Deviation, Mean Deviation	2	Chalk & Talk
	Standard Deviation	3	Chalk & Talk
III	Index numbers: Calculation of indices using simple aggregate method	1	Chalk & Talk
	average of price relatives method	3	PPT
	Weighted index numbers: Laspeyre‘s, paasche‘s, Fisher‘s, Bowley’s and Edge-worth’s index numbers	2	Chalk & Talk
IV	Curve fitting : Introduction	1	Lecture, Chalk & Talk
	Method of least squares: linear	2	Chalk & Talk
	Method of least squares: polynomial	1	Chalk & Talk
	Method of least squares: exponential	2	Chalk & Talk
V	Interpolation: Finite Differences.	2	Chalk & Talk
	Newton’s Forward Interpolation formula and Newton’s Backward Interpolation Formula .	2	Chalk & Talk
	Lagrange`s Formula.	2	Chalk & Talk

Course Designed By, Dr. C. Subramani

Allied Courses Offered to B.Sc Physics and Chemistry

Programme	**B.Sc.(Physics & Chemistry)**	**Programme Code**	**UMA**
Course Code	**20UMAA11**	**No. of Hrs per cycle**	**6**
Semester	**I**	**Max. Marks**	**100**
Part	**III**	**Credit**	**5**
Allied Course I			
Course Title	**Allied Mathematics - I**		
Cognitive level – Up to K3			

Preamble

This course deal with the application of mathematics like calculus, functions , complex numbers which are used to improve the knowledge used in various discipline.

Unit I **18 Hours**

Algebra :Summation of series- Binomial, Exponential and logarithmic series (only problems).

Unit II **18 Hours**

Theory of equations-an nth degree equation has exactly n roots- Relation between the roots and the Coefficients – Reciprocal equation- Transformation of equation- Newton and Horner's method of finding roots up to 2 decimals.

Unit III **18 Hours**

Elements of Differential calculus (not for examination)-Radius of curvature- centre of curvature and circle of curvature.

Unit IV **18 Hours**

Elements of Integral calculus (not for examination)-Evaluation of definite integrals- Integration by parts- Reduction formula $\sin^n x$, $\cos^n x$, $\tan^n x$,$\sec^n x$,$\cot^n x$,$\operatorname{cosec}^n x$,$\sin^m x\cos^n x$ and simple problems.

Unit V **18 Hours**

De moivre's theorem- Hyperbolic functions-Logarithms of complex numbers.

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book

1. Arumugam. S, June, (2014), “ANCILLARY MATHEMATICS paper-I”, New Gamma Publications, Palayamkottai.

Reference Books

1. Manickavasagam Pilai. T.K & Narayanan. S, (2015), “Calculus, Volumes I & II”, Publishers:S.Viswanathan.
2. Arumugam.S, (2011), ANCILLARY MATHEMATICS vol II, New Gamma Publications, Palayamkottai.
3. Manickavasagam pillai.T.K & Narayanan.S,(2011),“Algebra Volume I and *Trigonometry*”, S.Viswanathan Publications.

E-Resources:

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

At the end of the course, students would be able to:

CO 1	Recall binomial series and apply exponential and logarithmic to find summation of series
CO 2	Relate the importance of relation between roots and coefficients and apply various methods of obtaining roots
CO 3	Solve problems in radius, centre and circle of curvature
CO 4	Apply the concept of integrals and learn the reduction formula
CO 5	Relate trigonometric functions and hyperbolic functions and learn logarithm of complex number

For Physics: Mapping of CO with PO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PS10**	**PS11**	**PS12**
CO 1	1	2	3	1	2	1	1	1	3	1	1	1
CO 2	1	1	3	1	1	1	1	1	3	1	1	1
CO 3	2	1	3	1	1	1	1	1	3	1	1	1
CO 4	1	1	3	1	2	1	1	1	3	1	1	2
CO 5	2	1	3	1	1	1	1	1	3	1	1	1

Strong=3, Medium=2, Low=1

For Chemistry: Mapping of CO with PO

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PS10**	**PS11**	**PS12**
CO 1	1	3	1	1	1	3	1	1	1	1	1	2
CO 2	1	2	1	1	1	3	1	1	1	1	1	1
CO 3	1	3	1	1	2	2	1	1	1	1	1	1
CO 4	1	2	1	1	1	2	1	1	1	1	1	1
CO 5	1	2	1	1	2	1	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Articulation Mapping-K Levels with Course Outcomes(COs)

Units	Cos	K – Level	Section A		Section B	Section C
			MCQs		Either/Or Choice	Open choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO 1	Up to K3	2	K1 & K1	2(K2&K2)	1(K3)
2	CO 2	Up to K3	2	K1 & K1	2(K2&K2)	1(K3)
3	CO 3	Up to K3	2	K1 & K1	2(K2&K2)	1(K3)
4	CO 4	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
5	CO 5	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	8	-	-	8	8%	8%
K2	2	40	-	42	42%	42%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I	Summation of series :Introduction	3	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Binomial	5	
	Exponential	5	
	Logarithmic	5	
II	Theory of Equation: Introduction	3	Lecture (Chalk & Talk) PPT ICT
	Relation between the roots and the Coefficients	5	
	Reciprocal equation	2	
	Transformation of equation	3	
	Newton and Horner's method	5	
III	Differential calculus: Introduction	4	Lecture (Chalk & Talk) ICT
	Radius of curvature	6	
	centre of curvature	4	
	circle of curvature	4	
IV	Integral calculus	3	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Evaluation of definite integrals	4	
	Integration by parts	2	
	Reduction formula	5	
	problems	4	
V	Demoivre's theorem	6	Lecture (Chalk & Talk) PPT ICT
	Hyperbolic functions	6	
	Logarithms of complex numbers	6	

Course Designed by Dr. J. Kaligarani

Programme	B.Sc.(Physics & Chemistry)	Programme Code	UMA
Course Code	20UMAA21	No. of Hrs per cycle	6
Semester	II	Max. Marks	100
Part	III	Credit	5
Allied Course II			
Course Title	Allied Mathematics - II		
Cognitive level – Up to K3			

Preamble

This course develops among the students mathematical skills required to study physics and chemistry. This course deals with vector, solution of linear equation, eigen values, eigen vectors and Cayley-Hamilton theorem.

Unit-I **18 Hours**

Vector differentiation -velocity-Acceleration- vector differential operator- gradient- Divergence and Curl and their simple properties- directional derivatives- solenoidal – Irrotational vectors

Unit-II **18 Hours**

Vector - integration- Gauss, Green and Stokes theorems(without proofs)- Simple applications.

Unit-III **18 Hours**

Differential Equations- Equations of first order and first degree- Exact differential equations-integrating factors-Linear equations.

Unit-IV **18 Hours**

Matrices-Types of Matrices - Rank of a matrix - consistency of system of linear equations-simple problems

Unit-V **18 Hours**

Cayley Hamilton theorem (without proof)–Inverse of a Matrix and higher powers - Eigen values and Eigen vectors.

Course Outcomes:

At the end of the course, students would be able to:

CO 1	Understand the concept of vector differential operators and Relate Solenoidal and irrotational.
CO 2	Find the solution of Line integral, volume integral and surface integral using greens , Gauss, Green and Stokes theorems
CO 3	Solve the Differential equation
CO 4	Classify the matrix and apply it to solve system of equations
CO 5	Explain the application of Cayley Hamilton theorem

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book

1. Arumugam.S,(2011), ANCILLARY MATHEMATICS Vol II, New Gamma Publications, Palayamkottai.

Reference Books

1. Manickavasagam Pillai.T.K.&Narayanan.T, (2002), Analytical Geometry of Three Dimensions and VectorCalculus, Viswanathan Publishing Company, Chennai.
2. Manickavasagam Pillai.T.K.&Narayanan.T,. (2001),Differential equations and its application,Viswanathan Publishing Company, Chennai
3. Arumugam. S, June, (2014), "ANCILLARY MATHEMATICS paper-III", New Gamma Publications, Palayamkottai.

E-Resources:

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

For Physics: Mapping of CO with PO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PS10	PS11	PS12
CO1	1	2	3	1	2	1	1	1	3	1	1	1
CO2	1	1	3	1	1	1	1	1	3	1	1	1
CO3	2	1	3	1	1	1	1	1	3	1	1	1
CO4	1	1	3	1	2	1	1	1	3	1	1	2
CO5	2	1	3	1	1	1	1	1	3	1	1	1

Strong=3, Medium=2, Low=1

For Chemistry: Mapping of CO with PO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PS10	PS11	PS12
CO1	1	3	1	1	1	3	1	1	1	1	1	2
CO2	1	2	1	1	1	3	1	1	1	1	1	1
CO3	1	3	1	1	2	2	1	1	1	1	1	1
CO4	1	2	1	1	1	2	1	1	1	1	1	1
CO5	1	2	1	1	2	1	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Articulation Mapping-K Levels with Course Outcomes(COs)

Units	Cos	K – Level	Section A		Section B	Section C
			MCQs		Either/Or Choice	Open choice
			No. of Questions	K-Level	No. of Questions	No. of Questions

1	CO1	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
2	CO2	Up to K3	2	K1 & K2	2(K3&K3)	1(K3)
3	CO3	Up to K2	2	K1 & K2	2(K2&K2)	1(K2)
4	CO4	Up to K3	2	K1 & K2	2(K3&K3)	1(K3)
5	CO5	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5
K2	5	24	20	49	49%	49
K3	-	16	30	46	46%	46
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I	Vector differentiation	2	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Velocity, Acceleration	3	
	Vector differential operator, gradient Divergence and Curl	5	
	Directional derivatives	4	
	solenoidal , Irrotational vectors	4	
II	Introduction, Line integral	3	Lecture (Chalk & Talk) PPT ICT
	Green's theorem and problem	5	
	Gauss theorem and problem	5	
	Stokes theorems and Problems	5	
III	Differential Equations: Introduction	4	Lecture (Chalk & Talk) ICT
	Equations of first order and first degree	4	
	Exact differential equations	5	
	Linear equations	5	
IV	Matrix: Introduction	3	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	Types of Matrices	3	
	Rank of a matrix	6	
	consistency of system of linear equations	6	
V	Cayley Hamilton theorem	5	Lecture (Chalk & Talk) PPT ICT
	Inverse of a Matrix and higher powers	4	
	Eigen values and Eigen vectors	9	

Course Designed by Dr. J. Kaligarani

Programme	**B.Sc., (CS & IT) , BCA**	**Programme Code**	**UMA**
Course Code	**20UMAA12**	**Number of Hours/Cycle**	**4**
Semester	**I**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
Allied Course - I			
Course Title		**Discrete Mathematics**	
Cognitive Skills		**Up to K3**	

Preamble

Discrete Mathematics introduces the mathematics of networks, social choice, and decision making and the course provides hands-on exploration of the relevancy of set theory, logic, basic principles of Boolean Algebra and basic Graph theory

Unit I

12 Hours

Set Theory& Relations and Functions : Sets introduction – Notation and Description of sets – Subsets – Venn-Euler Diagrams – operation on sets – Properties of set operation - Relations and Functions - Cartesian Product of Two sets – Relations – Representations of a Relation – Operations on Relations – Equivalence Relations – Function definition and example.

Unit II ***11 Hours***

Logic & Boolean algebra: TF Statements – Connectives – Well Formed (Statement) Formulae - Truth table of a formula – Tautology – Tautological implications and equivalence of formulae - Boolean algebra - Lattices

Unit III ***14 Hours***

Recurrence Relations & Generating Functions: Recurrence – An Introduction – Recurrence Relations – Solution of finite order homogeneous (Linear) relations – Solution of non – homogeneous relations (For all the theorems consider the statements without proofs) - Generating Functions

Unit IV

12 Hours

Graphs and sub graphs: Introduction – Definition and examples – Degrees – sub graphs – matrices Trees: Introduction – Characterization of trees. Some Applications: Shortest path problem.

Unit V **11 Hours**

Matrix Algebra: Introduction – Matrix operation – Inverse of a square matrix – Elementary operations and Rank of a matrix – Simultaneous Equations- Eigen values and Eigenvectors.

Pedagogy

Quiz, Assignments

Text Books

(v) Venkataraman.M.K, Sridharan.N and Chandrasekaran.N,*"Discrete Mathematic*", (2009) The National Publishing company.

*(vi) Arumugam.S and Ramachandran.S, (2018) ,"*Introduction to Graph Theory *", Scitech Publications (India) pvt Ltd.,*

Reference Books

1. Alen Doerr and Kenneth Levesseur, , "*Applied Discrete Structures for computer Science*", (2000) Galgotia Publications.
2. Veerarajan.T, "Discrete Mathematics and its Applications", (2014)Tata McGrawHill, Delhi.
3. Balaji.G, "*Discrete Mathematics with Algorithms*", (2015) G.Balaji Publishers.

E – Resources:

- **https://nptel.ac.in/courses/111/107/111107058/**
- **https://nptel.ac.in/courses/106/106/106106094/**
- **https://www.youtube.com/watch?v=K73N9ES_8nI**
- ***https://nptel.ac.in/courses/111/106/111106102/***
- ***https://nptel.ac.in/courses/111/106/111106086/***

Course Outcomes:

At the end of the course, students would be able to:

CO 1	To understand the basic concepts of set theory, Relations and functions
CO 2	Construct and classify logical sentence in terms of logical connectives, predicates
CO 3	Formulate and construct the Recurrence Relations, solving problems
CO 4	Acquire the knowledge graphs, subgraphs, trees and shortest path problem
CO 5	Recall basic matrix operations and solve problems using matrix theor**y**

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for B.Sc., (Computer Science)

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO1 0**	**PSO1 1**	**PSO1 2**
CO 1	3	1	1	1	1	1	1	1	1	1	1	1
CO 2	3	1	1	1	1	2	1	1	1	1	1	1
CO 3	3	2	1	1	1	1	1	1	1	1	1	1
CO 4	3	1	1	1	1	1	1	1	1	1	1	1
CO 5	3	1	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for B.Sc., (Information Technology)

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10	PSO11	PSO12
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	3	1	1	1	1	2	1	1	1	1	1	1
CO3	3	2	1	1	1	1	1	1	1	1	1	1
CO4	3	1	1	1	1	1	1	1	1	1	1	1
CO5	3	1	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for BCA

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10	PSO11	PSO12
CO 1	3	1	1	1	1	1	1	1	1	1	1	1
CO 2	3	1	1	1	1	2	1	1	1	1	1	1
CO 3	3	2	1	1	1	1	1	1	1	1	1	1
CO 4	3	1	1	1	1	1	1	1	1	1	1	1
CO 5	3	1	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/Or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1 & K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/ or)	Section C (Open choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5	5%
K2	5	40	-	45	45	45%
K3	-	-	50	50	50	50%
Total Marks	10	40	50	100	100	100%

Lesson Plan

	Description	**Hours**	**Mode**
Unit I	**a.** Sets introduction , Notation and Description of sets, Subsets	2	Chalk & Talk, ICT
	b. Venn-Euler Diagrams , operation on sets	2	
	c. Properties of set operation	2	
	d. Relations & Cartesian Product of Two sets	1	
	e. Representations of a Relation Operations on Relations	2	
	f. Equivalence Relations	2	
	g. Function definition and example.	1	
Unit II	**Description**	**Hours**	**Mode**
	a. TF Statements , Connectives, Well Formed (Statement) Formulae	2	Chalk & Talk, ICT
	b. Truth table of a formula, Tautology	2	
	c. Tautological implications and equivalence of formulae	2	
	d. Boolean algebra , Lattices	5	
Unit III	**Description**	**Hours**	**Mode**
	a. Recurrence Relations	2	Chalk & Talk, ICT
	b. Solution of finite order homogeneous (Linear) relations	4	
	c. Solution of non – homogeneous relations	4	
	d. Generating Functions	4	
Unit IV	**Description**	**Hours**	**Mode**
	a. Definition and examples, Degrees, sub graphs, matrices	4	Chalk & Talk, ICT
	b. Trees: Introduction – Characterization of trees	4	
	c. Shortest path problem.	4	
Unit V	**Description**	**Hours**	**Mode**
	a. Matrix operation	2	Chalk & Talk, ICT
	b. Inverse of a square matrix	2	
	c. Elementary operations and Rank of a matrix	3	
	d. Simultaneous Equations, Eigen values and Eigenvectors	4	

Course Designed by: Mrs. A. Theeba Mrs. M. Devipriya

Programme	**B.Sc., (CS & IT), BCA**	**Programme Code**	**UMA**
Course Code	**20UMAA22**	**Number of Hours/Cycle**	**4**
Semester	**II**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
Allied - I			
Course Title	**Operations Research**		
Cognitive Skills	**Up to K3**		

Preamble

The course is a scientific approach to aid decision making and improving efficiency of the system by applying advanced analytical methods such as simplex method, Two-phase method, dual simplex method, etc.

Unit I

10 Hours

Origin and Development of OR - Nature and features of OR - Scientific Method in OR - Modeling in Operations Research - Application of OR.

Unit II

11 Hours

Formulation of LPP - Mathematical Formulation - Solution of LPP - Graphical Method.

Unit III ***15 Hours***

Simplex Method: Computational procedure - Big - M Method - Two phase Method.

Unit IV

12 Hours

Transportation problem: Mathematical formulation of Transportation problem - Method for finding IBFS for the Transportation problem - Modified distribution method - Degeneracy of TP.

Unit V ***12 Hours***

Assignment Problem: Mathematical formulation of assignment problem Solution to Assignment problem -Travelling salesman problem Sequencing : Processing ‘n’ jobs in two machines - Processing ‘n’ jobs in m machines

Pedagogy:

Quiz, Assignment

Text Books

1. Kanthiswarup, Gupta.P.K, Man Mohan,(2011) “*Operations Research*”, Sultan Chand &Sons.
2. *Arumugam .S& Thangapandi Issac, (2010)*“Topics in Operations Research*”, New Gamma Publishing House (India) pvt.Ltd.,*

Reference Books:

1. Sharma.S.D, “*Operations Research*”, Kedar Nath Ram Nath & Co.
2. Gupta.R.K, “*Operations Research*”, Krishna Prakashan Media Pvt Ltd.,

3. Sharma J.K, , "*Operations ResearchTheory and Applications*", MAC Milan.

E-Resources:

- https://nptel.ac.in/courses/110/106/110106062/
- https://nptel.ac.in/courses/112/106/112106134/
- https://www.youtube.com/playlist?list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX
- https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
- http://www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html

Course Outcomes:

At the end of the course, students would be able to:

CO 1	To understand study the origin of OR, Scientific Method in OR and some applications
CO 2	Demonstrate OR approach in decision making formulate mathematical LPP models and find their solutions
CO 3	Recall and apply simplex method and its extensions
CO 4	Recognize, solve and interpret transportation
CO 5	Understand and applying the Assignment problems and Sequencing

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for

B.Sc., (Computer Science)

CO / PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	3	1	1	1	1	2	1	1	1	1	1	1
CO3	3	1	1	1	1	2	1	1	1	1	1	1
CO4	3	2	1	1	1	2	1	1	1	1	1	1
CO5	3	2	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for

B.Sc., (Information Technology)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	3	1	1	1	1	2	1	1	1	1	1	1
CO3	3	1	1	1	1	2	1	1	1	1	1	1
CO4	3	2	1	1	1	2	1	1	1	1	1	1
CO5	3	2	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Mapping of Course Outcomes (COs) with Programme Specific Outcomes for BCA

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	3	1	1	1	1	2	1	1	1	1	1	1
CO3	3	1	1	1	1	2	1	1	1	1	1	1
CO4	3	2	1	1	1	2	1	1	1	1	1	1
CO5	3	2	1	1	1	2	1	1	1	1	1	1

Strong=3, Medium=2, Low=1

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	Up to K – Level	Section A		Section B	Section C
			MCQs		Either/Or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	K2	2	K1 & K1	2(K2&K2)	K2
2	CO2	K3	2	K1 & K2	2(K2&K2)	K3
3	CO3	K3	2	K1 & K2	2(K3&K3)	K3
4	CO4	K3	2	K1 & K1	2(K2&K2)	K3
5	CO5	K3	2	K1 & K1	2(K2&K2)	K3
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A(No Choice)	Section B (Either/ or)	Section C (Open choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	8	-	-	8	8	8%
K2	2	32	10	44	44	44%
K3	-	8	40	48	48	48%
Total Marks	10	40	50	100	100	100%

Lesson Plan

	Description	Hours	Mode
Unit I	**a.** Origin and Development of OR	2	Chalk & Talk, ICT
	b. Nature and features of OR	2	
	c. Scientific Method in OR	2	
	d. Modeling in Operations Research	2	
	e. Application of OR.	2	
Unit II	**Description**	**Hours**	**Mode**
	a. Formulation of LPP	2	Chalk & Talk, ICT
	b. Mathematical Formulation	2	
	c. Solution of LPP	3	
	d. Graphical Method	4	
Unit III	**Description**	**Hours**	**Mode**
	a. Simplex Method: Computational procedure	6	Chalk & Talk, ICT
	b. Big- M Method	5	
	c. Two phase Method	4	
Unit IV	**Description**	**Hours**	**Mode**
	a. Mathematical formulation of Transportation problem	1	Chalk & Talk, ICT
	b. Method for finding IBFS for the Transportation problem	4	
	c. Modified distribution method	4	
	d. Degeneracy of TP.	3	
Unit V	**Description**	**Hours**	**Mode**
	a. Mathematical formulation of assignment problem	1	Chalk & Talk, ICT
	b. Solution to Assignment problem	4	
	c. Travelling salesman problem	3	
	d. Sequencing : Processing ‘n’ jobs in two machines – Processing ‘n’ jobs in m machines	4	

Course Designed by : Mr. G. Ranjith kanna , Mr. S. Rajkumar

Programme	B.Sc Mathematics	Programme Code	UMA		
Course Code	20UMAC31	Number of Hours/Cycle	6		
Semester	III	Max. Marks	100		
Part	III	Credit	5		
Core Course V					
Course Title	Mechanics		L	T	P
Cognitive Level	Up to K3		90	-	-

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To provide fundamentals of Mechanics and show their significant role in upper level maths, science, engineering, physical and industrial world.

Unit I	**Forces acting at a point**	**18 Hours**
	Forces acting at a point: Resultant and components – Parallelogram law of forces – Triangle law of forces – Lami's theorem – Resolution of forces – Theorem of resolved part – Resultant of any number of coplanar forces – Condition of equilibrium (Book 1 : page no. 6-51)	
Unit II	**Parallel forces and Moments**	**18 Hours**
	Parallel forces and Moments: Forces acting on a rigid body – Parallel forces – Resultant of two like and unlike parallel forces – Moments of a forces – Varigon's theorem – Three forces acting on a rigid body- Friction: Law of friction – Coefficient of friction – angle of friction – cone of friction (Book 1 : page no. 52-83,206-223)	
Unit III	**Projectiles**	**18 Hours**
	Projectiles- Characteristics of projectile : Path is a parabola- Greatest height- time for greatest height-time of flight- horizontal range –Range of projectiles : Maximum horizontal range , Two possible direction– velocity--Range on an inclined plane (Book 2 : page no. 139-184)	
Unit IV	**Impulsive forces**	**18 Hours**
	Impulsive forces: Impact - Impulses - Loss of Kinetic energy in impact - Collision of elastic bodies :Fundamental laws of impact –Impact of a smooth sphere on a fixed smooth plane- Direct and Oblique impact- Loss of Kinetic energy due to Direct and Oblique impact – Compression and restitution- Impact on a rough plane (Book 2 : page no. 201-256)	
Unit V	**Central orbit**	**18 Hours**
	Polar coordinates: velocity and acceleration along and perpendicular to radius vector- Differential equation of n central orbits – Pedal equation for the central orbits (Book 2 : page no. 356-395)	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Books

1. Venkatraman M K, (2016), Statics , Agasthiar Publications
2. Venkatraman M K, (2017),Dynamics, Agasthiar Publications

Reference Books

1. Raisingha M S, (2002) Dynamics , Mc Millan India
2. Rajeshwari I,(2016) Mechanics, Shara s Publishers
3. Durai Pandian P I & others,(2011) Mechanics, S. Chand Publishing Company

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Understand mathematical concepts on Forces acting at a point and develop the skill to learn how to resolve the forces acting at a point.
CO2	Summarize about forces acting on a body like moments of a force, like and unlike parallel forces, Varigon's theorem, friction and their properties
CO3	Learn to apply and clarify path and characteristic of a moving object in horizon and inclined plane
CO4	Describe and evaluate the outcomes of direct and oblique impacts of moving objects
CO5	Illustrate and Explain about central Forces, central orbits and their polar and p-r forms

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	1	3	2	1	-	-	-	2
CO 2	3	2	3	3	1	3	2	1	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C0 5	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open choice
			No. of Questions	K- Level	No. Of Question	
1	CO1	Up to K2	2	K1&K1	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
3	CO3	Up to K2	2	K1&K1	2(K2& K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (open choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	-	--	10	10%	10%
K2	-	40	10	50	50%	50%
K3	-	-	40	40	40%	40%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

		Forces acting at a point	**18 Hours**	**Mode**
Unit I	a.	Introduction - Forces acting at a point	**1**	**Chalk & Talk**
	b.	Resultant and components of forces	**1**	
	c.	Parallelogram law of forces	**2**	
	d.	Triangle law of forces	**1**	
	e.	Lami's theorem on forces	**1**	
	f.	Resolution of forces	**3**	
	g.	Theorem of resolved part of forces	**3**	
	h.	Resultant of any number of coplanar forces	**3**	
		Condition of equilibrium of forces	**3**	
		Forces acting at a point	**18 Hours**	**Mode**
Unit II	a.	Introduction – Parallel forces and Moments	**1**	**Chalk & Talk**
	b.	Forces acting on a rigid body	**1**	
	c.	Parallel forces	**1**	
	d.	Resultant of two like and unlike parallel forces	**2**	
	e.	Moments of a force	**1**	
	f.	Varigon's theorem	**1**	
	g.	Three forces acting on a rigid body	**1**	
	h.	Friction: Law of friction	**1**	
		Coefficient of friction	**3**	
		angle of friction	**3**	
	k.	cone of friction	**3**	
		Projectiles	**18 Hours**	**Mode**
Unit III	a.	Introduction - Projectiles	**1**	**ICT**
	b.	Characteristics of projectile	**2**	
	c.	Path is a parabola	**2**	
	d.	Greatest height	**1**	
	e.	Time for greatest height	**1**	
	f.	Time of flight	**1**	
	g.	Horizontal range	**1**	
	h.	Range of projectiles : Maximum horizontal range	**2**	
		Two possible direction– velocity	**2**	
		Range on an inclined plane	**5**	
Unit IV		**Impulsive forces**	**18 Hours**	**Mode**
	a.	Introduction - Impulsive forces	**1**	**Chalk & Talk**
	b.	Impact - Impulses	**1**	
	c.	Loss of Kinetic energy in impact	**1**	
	d.	Collision of elastic bodies	**2**	
	e.	Fundamental laws of impact	**1**	
	f.	Impact of a smooth sphere on a fixed smooth plane-	**3**	
	g.	Direct and Oblique impact	**2**	
	h.	Loss of Kinetic energy due to Direct,Oblique impact	**3**	
		Compression and restitution	**2**	

		Impact on a rough plane	**2**	
Unit V		**Central orbit**	**18 Hours**	**Mode**
	a.	Introduction- Central orbit	**1**	**ICT**
	b.	Polar coordinates	**3**	
	c.	Velocity,acceleration along,perpendicular to r vector	**4**	
	d.	Differential equation of n central orbits	**5**	
	e.	Pedal equation for the central orbits	**5**	

Course designed by Dr. S. Ramachandran, Mrs. Pradheepa

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC32**	**Number of Hours/Cycle**	**6**		
Semester	**III**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Core Course VI					
Course Title	**Analytical Geometry 3D and Vector Calculus**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To establish rectangular coordinate system in the plane and in the space, express concept of vector both geometrically and analytically, understand operations on vectors and the properties of these operations

Unit I	**Plane**	**18 Hours**
	Rectangular cartesian coordinates-Distance between two points-Direction cosines-direction ratios-Area of Triangles-Planes-Equation of a plane-Intercept form-Normal form-Transformation to the normal form- Angle between two planes-Angle bisectors of two planes.	
Unit II	**Straight lines**	**18 Hours**
	Equation of a straight line-Non-symmetric form-symmetric form -Two points form -A plane and a line -Coplanar lines-Skew lines-Shortest distance -Equation of the line of shortest distance.	
Unit III	**The Sphere**	**18 Hours**
	Equation of a Sphere- Centre radius form-General form of a sphere- Diameter form-Tangent line and tangent plane- Angle of intersection of two spheres-Section of a sphere.	
Unit IV	**Vector Differentiation**	**18 Hours**
	Vector algebra-Differentiation of vectors -Vector differential operator-Gradient-Geometrical interpretation-Equation of the tangent plane-Equation of normal line-Divergence and curl	
Unit V	**Vector Integration**	**18 Hours**
	Line integrals-Work done by a force - surface integrals-Problems on Green, Gauss and Stoke's theorems	

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Books

1. Dr. S. Arumugam , Prof. A. Thangapandi Isaac and A.Somasundaram,(2020) *Analytical Geometry*,Yesdee Publishing,Pvt Ltd,Chennai
2. Dr. S. Arumugam and Prof. A. Thangapandi Isaac, (2011).*Analytical Geometry of 3D and Vector Calculus*, New Gamma Publishing House, January

Reference Books

1. Duraipandian.P, Laxmi Duraipandian.P, Muhilan.D, (2000), *Analytical geometry of Three Dimensions*, Emerald Publishers Reprint.

2.Veerarajan.T Engineering Mathematics-II, (2014), Mc Graw Hill Publishers, New Delhi.

3.Manickavasagam Pillai.T.K& Narayanan.T, (2007), Analytical Geometry of Three Dimensions and Vector Calculus, Viswanathan Publishing Company, Reprint.

E-Resources

- https://nptel.ac.in/courses/111/105/111105122/
- https://ndl.iitkgp.ac.in/
- https://ocw.mit.edu/index.htm
- http://mathforum.org/library/topics/applied/
- https://ndl.iitkgp.ac.in/acc-registration.php

Course Outcomes

After completion of this course, the students will be able to:

CO1	Find the direction cosines and direction ratios, compute the equation of the plane, also calculate the angle between the plane and angle bisector of the plane.
CO2	Distinguish non-symmetric and symmetric form of a straight line, find coplanar lines and shortest distance , also equation of the line of shortest distance.
CO3	Derive the equation of a sphere, tangent line and tangent plane, calculate the angle of intersection of two spheres and section of a sphere.
CO4	Compute directional derivative , gradient, curl and divergence using vector differential operator
CO5	Apply Green's theorem, Stokes' theorem and Guass theorem to integrate vector valued function

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	2	3	3	-	-	-	-	2
CO 2	3	3	2	2	2	3	3	-	-	-	-	1

CO 3	3	3	2	1	2	2	2	-	-	-	-	1
CO 4	3	3	3	3	2	2	3	-	-	-	-	1
C0 5	2	3	2	2	2	2	3	-	-	-	-	2

3. High; 2. Moderate ; 1. Low

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	**CO1**	Up to	2	(K1&K1)	2(K2&K2)	1(K2)
2	**CO2**	Up to	2	(K1&K1)	2(K2&K2)	1(K3)
3	**CO3**	Up to	2	(K1&K1)	2(K2&K2)	1(K3)
4	**CO4**	Up to	2	(K1&K1)	2(K2&K2)	1(K3)
5	**CO5**	Up to	2	(K1&K1)	2(K2&K2)	1(K3)
No. of Questions to be asked			10		10	5
No. of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	10	-	-	10	10%	10%
K2	-	40	10	50	50%	50%
K3	-	-	40	40	40%	40%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Plane**	**18 Hours**	**Mode**
	a. Rectangular cartesian coordinates, Distance between two points**.** Direction cosines-direction ratios, Area of triangles	**4**	Lecture (Chalk & Talk) PPT ICT
	b. Equation of a plane, Intercept form, Normal form	**4**	
	c. Transformation to the normal form	**3**	
	d. Angle between two planes	**3**	
	e. Angle bisectors of two planes.	**4**	
Unit II	**Straight lines**	**18 Hours**	**Mode**
	a. Equation of a straight line	**2**	Lecture (Chalk & Talk) PPT ICT
	b. Non-symmetric form, symmetric form	**3**	
	c. Two points form ,A plane and a line	**4**	
	d. Coplanar lines, Skew lines	**5**	
	e. Shortest distance ,Equation of the line of shortest distance.	**4**	
Unit III	**The Sphere**	**18 Hours**	**Mode**
	a. Equation of a Sphere, Centre radius form	**3**	Lecture (Chalk & Talk) PPT ICT
	b. General form of a sphere, Diameter form	**3**	
	c. Tangent line and tangent plane	**3**	
	d. Angle of intersection of two spheres	**4**	
	e. Section of a sphere.	**5**	
Unit IV	**Vector Differentiation**	**18 Hours**	**Mode**
	a. Vector algebra, Differentiation of vectors	**4**	Lecture (Chalk & Talk) PPT ICT
	b. Gradient, Geometrical interpretation	**5**	
	c. Equation of the tangent plane**.** Equation of normal line	**4**	
	d .Divergence and curl	**5**	
Unit V	**Vector Integration**	**18 Hours**	**Mode**
	a. Line integrals, Work done by a force	**3**	Lecture (Chalk & Talk) ICT Group discussio n Quiz
	b. Surface integrals	**3**	
	c. Problems on Green theorem	**4**	
	d. Problems on Gauss theorem	**4**	
	e. Problems on Stoke's theorem	**4**	

Course designed by **Dr.J.KaligaRani**

Programme	B.Sc Mathematics	Programme Code	UMA		
Course Code	20UMAC41	Number of Hours/Cycle	6		
Semester	IV	Max. Marks	100		
Part	III	Credit	5		
Core Course VII					
Course Title	Real Analysis		L	T	P
Cognitive Level	Up to K3		90	-	-

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course aims to introduce metric space, countable set, connected set, compact set and related theorems

Unit I	**Countable sets**	**18 Hours**
	Countable sets – Uncountable sets - Definition and examples of a metric space – bounded sets in a metric space – open ball in a metric space - open sets - subspaces –interior of a set	
Unit II	**Metric Spaces**	**18 Hours**
	Metric Spaces - closed sets - closure – limit point –Dense set –Complete Metric Spaces -Completeness – Baire's Category theorem	
Unit III	**Continuity**	**18 Hours**
	Continuity– homeomorphism– uniform continuity - discontinuous functions on R	
Unit IV	**Connectedness**	**18 Hours**
	Connectedness - Definition and examples - connected subsets of R – connectedness and continuity	
Unit V	**Compactness**	**18 Hours**
	Compactness - Compact metric spaces – compact subsets of R – Heine Borel theorem- equivalent characterisation for compactness	

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book

1. Arumugam. S. (2013) Modern Analysis New Gamma publications Palayamkottai.

UNIT I : Chapter 1 – 1.2 ,1.3 (Solved Problems Excluded)

Chapter 2 – 2.1 – 2.6 (Solved Problems in 2.4 Excluded)

UNIT II : Chapter 2 – 2.7 - 2.10 (Solved Problems Excluded)

Chapter 3 – 3.0 – 3.2 (Solved Problems Excluded)

UNIT III : Chapter 4 – 4.1 - 4.4

UNIT IV : Chapter 5– 5.1 – 5.3

UNIT V : Chapter 6 – 6.1, 6.2, 6.3

Reference Books

1. Shanthi Narayanan (2007) Elements of Real Analysis S.Chand & Co New Delhi
2. Goldberg.R Methods of (2017) Real Analysis Oxford & IBH publishing co New Delhi
3. K.Chandrasekara Rao ,K.S.Narayanan Real Analysis Volume –I (2008)S.Viswanathan (Printers & Publishers)Pvt.ltd Company
4. M.K.Singal and Asha Rani Singal (2008) A first course in Real Analysis S.Chand & Co New Delhi

E-Resources

- https://nptel.ac.in/courses/111/103/111103070/
- https://nptel.ac.in/courses/111/105/111105041/
- https://nptel.ac.in/courses/111/106/111106046/
- https://nptel.ac.in/courses/111/106/111106139/
- https://nptel.ac.in/courses/111/106/111106113/

Course Outcomes

After completion of this course, the students will be able to:

CO1	Acquire knowledge in countability and open sets
CO2	Develop problem solving skills closed set, limit point and dense set
CO3	Describe continuous and uniform continuous function
CO4	Get basic knowledge on connected set .
CO5	Acquire knowledge in compact space.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	3	3	2	2	1	1	1	-	-	-	-	-
CO2	3	2	3	3	1	1	1	-	-	-	-	-
CO3	2	3	2	3	1	2	1	-	-	-	-	-

CO 4	3	2	3	2	1	2	1	-	-	-	-	-
CO 5	3	3	2	2	1	1	1	-	-	-	-	-

3. High; 2. Moderate ; 1. Low

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	**Cos**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	**CO1**	Up to K3	2	K1&K1	2(K2&K2)	1(K2)
2	**CO2**	Up to K3	2	K1&K1	2(K3&K3)	1(K2)
3	**CO3**	Up to K3	2	K1&K1	2(K2&K2)	1(K2)
4	**CO4**	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
5	**CO5**	Up to K3	2	K1&K1	2(k3&K3)	1(K2)
No. of Questions to be asked			10		10	5
No. of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated (Rounded off)**
K1	10	-	-	10	10%	10%
K2	-	24	40	64	64%	64%
K3	-	16	10	26	26%	26%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Countable sets**	**18 Hours**	**Mode**
	a. Countable sets	2	Chalk & Talk
	b.Uncountable sets	1	
	c.Definition and examples of a metric space	4	
	d.Bounded sets in a metric space	2	
	e.Open ball in a metric space	2	
	f.Open sets	3	
	g.Subspaces	2	
	h.Interior of a set	2	
Unit II	**Metric spaces**	**18 Hours**	**Mode**
	a.Closed sets ,closure	5	Chalk & Talk
	b.Limit point –Dense set	3	
	c.Complete Metric spaces - Introduction	2	
	d.Completeness	4	
	e.Baire's category theorem	4	
Unit III	**Continuity**	**18 Hours**	**Mode**
	a.Continuity	7	Chalk & Talk
	b.Homomorphism	4	
	c.Uniform continuity	4	
	d.Discontinuous functions on R	3	
Unit IV	**Connected sets**	**18 Hours**	**Mode**
	a.Connected sets – Introduction	2	Lecture, Chalk & Talk
	b.Definition & Examples and theorems	6	
	c.Connected subsets of R	5	
	d.Connected and continuity	5	
Unit V	**Compactness**	**18 Hours**	**Mode**
	a.Compactness - Introduction	2	Chalk & Talk
	b.Compact metric spaces	4	
	c.Compact subsets of R	3	
	d.Heine Borel theorem	3	
	e.Equivalent characterisation for compactness	6	

Course designed by **Prof. N. Sakunthala**

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC42**	**Number of Hours/Cycle**	**6**		
Semester	**IV**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Core Course VIII					
Course Title	**Operations Research**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course aims to develop students to use quantitative methods and techniques for effective decision making, mathematical model formulation and applications that are used in solving real life problems.

Unit I	**Linear Programming Problem(L.P.P) –Mathematical formulation**	**18 Hours**
	Linear Programming Problem(L.P.P) –Mathematical formulation: Introduction – Linear Programming Problem – Mathematical formulation of the problem – Illustration on Mathematical formulation of LPPs. Linear Programming Problem – Graphical solution and extension: Introduction – Graphical solution method – Some exceptional cases – General linear programming problem – Canonical and Standard forms of L.P.P – Insights into the simplex method.	
Unit II	**Linear Programming Problem- Simplex method**	**18 Hours**
	Linear Programming Problem- Simplex method: Introduction – Basic solution – Basic feasible solution – Reduction of a feasible solution to a basic feasible solution – The computational procedure (The simplex algorithms and Problems) – Use of artificial variables – Big M method – Two phase Method – Degeneracy in Linear Programming.	
Unit III	**Duality in Linear Programming**	**18 Hours**
	Duality in Linear Programming: Introduction – General Primal – Dual pair – Formulating a dual Problem – Primal – Dual pair in matrix form – Duality theorems –	

	Complementary slackness Theorem - Duality and simplex method – Dual simplex method.	
Unit IV	**Transportation Problem & Assignment Problem**	**18 Hours**
	Transportation Problem: Introduction - LP formulation of the Transportation Problem - The Transportation table- Loops in Transportation table-Solution of a Transportation Problem-Finding an initial basic feasible solution- Test for optimality – Degeneracy in Transportation Problem - Transportation Algorithm (MODI Method).Assignment Problem: Introduction-Mathematical formulation of the problem – Solution methods of the Assignment problem – Special cases in Assignment Problem-The Travelling Salesman Problem.	
Unit V	**Games and Strategies**	**18 Hours**
	Games and Strategies – Introduction – Two person zero sum games – Some Basic terms –The MaxiMini-MiniMax principle – Games without Saddle Point – Mixed strategies – Graphical solution of 2 × n and m × 2 games – Dominance property – Arithmetic Method for n × n games–General solution of m × n rectangular games (linear programming method).	

Pedagogy

Chalk and Talk, Seminar, Group discussion, Quiz, Assignment, Numerical Exercises.

Text Book

1. Kantiswarup, P.K. Gupta and Manmohan, (2011),Operations Research,Sultan Chand & Sons Educational Publishers, New Delhi.

Reference Books

1. R.PaneerSelvam, (2006), Operations Research ,Prentice Hall of India Private limited,New Delhi.
2. Dr.S.Arumugam &Mr. A.Thangapandi Issac,(2010), Topics in Operations Research Linear Programming New Gamma Publishing House ,Palayamkottai.
3. A.M.Natarajan ,P.Balasubramani ,A.Tamilarasi ,(2006), Operations Research, Pearson, Delhi.

E-Resources

- https://nptel.ac.in/courses/110/106/110106062/
- https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
- http://www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html
- https://ndl.iitkgp.ac.in/
- https://ocw.mit.edu/
- https://mathforum.org

Course Outcomes

After completion of this course, the students will be able to:

CO1	Convert real life problems into mathematical models by making use of inequalities and find their solutions.
CO2	Recall and Develop the skills in solving LPP using Various Method.
CO3	Translate LPP using duality principle and find their solutions.
CO4	Recognize, solve and interpret transportation and assignment problems.

CO5	Recall mathematical skills to analyze and solve problem in games and strategies.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	3	3	3	3	2	2	-	-	-	-
CO2	3	2	3	3	1	2	2	2	-	-	-	-
CO3	1	1	1	1	1	2	1	1	-	-	-	-
CO4	3	3	3	3	2	2	2	3	-	-	-	-
C05	3	3	3	3	3	3	2	3	-	-	-	-

3.High; 2. Moderate ; 1. Low ; - No correlation

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open choice
			No. of Questions	K-Level	No. of Question	
1	CO1	Up to K3	2	K1 &K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1 &K2	2(K2&K2)	1K(3)
3	CO3	Up to K2	2	K1 &K2	2(K2&K2)	1K(3)
4	CO4	Up to K3	2	K1 &K2	2(K2&K2)	1K3)
5	CO5	Up to K3	2	K1 &K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10

Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without Choice
K1	5	-	-	5	5
K2	5	40	-	45	45
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit I	**Linear Programming Problem(L.P.P) – Mathematical formulation**	**18 Hours**	**Mode**
	a. Linear Programming Problem(L.P.P) :Introduction	1	Lecture, Chalk & Talk, PPT
	b. Mathematical formulation of the problem, Illustration on Mathematical formulation of LPPs	6	
	c. Graphical solution method.	5	
	d. Some exceptional cases.	3	
	e. General linear programming problem.	1	
	f.Canonical and Standard forms of L.P.P	2	
Unit II	**Linear Programming Problem- Simplex method**	**18 Hours**	**Mode**
	a. The Simplex method : Introduction	1	Lecture, Chalk & Talk, PPT
	b. Basic solution, Basic feasible solution	1	
	c. Reduction of feasible solution to a basic feasible solution	2	
	d.The computational procedure (The simplex algorithms and Problems)	5	
	e.Use of artificial variables	1	
	f.Big M method	3	
	g.Two phase Method	3	
	h.Problems of Degeneracy	2	
Unit III	**Duality in Linear Programming**	**18 Hours**	**Mode**
	a.Duality in Linear Programming: Introduction, General Primal – Dual pair	2	Lecture, Chalk & Talk, PPT
	b.Formulating a dual Problem	2	
	c.Primal – Dual pair in matrix form	1	
	d.Duality theorems	3	
	e.Complementary slackness Theorem	3	
	f.Duality and simplex method	4	

	g.Dual simplex method	3	
Unit IV	**Transportation Problem & Assignment Problem**	**18 Hours**	**Mode**
	a.The Transportation Problem :Introduction , Mathematical formulation, Loops in a transportation table	2	Lecture, Chalk & Talk, PPT
	b.Finding IBFS	3	
	c.Test for optimality	1	
	d.Degeneracy in transportation problem	1	
	e.Transportation algorithm (MODI Method)	2	
	f.The Assignment problem (A.P) : Introduction, Mathematical formulation of an A.P	1	
	g.Hungarian method	3	
	h.Special case in Assignment problem, Maximization case	2	
	i.Unbalanced assignment problem	1	
	j.Travelling salesman problem	2	
Unit V	**Games and Strategies**	**18 Hours**	**Mode**
	a.Games and Strategies : Introduction	1	Lecture, Chalk & Talk, PPT
	b.Two person zero sum games , Some Basic terms	2	
	c.The MaxiMini-MiniMax principle	1	
	d.Games without Saddle Point, Mixed strategies	2	
	e.Solution of 2× 2 rectangular games	2	
	f.Graphical solution for 2 × n, m × 2	3	
	g.Dominance property	2	
	h.Arithmetic Method for n × n games	3	
	i.Solution of game by linear programming method	2	

Course designed by : Dr. C. Subramani

Allied Courses offered to Other Departments

Programme	**B.Sc.(Physics and Chemistry)**	**Programme Code**	**UMA**		
Course Code	**20UMAA31**	**Number of Hours/Cycle**	**6**		
Semester	**III**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**4**		
Allied Course III					
Course Title	**Allied Mathematics - III**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course is to enable the students to know the basic concepts of complex analysis, Statistics, Groups, Laplace Transform which are used to attain skills to broaden knowledge in science and technology

Unit I	**Complex Analysis**	**18 Hours**
	Introduction to complex numbers – complex differentiation – Cauchy Riemann equation – analytic function – harmonic equation – related problems	
Unit II	**Statistics**	**18 Hours**
	Sampling theory – Large sample mean – small sample mean – normal test – t-test – Chi-square test	
Unit III	**Fourier Series**	**18 Hours**
	Fourier series - odd and even function- Properties of odd and even function - half range Fourier series – cosine and sine series – change of interval.	
Unit IV	**Laplace Transform**	**18 Hours**
	Laplace Transforms – the inverse Laplace Transform – solution of differential equation using Laplace Transform	
Unit V	**Groups**	**18 Hours**
	Groups – elementary properties of a group –equivalent definitions of a group- permutation groups – subgroups – cyclic group – order of an element – cosets and Lagrange's theorem	

Pedagogy
Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book
1. Narayanan S, Kandasamy P,Hanumantha Rao R, Manicavachagam Pillay T K, (2010), "Ancillary Mathematics volume-II", S Viswanathan Printers and Publishers,Chennai.
2. Arumugam. S, June, (2014), "Allied Mathematics paper-III", New Gamma Publications, Palayamkottai.
3.Arumugam.S, Thangapandi Isaac,June (2015), Statistics, New Gamma Publications, Palayamkottai.

Reference Books
1. Manickavasagam Pilai. T.K & Narayanan. S, (2015), "Calculus, Volumes I & II", Publishers:S.Viswanathan.
2. Arumugam.S, 2011, ANCILLARY MATHEMATICS vol IV, New Gamma Publications, Palayamkottai.
3. Manickavasagam pillai.T.K & Narayanan.S,(2011),"Algebra Volume I and *Trigonometry*", S.Viswanathan Publications.

E-Resources
- https://nptel.ac.in/courses/111/103/111103070/
- https://nptel.ac.in/courses/111/105/111105041/
- https://nptel.ac.in/courses/111/106/111106046/
- https://nptel.ac.in/courses/111/106/111106139/
- https://nptel.ac.in/courses/111/106/111106113/

Course Outcomes
After completion of this course, the students will be able to:

CO1	Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions
CO2	Apply various statistical analysis tools
CO3	Construct the Fourier series of given periodic functions by evaluating Fourier coefficients.
CO4	Find the Laplace Transform of various functions and solve the linear differential equations using Laplace Transform
CO5	Illustrate the Lagrange's theorem and cosets

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	3	1	2	2	3	2	-	-	-	-	-
CO 2	2	2	3	3	3	3	3	2	-	-	-	-
CO 3	3	2	2	2	2	3	3	1	-	-	-	-
CO 4	3	2	2	2	1	3	2	2	-	-	-	-
C0	3	3	2	2	2	3	3	2	-	-	-	-

5												

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without Choice
K1	10		-	10	10%

K2	-	40	-	40	40%
K3	-	-	50	50	50%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit I	**Description**	**18 Hours**	**Mode**
	a. Introduction to complex numbers	2	**Lecture, Chalk & Talk, PPT**
	b. complex differentiation	4	
	c. Cauchy Riemann equation	4	
	d. analytic function	4	
	e. related problems	4	
Unit II	**Description**	18 Hours	**Mode**
	a. Sampling theory	2	**Lecture, Chalk & Talk, PPT**
	b. Large sample mean	5	
	c. small sample mean	5	
	d. normal test	2	
	e. t-test	2	
	f. chi square test	2	
Unit III	**Description**	18 Hours	**Mode**
	a. Fourier series	2	**Lecture, Chalk & Talk, PPT**
	b. odd and even function	4	
	c. Properties of odd and even function	3	
	d. half range Fourier series	4	
	e. cosine and sine series	3	
	f. change of interval	2	
Unit IV	**Description**	18 Hours	**Mode**
	a. Laplace Transforms	4	**Lecture, Chalk & Talk, PPT**
	b. some elementary properties of Laplace transform	3	
	c. problems on laplace transform	3	
	c. inverse Laplace Transform	4	
	d. solution of differential equation using Laplace Transform	4	
Unit V	**Description**	18 Hours	**Mode**
	a. Groups	2	**Lecture, Chalk & Talk, PPT**
	b. elementary properties of a group	3	
	c. equivalent definitions of a group	3	
	d. permutation groups	3	

	e. subgroups	2	
	f. cyclic group	2	
	g. cosets and Lagrange's theorem	3	

Course designed by Dr. P. Pandiammal

Programme	**B.Sc.(Physics & Chemistry)**	**Programme Code**	**UMA**		
Course Code	**20UMAA41**	**Number of Hours/Cycle**	**6**		
Semester	**IV**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Allied Course IV					
Course Title	**Allied Mathematics - IV**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course aims to develop students to use quantitative methods and techniques for effective decision making, mathematical model formulation and applications that are used in solving real life problems.

Unit I	**Linear Programming Problem –Mathematical formulation**	**18 Hours**
	Linear Programming Problem(L.P.P) –Mathematical formulation: Introduction – Linear Programming Problem – Mathematical formulation of the problem – Illustration on Mathematical formulation of LPPs. Linear Programming Problem – Graphical solution and extension: Introduction – Graphical solution method – Some exceptional cases – General linear programming problem – Canonical and Standard forms of L.P.P.	
Unit II	**Linear Programming Problem- Simplex method**	**18 Hours**
	Linear Programming Problem- Simplex method: Introduction – Basic solution – Basic feasible solution – Fundamental properties of solutions (Problems Only) – The computational procedure (The simplex algorithms and Problems).	
Unit III	**Transportation Problem**	**18 Hours**
	Transportation Problem: Introduction - LP formulation of the Transportation Problem - The Transportation table- Loops in Transportation table-Solution of a Transportation Problem-	

	Finding an initial basic feasible solution- Test for optimality – Degeneracy in Transportation Problem - Transportation Algorithm (MODI Method).	
Unit IV	**Assignment Problem**	**18 Hours**
	Assignment Problem: Introduction-Mathematical formulation of the problem – Solution methods of the Assignment problem – Special cases in Assignment Problem-The Travelling Salesman Problem.	
Unit V	**Games and Strategies**	**18 Hours**
	Games and Strategies – Introduction – Two person zero sum games – Some Basic terms –The MaxiMini-MiniMax principle – Games without Saddle Point – Mixed strategies – Graphical solution of 2 × n and m × 2 games – Dominance property.	

Pedagogy

Chalk and Talk, Seminar, Group discussion, Quiz, Assignment, Numerical Exercises.

Text Book

1. Kantiswarup, P.K. Gupta and Manmohan, (2011),Operations Research, Sultan Chand & Sons Educational Publishers, New Delhi.

Reference Books

1. R.PaneerSelvam, (2006), Operations Research ,Prentice Hall of India Private limited,New Delhi
2. Dr.S.Arumugam &Mr. A.Thangapandi Issac, (2010), Topics in Operations Research Linear Programming New Gamma Publishing House, Palayamkottai
3. A.M.Natarajan ,P.Balasubramani ,A.Tamilarasi ,(2006), Operations Research, Pearson, Delhi.

E-Resources

- https://nptel.ac.in/courses/110/106/110106062/
- https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
- http://www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html
- https://ndl.iitkgp.ac.in/
- https://ocw.mit.edu/
- https://mathforum.org

Course Outcomes

After completion of this course, the students will be able to:

CO1	Convert real life problems into mathematical models by making use of inequalities and find their solutions
CO2	Recall and Develop the skills in solving LPP using Various Method
CO3	Recognize, solve and interpret transportation and assignment problems
CO4	Interpret in the common man's language and to hone the ability to do reality checks on calculations.
CO5	Recall mathematical skills to analyze and solve problem in games and strategies

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO	PSO

											11	12
CO 1	3	2	3	3	3	3	2	2	-	-	-	-
CO 2	3	2	3	3	1	2	2	2	-	-	-	-
CO 3	3	3	3	3	2	2	2	3	-	-	-	-
CO 4	3	3	3	3	2	2	2	3	-	-	-	-
C0 5	3	3	3	3	3	3	2	3	-	-	-	-

3. High; 2. Moderate ; 1. Low; - No Correlation

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without Choice
K1	5	-	-	5	5
K2	5	40	-	45	45
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit I	**Linear Programming Problem – Mathematical formulation**	**18 Hours**	**Mode**
	a. Linear Programming Problem(L.P.P) :Introduction	1	Lecture, Chalk & Talk, PPT
	b. Mathematical formulation of the problem, Illustration on Mathematical formulation of LPPs	6	
	c. Graphical solution method	5	
	d. Some exceptional cases	3	
	e. General linear programming problem.	1	
	f. Canonical and Standard forms of L.P.P	2	
Unit II	**Linear Programming Problem- Simplex method**	**18 Hours**	**Mode**
	a. The Simplex method : Introduction	1	Lecture, Chalk & Talk, PPT
	b. Basic solution, Basic feasible solution	3	
	c. Problems based on Reduction of feasible solution to a basic feasible solution	4	
	d. The computational procedure (The simplex algorithms and Problems)	10	
Unit III	**Transportation Problem**	**18 Hours**	**Mode**
	a.The Transportation Problem :Introduction , Mathematical formulation, Loops in a transportation table	4	Lecture, Chalk & Talk, PPT
	b. Finding IBFS	4	
	c. Test for optimality	1	
	d. Degeneracy in transportation problem	3	
	e. Transportation algorithm (MODI Method)	6	

Unit IV	Assignment Problem	18 Hours	Mode
	a.The Assignment problem (A.P) : Introduction, Mathematical formulation of an A.P	2	Lecture, Chalk & Talk, PPT
	b. Hungarian method	6	
	c. Special case in Assignment problem, Maximization case	4	
	d. Unbalanced assignment problem	2	
	e. Travelling salesman problem	4	
Unit V	**Games and Strategies**	**18 Hours**	**Mode**
	a.Games and Strategies : Introduction	1	Lecture, Chalk & Talk, PPT
	b.Two person zero sum games , Some Basic terms	2	
	c.The MaxiMini-MiniMax principle	2	
	d.Games without Saddle Point, Mixed strategies	3	
	e.Solution of 2× 2 rectangular games	3	
	f.Graphical solution for 2 × n, m × 2	4	
	g.Dominance property	3	

Course designed by Dr. C. Subramani

Programme	**BBA**	**Programme Code**	**UMA**		
Course Code	**20UMAA32**	**Number of Hours/Cycle**	**6**		
Semester	**IV**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**4**		
Allied Course					
Course Title	**Business Statistics**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

In this course significance is placed on the applications of measures of central tendency, measures of dispersion, skewness and index numbers in business and finance

Unit I	**Classification and Tabulation**	**17 Hours**
	Definition- Application of statistics in various fields. Collection of Data- Primary and Secondary data- Framing a Questionnaire- Sampling- Methods of Sampling- Classification of Sampling- Characteristics. Objects, Types- frequency Distribution- Cumulative Frequency Distribution – Tabulation- Types- Simple Problems.	
Unit II	**Diagrammatic Presentation**	**17Hours**
	Diagrammatic Presentation- Types – Line Diagram. Bar Diagram, Pie Diagram- Graphic Presentation- Graphs of Frequency Distribution- Histogram, Frequency Polygon.	

	Frequency craves, Ogives	
Unit III	**Measures of Central Tendency**	**20 Hours**
	Measures of Central Tendency- Mean, Median, Mode- Geometric mean, Harmonic Mean- Quartiles. Deciles- Merits and Demerits- Measures of Dispersion- Methods of Measuring Dispersion- Range, Inter Quartile range, Mean Deviation - standard Deviation- co-Efficient of variation	
Unit IV	**Measures of Skewness and Correlation**	**18 Hours**
	Skewness – Meaning – Measures of Skewness – Karl Person's and Bowley's Co-efficient of Skewness – Correlation - Rank correlation	
Unit V	**Index Numbers**	**18 Hours**
	Index Numbers- Types- simple Aggregate Method, Sampling Average of Price Relatives- Weighted Index Number- Laspeyre's, Bowler's Fischer's and Marshall-Edgeworth Index Number- Test of Consistency of Number – Is Fischer's index number an ideal index number.	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion and Quiz

Text Book

1. Vittal .P.R, (2001), " *Business Statistics"*, Margham Publications , Chennai.

Reference Books

1. Dr.Manoharan.M, 2010, "*Statistical Method"*, Palani Paramount Publications, Palani.
2.Pillai.R.S.N&Bagavathi, (2006), "*Business Statistics"*,S.Chand Publication, New Delhi.
3.Alagar.K, (2009), " *Business statistics"*, Tata. Mc Graw publication, New Delhi.

E-Resources

- https://www.mooc-list.com/course/statistics-business-i-edx
- https://www.classcentral.com/course/swayam-business-statistics-12992
- https://nptel.ac.in/courses/110/107/110107114

Course Outcomes

After completion of this course, the students will be able to:

CO1	Understand the data classification and tabulations
CO2	Acquire knowledge of solving problems on Diagrammatic Presentation
CO3	Solve problems in Measures of central tendency and Measures of Dispersion
CO4	Solve problems in Standard deviations and Skewness
CO5	Acquire knowledge of solving problems in Index Numbers.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12

	1											
CO 1	**1**	3	1	1	2	1	1	1	1	1	1	1
CO 2	**1**	3	1	1	2	1	1	1	1	1	1	1
CO 3	**2**	3	1	2	1	1	1	1	1	1	1	1
CO 4	**2**	3	1	2	1	1	1	1	1	1	1	1
CO 5	**1**	3	1	2	1	1	1	1	1	1	1	1

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	2(K1&K1)	2(K2, K2)	1(K2)
2	CO2	Up to K2	2	2(K1&K1)	2(K2.K2)	1(K2)
3	CO3	Up to K3	2	2(K1&K2)	2(K2,K2)	1(K3)
4	CO4	Up to K3	2	2(K1&K1)	2(K3,K3)	1(K3)
5	CO5	Up to K3	2	2(K1&K1)	2(K3,K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10

Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	9	-	-	9	9%
K2	1	24	20	45	45%
K3	-	16	30	46	46%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit I	**Classification and Tabulation**	**17 Hours**	**Mode**
	a. Application of statistics in various fields	1	Chalk & Talk
	b. Collection of Data- Primary and Secondary data, Framing a Questionnaire	3	
	c. Sampling- Methods of Sampling- Classification of Sampling, Characteristics. Objects, Types- frequency Distribution	5	
	d. Cumulative Frequency Distribution	4	
	e. Tabulation- Types, Simple Problems	4	
Unit II	**Diagrammatic Presentation**	**17 Hours**	**Mode**
	a. Diagrammatic Presentation, Line Diagram. Bar Diagram	2	Chalk & Talk
	b. Pie Diagram	3	
	c. Graphic Presentation- Graphs of Frequency Distribution	4	
	d. Histogram, Frequency Polygon	4	
	e. Frequency craves, Ogives	4	
Unit III	**Measures of Central Tendency**	**20 Hours**	**Mode**
	a. Mean, Geometric mean, Harmonic Mean	4	Chalk & Talk
	b. Median, Mode	3	
	c. Quartiles. Deciles- Merits and Demerits	4	

	d. Measures of Dispersion- Methods of Measuring Dispersion	4	
	e. Range, Inter Quartile range, Mean Deviation, standard Deviation, Co-Efficient of variation	5	
Unit IV	**Measures of Skewnessand Correlation**	**18 Hours**	**Mode**
	a.Skewness – Meaning – Measures of Skewness	5	Chalk & Talk
	b. Karl Person's Co-efficient of Skewness	3	
	c.Bowley's Co-efficient of Skewness.	4	
	d.Correlation	3	
	e.Rank correlation	3	
Unit V	**Index Numbers**	**18 Hours**	**Mode**
	a. simple Aggregate Method, Sampling Average of Price Relatives	4	Chalk & Talk
	b. Weighted Index Number- Laspeyre's	4	
	c. Bowler's Fischer's and Marshall	3	
	d. Edgeworth Index Number- Test of Consistency of Number	4	
	e. Is Fischer's index number an ideal index number.	3	

Course designed by Mr. G. Ranjith kanna

Programme	**BBA**	**Programme Code**	**UMA**		
Course Code	**20UMAA42**	**Number of Hours/Cycle**	**6**		
Semester	**IV**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**4**		
Allied Course					
Course Title	**Business Mathematics**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course provides a basic mathematical skills which needs to understand, an analyze and solve the mathematical problems encountered in business and finance

.**Unit I**	**Set Theory**	**17 Hours**
	Set Definition- Operations on sets- Venn diagram- Laws of Sets- Verification of Laws by Venn diagrams and Examples- Solving problems using set theory	
Unit II	**Simple and Compound Interest**	**18 Hours**
	Simple Interest- Compound Interest- Difference between Simple Interest and Compound Interest- Discount on bills.	
Unit III	**Application of Differential Calculus**	**20 Hours**
	Differentiation- Formulae- Application of derivatives- Marginal Cost- Marginal Revenue- Maxima and Minima of a	

	function	
Unit IV	**Arithmetic and Geometric Progression**	**18 Hours**
	Arithmetic Progression – n^{th} term of AP– Sum to n terms in AP – properties of an AP – Geometric Progression - n^{th} term of GP - Sum to n terms in GP.	
Unit V	**Matrices**	**17 Hours**
	Definitions- Types of matrix - Addition, Subtraction, Multiplication of matrices- Matrix Equations- Inverse of a Matrix- Simultaneous equations by matrix inverse method.	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion and Quiz

Text Book

1. Dr. P.R. Vittal(2004)," *Business Mathematics"*, Margham Publications, Chennai.

Reference Books

1. J.PSingh, (2014), "*Business Mathematics"*, Anne book Pvt. Ltd., New Delhi.
2. Mohd. Shadabkhan, (2012), "*Business Mathematics"*, Viva Books publication, NewDelhi.
3. C.Ranganathan, (2003),"*Business Mathematics"*, Himalayan publication

E-Resources

1. https://www.topper.com/guides/maths/sets/venn-diagrams/
2. https://www.scripd.com/doc/19613606/Applications-of-Matrices-to-Business-and-Economics
3. https://www.pearsonhighered.com/assets/samplechapter/0/1/3/4/0134437764.pdf
4. https://math.hawaii.edu/~mchyba/documents/syllabus/Math499/extracredit.pdf

Course Outcome

After completion of this course, the students will be able to:

CO1	Draw and use Venn diagrams to solve real problems in business
CO2	various mathematical applications in business
CO3	use derivatives in marginal analysis and application of differential calculus to find the maxima and minima of a function
CO4	solve problems in Arithmetic Progression and Geometric Progression
CO5	perform elementary matrix operations and use the concept of matrices in business decision making.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	3	1	1	1	1	1	1	1	1	1	1
CO 2	2	2	1	2	1	1	1	1	1	1	1	1

CO 3	2	2	1	1	1	1	1	1	1	1	1	1
CO 4	3	2	2	1	1	1	1	1	1	1	1	1
C0 5	3	3	2	1	1	1	1	1	1	1	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3

Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	5	-	-	5	5%
K2	5	40	-	45	45%
K3	-	-	50	50	50%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit I	**Set Theory**	**17 Hours**	**Mode**
	a.Set Definition and Types of Sets	**2**	Chalk & Talk
	b. Operations on sets	**2**	
	c.Venn diagram	**3**	
	d.Laws of Sets	**3**	
	e.Verification of Laws by Venn diagrams and Examples and Solving problems using set theory	**7**	
Unit II	**Simple and Compound Interest**	**18 Hours**	**Mode**
	a.Simple Interest	**4**	Chalk & Talk
	b. Compound Interest	**5**	
	c.Difference between Simple Interest and Compound Interest	**3**	
	d.Discount on bills.	**6**	
Unit III	**Application of Differential Calculus**	**20 Hours**	**Mode**
	a.Differentiation & Formulae	**2**	Chalk & Talk
	b.Application of derivatives	**5**	
	c.Marginal Cost	**4**	

	d.Marginal Revenue	**4**	
	e.Maxima and Minima of a function	**5**	
Unit IV	**Arithmetic and Geometric Progression**	**18 Hours**	**Mode**
	a.Arithmetic Progression	**2**	Chalk & Talk
	b.n^{th} term of AP and Sum to n terms	**5**	
	c.properties of an AP	**2**	
	d.Geometric Progression	**3**	
	e.n^{th} term of GP and Sum to n terms	**6**	
Unit V	**Matrices**	**17 Hours**	**Mode**
	a Matrix, Definitions & Types of Matrix	**3**	Chalk & Talk
	b.Addition, Subtraction, Multiplication of matrices	**4**	
	c.Matrix Equation	**3**	
	d.Inverse of Matrix	**3**	
	e.Simultaneous equations by matrix inverse method	**4**	

Course designed by Mrs .A. Theeba

Programme	**B.Sc CS & B. Sc IT**	**Programme Code**	**UMA**		
Course Code	**20UMAA33**	**Number of Hours/Cycle**	**4**		
Semester	**III**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**4**		
Allied Course					
Course Title	**Numerical Methods**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**60**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

The course deals with the methods of solving transcendental and algebraic equations, system of linear algebraic equations. Evaluation of definite integrals and solving initial value problems are dealt with iterations

Unit I	**Algebraic and Transcendental Equations:**	**10 Hours**
	Introduction - Iteration method - Bisection method -Regula Falsi method - Newton- Raphson method	

Unit II	**Simultaneous Equations:**	**12 Hours**
	Introduction – Gauss Elimination method-Gauss – Jordan Elimination method – Inverse of a matrix **Iterative methods:** Gauss-Jacobi Iteration method – Gauss-seidal iteration method.	
Unit III	**Interpolation:**	**14 Hours**
	Introduction – Newton's interpolation formulae **Central difference interpolation formulae:** Gauss Forward, Gauss Backward, Lagrange's interpolation formulae – Inverse interpolation	
Unit IV	**Numerical differentiation & integration:**	**12 Hours**
	Introduction - Derivatives using Newton's forward difference and Newton backward difference formula Trapezoidal rule – Simpson's one third rule - Simpson's $3/8^{th}$ rule.	
Unit V	**Numerical solution of ordinary differential equations:**	**12 Hours**
	Taylor's series method – Euler's method – Runge-kutta method of second, third, fourth order	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching ,group discussion and Quiz.

Text Book

1. Arumugam.S, ThangapandiIssac. A, Somasundaram A (2014) Second edition "*NUMERICAL METHODS*", SCITECH Publications India PVT Limited.

Reference Books

1. SingaraveluA,(2008)," *Numerical Methods*", Published by Meenakshi Agency.
2. Veerarajan T, (2007), "*Numerical Methods*" Sigma series, Tata McGraw-Hill Education

3. Jain M.K., Iyengar. S.R.K and Jain R. K, 2018, "*Numerical Methods for Scientific and Engineering Computation*", Sixth Edition, New Age International Publishers, New Delhi.

E-Resources

1. https://ocw.mit.edu/courses/mathematics/18-330-introduction-to-numerical-analysis-spring-2012/lecture-notes/MIT18_330S12_Chapter3.pdf
2. https://www.coursera.org/courses?query=numerical%20analysis&page=1
3.https://www.mooc-list.com/tags/numerical-analysis
4.https://github.com/numerical-mooc/numerical-mooc
5.https://nm.mathforcollege.com/topics/textbook_index.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Solve Transcendental and system of liner algebraic equations using iteration.
CO2	Develop problems solving skills using Direct methods and Iterative Methods.
CO3	Explain Lagrange and Newton's Interpolations and Central difference interpolation Procedure.
CO4	Make use of Numerical Techniques to find the derivative at a point and evaluate definite integrals.
CO5	Solve Problems in Numerical solution of Ordinary differential equations. .

Mapping of Course Outcomes (COs) withProgramme Specific Outcomes for B.Sc.,(Computer Science)

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	2	2	2	1	-	-	-	-	-	-	-	-
CO 2	3	2	2	-	-	-	-	-	-	-	-	-
CO 3	3	2	2	1	-	-	-	-	-	-	-	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	-
C0 5	2	2	2	-	-	-	-	-	-	-	-	-

3-High 2-Moderate 1-Low

Mapping of Course Outcomes (COs) withProgramme Specific Outcomes for B.Sc.,(Information Technology)

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	1	1	2	2	3	2	1	1	1	1	1	1
CO 2	1	1	3	2	2	1	1	1	2	1	1	1
CO 3	1	1	3	2	2	1	1	1	1	1	1	1
CO 4	1	1	3	2	3	1		1	1	1	1	1
C0 5	1	1	3	2	3	2	1	1	1	1	1	1

3-High 2-Moderate 1-Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No.of Questions**
1	CO 1	Up to K3	2	K1&K2	2(K2, K2)	1(K3)
2	CO 2	Up to K3	2	K1&K2	2(K2, K2)	1(K3)
3	CO	Up to K3	2		2(K2, K2)	1(K3)

	3			K1&K2		
4	CO 4	Up to K3	2	K1&K2	2(K2, K2)	1(K3)
5	CO 5	Up to K3	2	K1&K2	2(K2, K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5 %	5 %
K2	5	40	-	45	45%	45%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Algebraic and Transcendental Equations**	**10 Hours**	**Mode**
	a. Introduction	**1**	**Chalk and Talk**
	b. Iteration method	**2**	
	c. Bisection method	**2**	
	d. Regula Falsi method	**2**	
	e. Newton- Raphson's method	**3**	
Unit II	**Simultaneous Equations**	**12 Hours**	**Mode**
	a. Introduction	**1**	**Chalk**
	b. Gauss Elimination method	**2**	

	c. Gauss – Jordan Elimination method	**2**	**and Talk**
	d. Inverse of a matrix	**2**	
	e. Gauss-Jacobi Iteration method – Gauss-seidal iteration method	**5**	
Unit III	**Interpolation**	**14 Hours**	**Mode**
	a. Introduction	**1**	**Chalk and Talk**
	b. Newton's interpolation formulae	**3**	
	c. Central difference interpolation	**6**	
	d. Lagrange's interpolation formulae	**2**	
	e. Inverse interpolation	**2**	
Unit IV	**Numerical differentiation & integration**	**12 Hours**	**Mode**
	a. Introduction	**1**	**Chalk and Talk**
	b. Derivatives using Newtons forward difference and Newton backward difference formula	**4**	
	c. Trapezoidal rule	**2**	
	d. Simpson's one third rule	**2**	
	e. Simpson's $3/8^{th}$ rule	**3**	
Unit V	**Numerical solution of ordinary differential equations**	**12 Hours**	**Mode**
	a. Taylor's series method	**2**	**Chalk and Talk**
	b. Euler's method	**2**	
	c. Runge-kutta method of secondorder	**3**	
	d. Runge-kutta method of third order	**2**	
	e. Runge-kutta method of fourth order	**3**	

Course designed by Mrs. G.A.Pradheepa , Mrs. M.Devi Priya

Programme	**B.Sc., CS & IT**	**Programme Code**	**UMA**
Course Code	**20UMAA43**	Number of Hours/Cycle	**4**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**4**
Allied Course			
Course Title	**Quantitative Aptitude**		
Cognitive Level		**Up to K3**	

Preamble

The course provides various mathematical aptitude techniques of solving problems in Percentages, Profit and Loss, Simple and compound interest etc.

Unit I	**Numbers**	**12 Hours**
	Numbers – HCF and LCM of Numbers – Decimal Fractions.	
Unit II	**Square roots and Cube roots**	**12Hours**
	Square roots and Cube roots – Average – Problems on Numbers – Problems on Ages.	
Unit III	**Percentage**	**14 Hours**
	Percentage – Profit and Loss – Ratio and Proportion.	
Unit IV	**Time and Works**	**11Hours**
	Time and Works – Time and Distance – Calendar.	
Unit V	**Simple and Compound Interest**	**11 Hours**
	Simple Interest – Compound Interest – Logarithms.	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion and Quiz

Text Book

1.R.S.Aggarwal, (2011), "*Quantitative Aptitude*", S.Chand& Company Ltd.,

Reference Books

1. R.V.Praveen, (2013), "*Quantitative Aptitude and reasoning*" ,2nd Edition,, PHI Learning.
2.M.Tyra,(2011), "*Magical book on Quicker Maths*", Delhi ,BSC Publishing Co.Pvt.Ltd.
3. AbhijitGuha, (2003),"*Quantitative Aptitude for Competitive Exams*", (4th Edition),New Delhi, McGraw Hill Company.

E-Resources

1.https://www.quora.com
2.https://www.qsleap.com › cat › resources ›
3. https://www.greatlearning.in

After completion of this course, the students will be able to:

CO1	Formulatethe problem quantitatively and recall appropriate arithmetical methods to solve the problem
CO2	Demonstrate the various principles involved in solving mathematical problems.
CO3	Solve the problems in Percentage, Profit and Loss and Ratio and Proportion.

CO4	Solve the problems in Time and Works ,Time and Distance and Calendar
CO5	Acquire knowledge of solving problems in Simple and Compound InterestandLogarithms.

Mapping of Course Outcomes (COs)
with Programme Specific Outcomes for B.Sc.,(Computer Science)

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	1	0	0	1	2	1	0	3	0	0	0
CO 2	3	2	0	0	1	2	1	0	3	0	0	0
CO 3	3	2	0	0	1	2	1	0	3	0	0	0
CO 4	3	2	0	0	1	2	1	0	3	0	0	0
CO 5	2	2	0	0	1	2	1	0	3	0	0	0

3. High; 2. Moderate; 1. Low

Mapping of Course Outcomes (COs) withProgramme Specific Outcomes for B.Sc.,(Information Technology)

PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
1	**0**	**1**	**2**	**0**	**2**	0	0	2	0	0	1
1	**0**	**1**	**2**	**0**	**2**	0	0	2	0	0	1
1	**0**	**1**	**2**	**0**	**2**	0	0	2	0	0	1
1	**0**	**1**	**2**	**0**	**2**	0	0	2	0	0	1
1	**0**	**1**	**2**	**0**	**2**	0	0	2	0	0	1

3.High; 2. Moderate; 1. Low;

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each sSection			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5	5%
K2	5	40	-	45	45	45%
K3	-	-	50	50	50	50%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Numbers**	**12 Hours**	**Mode**
	a.Numbers	**5**	Chalk & Talk
	b.HCF and LCM of Numbers	**4**	
	c.Decimal Fractions	**3**	
Unit II	**Square roots and Cube roots**	**12 Hours**	**Mode**
	a.Square roots and Cube root	**3**	Chalk & Talk
	b.Average	**2**	
	c.Problems on Numbers	**4**	
	d.Problems on Ages	**3**	
Unit III	**Percentage**	**12 Hours**	**Mode**
	a.Percentage	**5**	Chalk & Talk
	b.Profit and Loss	**6**	
	c.Ratio and Proportion	**3**	
Unit IV	**Time and Works**	**12 Hours**	**Mode**
	a. Time and Works	**4**	Chalk & Talk
	b.Time and Distance	**4**	
	c.Calendar	**3**	
Unit V	**Simple and Compound Interest**	**12 Hours**	**Mode**
	a.Simple Interest – Compound Interest – Logarithms.	**4**	Chalk & Talk
	b.Compound Interest	**4**	
	c.Logarithms	**3**	

Course designed by **Mrs. A. Theeba**

Value Added Courses

Programme	**B.Sc.(Mathematics)**	**Programme Code**	**UMA**
Course Code	**20CMAT31**	**No. of Hrs per cycle**	**1**
Semester	**III**	**Max. Marks**	**100**
Part	**-**	**Credit**	**1**
Value Added Course I			
Course Title	**Developing Quantitative Aptitude - I**		
Cognitive level – Up to K3			

Preamble

This course will enable the students to develop their quantitative skills that strengthen their edge over others in competitive examinations.

Unit I		**6 Hours**
	Applications of Decimal fractions in competitive examinations	
Unit II		**6 Hours**
	Simplification problems in competitive examinations	
Unit III		**6 Hours**
	Partnership problems in competitive examinations	
Unit IV		**6 Hours**
	Alligation and mixture problems in competitive examination	
Unit V		**6 Hours**
	Odd man out series – True Discount problems in competitive examinations	

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book

1. Aggarwal R.S. Quantitative Aptitude, S.chand & company Ltd., 2011
   Unit I: Chapters 3
   Unit II: Chapters 4
   Unit III: Chapters 13
   Unit IV: Chapters 20
   Unit V: Chapters 32,35.

Reference Book

1.Aggarwal R.S (2005) Quantitative Aptitude For Competitive Examinations, 3rd edition, Tata McGraw Hill.

Course designed by Dr. S. Ramachandran

Programme	**B.Sc.(Mathematics)**	**Programme Code**	**UMA**

Course Code	**20CMAT41**	**No. of Hrs per cycle**	**1**
Semester	**IV**	**Max. Marks**	**100**
Part	**-**	**Credit**	**1**
Value Added Course II			
Course Title	**Developing Quantitative Aptitude - II**		
Cognitive level – Up to K3			

Preamble

This course will enable the students to develop their quantitative skills that strengthen their edge over others in competitive examinations.

Unit I		**6 Hours**
	Surds and Indices problems in competitive examinations	
Unit II		**6 Hours**
	Pipes and cistern problems in competitive examinations	
Unit III		**6 Hours**
	Boats and Streams problems in competitive examinations	
Unit IV		**6 Hours**
	Heights and distances problems in competitive examinations	
Unit V		**6 Hours**
	Chain Rule (direct and inverse variation) problems in competitive examinations	

Pedagogy

Class Room lectures, ICT , Participatory method of teaching, Group discussion and Quiz

Text Book

1. Aggarwal R.S. (2006) Quantitative Aptitude, S.chand & company Ltd.,

Unit I: Chapters 9
Unit II: Chapters 16
Unit III: Chapters 19
Unit IV: Chapters 34
Unit V: Chapters 14

Reference Book

1. Aggarwal R.S (2005) Quantitative Aptitude For Competitive Examinations, 3rd edition, Tata McGraw Hill.

Course designed by Dr. C. Subramani

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC51**	**Number of Hours/Cycle**	**5**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Core Course IX					
Course Title	**Discrete Algebraic Structures**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**75**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To have basic concept of groups, types of groups, Rings and to make the students familiar with discrete structure and it induce analytical thinking towards developing Programming skills.

Unit I	**Groups – subgroups – cyclic & Per mntation groups**	**15 Hours**
	(Groups – definition – properties – problems - Functions and Relations – Groups Basics Not for semester) - Subgroups- Definitions, Examples- Theorems on Subgroups- Permutation Groups- Cycles and Transpositions- Even Permutations- Theorems on Permutations - S_n and A_n - Cyclic Groups- Definitions, Examples, Theorems- Order of an element- Generators- Number of Generators of cyclic groups	
Unit II	**Cosets – Normal, subgroups & Qnotient groups**	**15 Hours**
	Cosets- Theorems on cosets, Lagrange's theorem, Problems using Lagrange's theorem- Euler's, Fermat's Theorems- Normal Subgroups- Theorems on Normal subgroups- Quotient group	
Unit III	**Homomorphism on Groups & Cayley's Theorem**	**15 Hours**
	Homomorphism- Types and examples- Theorems on Homomorphism- Isomorphism - Fundamental theorem of Homomorphism- Any infinite cyclic group is isomorphic to (Z,+)- Any finite group is isomorphic to (Z_n,+)- Cayley's theorem.	
Unit IV	**Rings & Integral Domains**	**15 Hours**
	Rings- Definition and examples- Elementary properties- Isomorphism- Types of Rings- Integral Domains, Fields- Zero divisors- Theorems on Integral Domains and fields, Characteristic of a Ring.	
Unit V	**Sub rings – Ideals & Quotient rings**	**15 Hours**
	Sub rings- Ideals- Quotient rings- maximal and prime ideals- Field of Quotient of an Integral Domain	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book

1.Dr.S.Arumugam and A.T.Isacc (2008),Modern Algebra,Scitech Publications.

Reference Books

1. S.G.venkatachalapathy (2011),Modern Algebra,MARGHAM PUBLICATIONS,Chennai
2. Surjeet Singh (eight edition), Modern Algebra, Qazi Zameeruddin VIKAS – publishing house Pvt- Ltd.

3. Paul B. Garrett (2009) , Abstract Algebra ,Chapman &hall ICRC Taylor & Francis Group.
4. John .B. Fraleigh (2003), A first course in Abstract Algebra , Dorling Kindersely (India) Pvt. Ltd.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	To understand the basic concepts of groups and it's types properties of subgroups & it's types..
CO2 Co	construct and classify the cosets &Normal Subgroups and applying Lagrange's Eulers, Fermatts theorems
CO3	Formulate and Construct mappings between Groups of cyclic, finite & infinite groups.
CO4	Acquire the knowledge of Rings – Integral domains.
CO5	Constructing Sub rings – Ideals Quotient rings and under solving the properties Of the field of quotient of an ID

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	1	3	2	1	-	-	-	2
CO 2	3	2	3	3	1	3	2	1	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K- Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
2	CO2	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
3	CO3	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
4	CO4	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
5	CO5	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
No of Questions to be asked			10		10	5

No of Questions to be answered	10		5	3
Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	10	--	--	10	10	10
K2	--	40	-	40	40	40
K3	-	-	50	50	50	50
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Groups – subgroups – cyclic & Permutation groups**	**15 Hours**	**Mode**
	j. Definition of Group	**2**	**Chalk & Talk**
	k. Properties of the Group	**2**	
	l. Problems in Groups	**1**	
	m. Functions and Relations	**1**	
	n. Subgroups- Definitions, Examples	**2**	
	o. Theorems on Subgroups	**2**	
	p. Permutation Groups Cycles and Transpositions	**2**	
	q. Even Permutations- Theorems on Permutations	**2**	
	r. Theorems	**1**	
Unit II	**Cosets – Normal, subgroups & Qnotient groups**	**15 Hours**	**Mode**
	l. Cosets- Theorems on cosets	**2**	**Chalk & Talk**
	m. Lagrange's theorem	**1**	
	n. Problems using Lagrange's theorem	**2**	
	o. Euler's, Fermat's Theorems- Normal Subgroups	**3**	
	p. Theorems on Normal subgroups	**4**	
	q. Quotient groups	**3**	
Unit III	**Homomorphism on Groups & caylen's Theorem**	**15 Hours**	**Mode**
	k. Homomorphism	**2**	**ICT**
	l. Theorems on Homomorphism	**3**	
	m. Isomorphism	**2**	
	n. Fundamental theorem of Homomorphism	**2**	
	o. Any infinite cyclic group is isomorphic to (Z,+), Problems	**3**	
	p. Any finite group is isomorphic to $(Z_n,+)$- Cayley's theorem. Problems	**3**	
Unit IV	**Rings & Integral Domains**	**15 Hours**	**Mode**
	k. Rings	**3**	**Chalk**

	l. Definition and examples	**2**	**& Talk**
	m. Elementary properties- Isomorphism	**2**	
	n. Types of Rings	**2**	
	o. Integral Domains, Fields	**2**	
	p. Zero divisors	**1**	
	q. Theorems on Integral Domains and fields	**2**	
	r. Characteristic of a Ring.	**1**	
Unit V	**Sub rings – Ideals & Quotient rings**	**15 Hours**	**Mode**
	f. Sub rings	**4**	**ICT**
	g. Ideals	**4**	
	h. Quotient rings	**3**	
	i. maximal and prime ideals	**2**	
	j. Field of Quotient of an Integral Domain	**2**	

Course designed by: Dr. S. Ramachandran, Mrs. A.Theeba

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC52**	**Number of Hours/Cycle**	**5**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Core Course X					
Course Title	**Differential Equations and Laplace Transform**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**75**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To help students to develop skills and knowledge of standard concepts in differential equations and to create an interest in problem solving.

Unit I	**Exact differential equations**	**15 Hours**
	Exact differential equations - differential equations of first order but of higher degree-Equations solvable for p- Equations solvable-for x- Equations solvable-for y-Clairaut's form Linear Equations with constant coefficients	
Unit II	**Linear equations of the second order**	**15 Hours**
	Linear Equations with variable coefficients - Equations reducible to the linear homogeneous equations -Linear equations of the second order –Complete solution given a known integral	
Unit III	**Simultaneous differential equations**	**15 Hours**
	Reduction to the normal form- Change of independent variables- Variation of parameters - Simultaneous differential equations-First order and first degree	
Unit IV	**Partial differential equations of the first order**	**15 Hours**
	Solutions of $\frac{dx}{X} = \frac{dy}{Y} = \frac{dz}{Z}$ -Partial differential equations of the first order-Derivation of partial differential equations-Lagrange method of solving linear equations	
Unit V	**Laplace Transform**	**15 Hours**
	Laplace Transforms-Theorems-Problems-Evaluation of integrals -Inverse Laplace Transforms – Results-problems-Solving ordinary differential equation with constant coefficient and variable coefficients-Simultaneous linear equations using Laplace Transforms.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and

Quiz.

Text Book

1. ManickaVasagam Pillai.T.K., and Narayanan.S.(2011), "*Differential equations and its applications*", S.Viswanathan Publications, Chennai

Reference Book(s)

1. Dr. S.Arumugam,(2008), "*Differential equations and Application*", New Gamma Publications, Palayamkottai
2. Dr. Moorthy. M.B.K., Senthilvadivu. K.,Mahendran. P.,(2006), "*Engineering Mathematics*", VRB publishers Private Limited Chennai.
3. Dr.Singaravelu.A.,(2009), "*Engineering Mathematics–I*", Meenakshi Agency, Chennai.

E-resources

IIT Lectures, UGC Gyan Dharshan videos
http://ndl.iitkgp.ac.in
http://ocw.mit.edu
http://mathforum.org
https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO 1	Applying different techniques to solve exact differential equation and stating main ideas of equation solvable for x,y and p
CO 2	Solve problems in linear equations with variable co-efficients and equations reducible to homogeneous equations
CO 3	Identify variation of parameter and applying techniques to solve simultaneous equation
CO 4	Develop various methods to solve problems in partial differential equations
CO 5	Utilize different technique of Laplace transforms to solve differential equation with constant and variable co-efficients

Mapping of Programme specific outcomes with Course Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	3	1	3	2	3	3	1	1	1	1	2
CO2	3	2	2	2	1	2	1	1	1	1	1	1
CO3	3	3	2	2	1	3	2	1	1	1	1	1
CO4	3	3	3	3	2	2	2	1	1	1	1	2
CO5	3	3	2	3	1	2	2	1	1	1	1	2

1-Low **2-Moderate** **3-High**

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	Consolidated (Rounded off)
K1	5	--	--	5	5%
K2	5	40	--	45	45%
K3	--	--	50	50	50%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit	Lesson Plan	Hours	Mode
I	a.Exact differential equations	3	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b.Differential equations of first order but of higher degree	2	
	c.Equations solvable for p	2	
	d.Equations solvable-for x	2	
	e.Equations solvable-for y	2	
	f.Clairaut's form Linear Equations with constant coefficients	4	
II	a. Linear Equations with variable coefficients	4	Lecture (Chalk & Talk) ICT
	b. Equations reducible to the linear homogeneous equations	3	
	c.Linear equations of the second order	4	
	d.Complete solution given a known integral	4	
III	a.Reduction to the normal form	3	Lecture (Chalk & Talk) PPT ICT
	b.Change of independent variables	3	
	c.Variation of parameters	3	
	d.Simultaneous differential equations-	4	
	e.First order and first degree	2	
IV	a.Solutions of $\frac{dx}{X} = \frac{dy}{Y} = \frac{dz}{Z}$	4	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b.Partial differential equations of the first order	4	
	c.Derivation of partial differential equations-	4	
	d.Lagrange method of solving linear equations	3	
V	a.Laplace Transforms	2	Lecture (Chalk & Talk) PPT ICT
	b.Theorems	2	
	c.Problems	2	
	d.Evaluation of integrals	2	
	e.Inverse Laplace Transforms Results-problems-	2	
	f.Solving ordinary differential equation with constant coefficient and variable coefficients-	2	
	g.Simultaneous linear equations using Laplace Transforms.	3	

Course designed by: Prof. N. Sakunthala

Programme	B.Sc Mathematics	Programme Code	UMA		
Course Code	20UMAA51	Number of Hours/Cycle	3		
Semester	V	Max. Marks	100		
Part	III	Credit	3		
Allied Course V					
Course Title	Numerical Methods with C		L	T	P
Cognitive Level	Up to K3		45	-	-

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course is designed to Numerical methods with C programming to provide the necessary basic concepts of Numerical Methods and give procedures for solving numerically different kinds of problems in scientific computing.

Unit I	**Introduction to C**	**9 Hours**
	History of C – Structure of C Programs – constant – variables – data types – operators and expressions – input and output statements.	
Unit II	**Conditional Statements**	**9 Hours**
	Conditional statements: simple if, if-else, nested if-else, else-if (ladder), switch, go-to statements – Looping Statements: while, do-while and for statements – nesting of loops – introduction to array – one dimensional, two dimensional and multi dimensional arrays.	
Unit III	**Numerical Solutions of Equation**	**9 Hours**
	Algebraic and Transcendental Equations – Iteration method – Bisection method (Bolzano method) – Regula Falsi method – Newton-Raphson method – Simultaneous Equations: Gauss Elimination Method – Gauss Jordan Method – Gauss Seidel Method.	
Unit IV	**Interpolation and Numerical Differentiation**	**9 Hours**
	Interpolation – Equally spaced intervals: Newton's forward and backward Formula – Unequally spaced interval: Lagrange's Interpolation Formula – Divided differences – Newton's Divided Difference Formula - Numerical Differentiation: Newton's Forward and Backward Difference Formula	
Unit V	**Numerical Integration**	**9 Hours**
	Trapezoidal rule – Simpson's one-third rule - Simpson's three-eighth rule – Solving Differential Equations: Euler's methods –Runge-Kunge methods: Second order Runge-Kunge method – Fourth order Runge-Kunge method.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book(s)

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, (2013) Numerical Analysis with Programming in C, New Gamma Publishing House, Palayamkottai.

2. Balagurusamy E, (2009), Programming in ANSI 'C', Tata McGraw Hill Publications, New Delhi.

Reference Book(s)

1. Kandasamy P, Thilagavathy K, Gunavathy K, (2012), Numerical Methods, S. Chand & Sons
Company, New Delhi.
2. Jain M K, Iyengar S R K, Jain R K, (2012), Numerical Methods for Science and Engineering
Computations 6th edition, New Age International Publishers.
3. Sastry S.S, (2009), Introductory Methods of Numerical Analysis, (2008), Meenakshi Agency, Chennai.

E-Resources

1. http://www.math.iitb.ac.in/~baskar/book.pdf
2. https://www.math.ust.hk/~machas/numerical-methods.pdf
3.http://www.cse.iitm.ac.in/~vplab/downloads/opt/Applied%20Numerical%20Analysis.pdf
4.http://www.ikiu.ac.ir/public-files/profiles/items/090ad_1410599906.pdf

Course Outcomes

After completion of this course, the students will be able to:

CO 1	Understand basic data structures and to develop logics which will help them to create well-structured programs using C language.
CO 2	Knowledge of Operators, Data types, Array, Functions and can develop programs in C language.
CO 3	Obtain approximate solutions of algebraic and transcendental equations and Solve simultaneous linear equations.
CO 4	Derive Numerical methods of various mathematical operations and tasks, such as Interpolation and Numerical Differentiation.
CO 5	Develop and apply Numerical Integration and Solve ordinary differential equations numerically using single and multi-step methods.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	2	3	3	1	3	1	3	-	-	-	2
CO 2	3	2	3	3	1	3	1	2	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C05	3	2	3	2	1	2	3	2	-	-	-	3

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K1	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K1	2(K2 & K2)	1(K3)
4	CO4	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	-	-	10	10%	10%
K2	-	40	-	40	40%	40%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

		Introduction to C	**9 Hours**	**Mode**
Unit I	a.	History of C	**2**	**Chalk & Talk**
	b.	Structure of C Programs	**1**	
	c.	Constant, variables	**2**	
	d.	Data types, Operators and expressions	**2**	
	e.	Input and output statements	**2**	
		Conditional statements	**9 Hours**	**Mode**
Unit II	a.	Simple if, if-else, nested if-else, else-if(ladder)	**1**	**Chalk & Talk**
	b.	switch, go-to statements	**1**	
	c.	Looping Statements: while, do-while and for statements	**2**	
	d.	nesting of loops	**1**	
	e.	Introduction to array	**2**	
	f.	one dimensional, two dimensional and multi dimensional arrays	**2**	
		Numerical Solutions of Equation	**9 Hours**	**Mode**
Unit III	a.	Algebraic and Transcendental Equations	**1**	**Chalk & Talk ICT**
	b.	Iteration method	**1**	
	c.	Bisection method (Bolzano method)	**1**	
	d.	Regula Falsi methods	**1**	
	e.	Newton-Raphson method	**2**	
	f.	Simultaneous Equations: Gauss Elimination Method, Gauss Jordan Method	**2**	
	g.	Gauss Seidel Method	**1**	
		Interpolation and Numerical Differentiation	**9 Hours**	**Mode**
Unit IV	a.	Interpolation, Newton's Interpolation Formula	**2**	**Chalk & Talk ICT**
	b.	Lagrange's Interpolation Formula	**2**	
	c.	Divided differences, Newton's Divided Difference Formula	**2**	
	d.	Numerical Differentiation: Introduction	**1**	
	e.	Derivatives using Newton's Forward Difference Formula	**1**	
	f.	Derivatives using Newton's Backward Difference Formula	**1**	
Unit V		**Numerical Integration**	**9 Hours**	**Mode**
	a.	Numerical Integration: Trapezoidal rule	**1**	**Chalk & Talk**
	b.	Simpson's one-third rule	**1**	
	c.	Simpson's three-eighth rule	**1**	

d.	Solving differentiak equations: Euler's methods	**1**	
e.	Runge-Kunge methods, Second order Runge-Kunge method	**2**	
f.	Fourth order Runge-Kunge method.	**3**	

Course designed by: Dr. P. Pandiammal

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAA5P**	**Number of Hours/Cycle**	**2**		
Semester	**V**	**Max. Marks**	**50**		
Part	**III**	**Credit**	**2**		
Allied Practical III					
Course Title	**Numerical Methods with C Programming**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**-**	**-**	**30**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To develop the computational skills of the students to solve various mathematical problems by numerical techniques using C Programming.

Course Outcome:

Students will be able to solve problems of mathematics using computers and apply their knowledge gain solving real life problems appearing in various engineering applications that are often impossible to solve using analytical techniques.

List of Experiment

1. Program to find a root of a nonlinear equation using the Method of Bisection.
2. Program to find a root of a nonlinear equation using the Method of False Position.
3. Program to find the root of a nonlinear equation using the Newton-Raphson method.
4. Program to obtain the solution of a system of linear equations using Gauss elimination method.
5. Program to obtain the solution of a system of linear equations using Gauss -Seidel method.
6. Program to construct Newton's forward difference interpolation polynomial.
7. Program to construct Lagrange's interpolation polynomial formula.
8. Program to evaluate a definite integral by Trapezoidal rule.
9. Program to evaluate a definite integral by Simpson's rule.
10. Program to find solution of initial value problem using fourth order Runge Kutta method.

Text Book

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, (2013) Numerical Analysis with Programming in C, New Gamma Publishing House, Palayamkottai.

Course designed by: Dr. P. Pandiammal

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAA52**	**Number of Hours/Cycle**	**5**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Allied Course VI					
Course Title	**Mathematical Statistics- I**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**75**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

The course essentially deals with the probability distribution theory which is the basis of statistics. The topics covered includes Correlation and Regression and curve fitting.

Unit I	**Random Variables-Distribution Functions**	**15 Hours**
	Sample space – Random Variable – Discrete random variable – Continuous random variable – Probability density function – Discrete and continuous Distribution function – Joint probability function – Related Problems.	
Unit II	**Mathematical expectations and Generating Functions**	**15 Hours**
	Mathematical expectation– Moment generating function – Charateristic function – Chebyche's inequality – Bernoulli's Law of large numbers – Theorems with proof and related problems.	
Unit III	**Some Special Distributions**	**15 Hours**
	Theoretical Discrete and Continuous distributions – Binomial, Poisson, Normal, Gamma, Exponential, Rectangular (Or) Uniform distributions – Standard properties and Related Problems.	
Unit IV	**Correlation and Regression**	**15 Hours**
	Correlation and regression – Introduction-Correlation–Karl perason's coefficient of correlation – Rank correlation – spearman's formula for rank correlation –Regression line of y on x – Regression line of x on y . Correlation coefficient for a bivariate frequency distribution – Related problems.	
Unit V	**Curve Fitting**	**15 Hours**
	Curve fitting – Principle of Least Squares – Fitting of a straight line – Fitting of a second degree parabola – Change of origin. Conversion of data to linear form – Fitting of a	

	power curve – Fitting of exponential curves – Related Problems.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book (s)

1. Arumugam. S and Thangapandi Isaac.A, (2016) Statistics, New Gamma Publications Private Limited.

Unit I: Chapter 12 (sec 12.1-12.3)
Unit II: Chapter 12 (sec 12.4 -12.6)
Unit III: Chapter 13
Unit IV: Chapter 6(sec 6.1- 6.4)
Unit V: Chapter 5

2.Gupta. S.C and Kapoor.V.K, Mathematical Statistics,(2008), Sultan Chand and Sons.
Unit I: Chapter 5 (sec 5.5.1-5.5.4)
Unit II: Chapter 6 (sec 6.12, 6.13, 6.13.1)
Unit III: Chapter 8 (sec 8.1, 8.3, 8.6)

Reference Book(s)

1. Dr. S.P. Gupta, Dr. M.P. Gupta (2010),Business Statistics, Sultan Chand & Sons Educational Publishers, New Delhi
2. P.R. Vittal (2002), Mathematical Statistics, Margham Publications, Chennai.
3. Manmohan Gupta, Statistics,(2001), Sultan Chand & Sons.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Identify discrete and continuous random variables.
CO2	Recall and apply a comprehensive set of Probability ideas in generating expectations.
CO3	Find, interpret and analyze the measure of central tendencies in distributions.
CO4	Determine the relationship between quantitative variables and extend regression analysis.
CO5	Fit the appropriate curve.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	2	3	2	2	2	3	2	-	-	-	2
CO 2	3	2	3	3	2	2	2	3	-	-	-	2
CO 3	3	2	3	2	2	2	3	2	-	-	-	2
CO 4	3	2	3	2	2	2	3	2	-	-	-	2
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	40	-	45	45%	45%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Random Variables-Distribution Functions**	**15 Hours**	**Mode**
	a.Sample space, Random Variable	1	**Chalk & Talk**
	b.Discrete random variable	2	
	c.Continuous random variable	3	
	d. Probability density function	2	
	e. Discrete and continuous Distribution function	3	
	f. Joint probability function	4	
Unit II	**Mathematical expectations and Generating Functions**	**15 Hours**	**Mode**
	a.Mathematical expectation	3	**Chalk & Talk**
	b.Moment generating function	4	
	c. Characteristic function.	2	
	d.Chebyche's inequality	3	
	e.Bernoulli's Law of large numbers	3	
Unit III	**Some Special Distributions**	**15 Hours**	**Mode**
	a.Binomial distributions, Standard properties & Related Problems	2	**Chalk & Talk ICT**
	b.Poisson distribution, Standard properties & Related Problems	2	
	c.Normal distribution, Standard properties & Related Problems	5	
	d.Gamma distribution , Standard properties & Related Problems	2	
	e.Exponential distribution , Standard properties & Related Problems	2	
	f.Rectangular distribution , Standard properties & Related Problems	2	
Unit IV	**Correlation and Regression.**	**15 Hours**	**Mode**
	a.Introduction-correlation.	1	**Chalk & Talk ICT**
	b.Karl perason's coefficient of correlation	4	
	c.Rank correlation	1	
	d.Spearman's formula for rank correlation	3	
	e.Regression line of y on x – regression line of x on y	3	
	f.Correlation coefficient for a bivariate frequency distribution	3	
Unit V	**Curve Fitting**	**15 Hours**	**Mode**
	a.Curve fitting- Principle of Least Squares	2	**Chalk & Talk ICT**
	b.Fitting of a straight line	2	
	c.Fitting of second degree parabola	3	
	d.Change of origin	2	
	e.Conversion of data to linear form - Fitting of a power curve	3	
	f.Fitting of exponential curves	3	

Course designed by: Dr. C. Subramani

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**

Course Code	20UMAE51	Number of Hours/Cycle	4		
Semester	V	Max. Marks	100		
Part	III	Credit	3		
Core Elective Course I A					
Course Title	Fourier Transformation and Z Transformation		L	T	P
Cognitive Level	Up to K3		60	-	-

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To provide fundamentals of fourier transform , finite fourier transform and Z transform and increase the problem solving skill of the students

Unit I	**Fourier Integral Theorem**	**12 Hours**
	Introduction- Dirichlets condition -Statement of Fourier integral theorem- Problems based on Fourier integral theorem–Complex form of Fourier Integrals-Fourier Sine and cosine Integrals-problems- Fourier transform-Problems	
Unit II	**Fourier transform**	**12 Hours**
	Inverse formula for Fourier transform- Problems based on Fourier transform and its inversion formula-Properties of Fourier transform-Convolution theorem- Parseval's identity	
Unit III	**Sine and cosine Transforms**	**12 Hours**
	Fourier Sine and cosine Transforms –Properties of Fourier Sine and cosine Transforms- Inversion formula- Problems based on Fourier Sine and cosine Transforms.	
Unit IV	**Z transform**	**12 Hours**
	Introduction-Definition of Z-transforms for Bilateral, Unilateral, Discrete value of t – Problems based on Z transform of some basic functions- Linear Property - First Shifting – Differentiation in the Z-Domain-Second shifting--Initial and final value theorem- Simple Problems	
Unit V	**Inverse z-transform**	**12 Hours**
	Inverse z-transforms-Convolution Theorem –Formation of difference equations- Solution of the difference equations using Z-Transform.-Problems based on Solution of the difference equations using Z-Transform.	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion and Quiz.

Text Book

1. G.Balaji,(2007),Engineering Mathematics-III,G.Balaji Publishers,Chennai.

Reference Book(s)

1. T.Veerarajan (2011), Transform and Partial Differential equations, Tata McGraw hill Education Private limited, New Delhi.
2. Dr.B.S.Grewal (2012), Higher Engineering Mathematics, Khanna Publishers, New Delhi.

3. K.sankara Rao (1995), Introduction to Partial Differential Equations, Prentice Hall of India, New Delhi

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Learn and apply Fourier integral theorem and Fourier sine and cosine integral to solve problems
CO2	Apply Fourier integral theorem and Fourier sine and cosine integral to solve problems
CO3	Understand and apply Fourier sine and cosine transforms, convolution theorem and Parsevel's identity
CO4	Apply properties of Z –Transform and solve Problems based on Z transform of some basic functions
CO5	Find Solution of the difference equations using Z-Transform

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO 2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	3	2	2	2	2	3	3	-	-	-	3
CO 2	3	3	2	2	2	3	3	2	-	-	-	3
CO 3	2	2	2	2	2	3	3	2	-	-	-	3
CO 4	3	3	2	2	2	3	3	2	-	-	-	2
C05	2	2	2	2	2	3	3	2	-	-	-	2

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
2	CO2	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1 & K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	-	-	10	10%	10%
K2	-	40	-	40	40%	40%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Fourier Integral Theorem**	**12Hours**	**Mode**
	a. Introduction- Dirichlets condition-Statement of Fourier integral theorem	2	**Chalk & Talk ICT**
	b. Problems based on Fourier integral theorem–Complex form of Fourier Integrals	4	
	c. Fourier Sine and cosine Integrals-problems	3	
	d. Fourier transform-Problems	3	
Unit II	**Fourier transform**	**12 Hours**	**Mode**
	a. Inverse formula for Fourier transform	2	**Chalk & Talk ICT**
	b. Problems based on Fourier transform and its inversion formula	3	
	c. Properties of Fourier transform	3	
	d. Convolution theorem	2	
	e. Parseval's identity	2	
Unit III	**Sine and cosine Transforms**	**12Hours**	**Mode**
	a. Fourier Sine and cosine Transforms	3	**Chalk & Talk ICT**
	b. Properties of Fourier Sine and cosine Transforms-	3	
	c. Inversion formula	3	
	d. Problems based on Fourier Sine and cosine Transforms	3	
Unit IV	**Z transform**	**12 Hours**	**Mode**
	a. Introduction-Definition of Z-transforms for Bilateral, Unilateral, Discrete value of t	2	**Chalk & Talk ICT**
	b. Problems based on Z transform of some basic functions- Linear Property	3	
	c. First Shifting- Differentiation in the Z-Domain-Second shifting	4	
	d. Initial and final value theorem- Simple Problems	3	
Unit V	**Inverse z-transforms**	**12 Hours**	**Mode**
	a. Inverse z-transforms-Convolution Theorem	4	**Chalk & Talk ICT**
	b. Formation of difference equations - Solution of the difference equations using Z-Transform	4	
	c. Problems based on Solution of the difference equations using Z-Transform.	4	

Course designed by: Dr. J. Kaliga Rani

Programme	**B.Sc., Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAE52**	**Number of Hours/Cycle**	**4**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**3**		
Core Elective Course I B					
Course Title	**Combinatorics**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**60**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

The course is to enable the students to understand the concepts of permutation, combination and Inclusion and Exclusion principle, recurrence relations.

Unit I	**The Pigeonhole Principle**	**12 Hours**
	The Sum Rule and the Product Rule – The Pigeonhole Principle –Solved Problems on the Sum Rule and the Product Rule – Solved Problems on the Pigeonhole Principle.	
Unit II	**Permutations and Combinations**	**12 Hours**
	Permutations and Combinations – Solved Problems on Permutations and Combinations.	
Unit III	**Generating Permutations and Combinations**	**12 Hours**
	Generalized Permutations and Combinations – The Inclusion – exclusion Principle – Solved Problems on Generalized Permutations and Combinatio ns – Solved Problems on the Inclusion – Exclusion Principle – Solved Problems on Generalized Inclusion – Exclusion Principle.	
Unit IV	**Ordinary and Exponential Generating Function**	**12 Hours**
	Ordinary and Exponential Generating Function – Solved Problems on Ordinary Generating Function – Solved Problems on Exponential Generating Function.	
Unit V	**Recurrence Relations**	**12 Hours**
	Recurrence Relations – Solved Problems on Recurrence Relations and Associated Generating Functions.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book(s)

1. Balakrishnan. V.K., Theory and Problems of Combinatorics, (1995), Schaum's Outline Series, Mc Grow – Hil, Inc. Singapore.
   Unit I: Chapter 1 (1.1-1.3)
   Unit II: Chapter 1 (1.2)
   Unit III: Chapter 2 (2.1, 2.3)

Unit IV: Chapter 3 (3.1)
Unit V: Chapter 3 (3.3)

Reference Books

1. V. Krishnamurthy, Combinatorics Theory and Applications, (2000), East West Press.
2. Alan Tucker, Combinatorics, (2002), Wiley Publishers.
3. Rosen Kenneth, Discrete Mathematics and its Applications, (2007), 6th Edition International Edition, Mc Grow Hill.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Relate and apply sum and product rule.
CO2	Analyze and solve problems related to Permutation and Combination.
CO3	Make use of Inclusion-Exclusion Principle to solve problems on generalized permutation and combination.
CO4	Demonstrate ordinary and exponential generating functions and Solve Problems using ordinary and exponential generating functions.
CO5	Solve Problems using Recurrence Relations.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	2	3	2	2	2	2	2	-	-	-	2
CO 2	3	2	3	3	2	2	2	2	-	-	-	2
CO 3	3	2	3	2	2	2	2	2	-	-	-	2
CO 4	3	2	3	2	2	2	2	2	-	-	-	3
C0 5	3	2	3	2	2	2	2	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	40	-	45	45%	45%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**The Pigeonhole Principle**	**12 Hours**	**Mode**
b.	a. The Sum Rule and the Product Rule	1	**Chalk & Talk ICT**
	b. The Pigeonhole Principle	2	
	c. Solved Problems on the Sum Rule and the Product Rule	6	
	d. Solved Problems on the Pigeonhole Principle.	3	
Unit II	**Permutations and Combinations**	**12 Hours**	**Mode**
	a. Permutations and Combinations	2	**Chalk & Talk ICT**
	b. Solved Problems on Permutations and Combinations	10	
Unit III	**Generating Permutations and Combinations**	**12 Hours**	**Mode**
	a. Generalized Permutations and Combinations	1	**Chalk & Talk ICT**
	b. The Inclusion,Exclusion Principle	1	
	c.Solved Problems on Generalized Permutations and C ombinations	3	
	d.Solved Problems on the Inclusion, Exclusion Principle	4	
	e.Solved Problems on Generalized Inclusion , Exclusion Principle.	3	
Unit IV	**Ordinary and Exponential Generating Function**	**12 Hours**	**Mode**
	a. Ordinary and Exponential Generating Function	2	**Chalk & Talk ICT**
	b. Solved Problems on Ordinary Generating Function	5	
	c. Solved Problems on Exponential Generating Function	5	
Unit V	**Recurrence Relations**	**12 Hours**	**Mode**
	a.Recurrence Relations	2	**Chalk & Talk ICT**
	b.Solved Problems on Recurrence Relations and Associated Generating Functions.	10	

Course designed by: Dr. C. Subramani

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAE53**	**Number of Hours/Cycle**	**4**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**3**		
Core Elective Course I C					
Course Title	**Formal Languages and Automata Theory**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**60**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

Formal languages & Automata theory induce the knowledge of the learners towards still on algorithm making and developing skill to construct a machine inputs the base of programming.

Unit I	**Finite Automata and Regular Expressions:**	**12 Hours**
	Finite state system - non – deterministic and deterministic finite state automation – finite automation with E-moves – Regular expressions.	
Unit II	**Properties of Regular Expressions:**	**12 Hours**
	Pumping lemma or Regular sets – closure – and other properties of Regular sets.	
Unit III	**Context Free Grammars:**	**12 Hours**
	Context free grammar – Derivation tree – Simple properties – Normal forms – Chamsky and Greibach – Normal forms.	
Unit IV	**Pushdown Automata:**	**12 Hours**
	Informal description – Definition and examples – Push down Automata – and context free languages.	
Unit V	**Properties of context Free Languages:**	**12 Hours**
	Pumping lemma for context languages – closure – other properties of context free languages.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

TextBook

1. Trembley & Manohar , (2000) Discrete Mathematical Structures & Appli cations, TataMC Hill Ltd.

Reference Book(s)

1. John, Hopcroft and Jeffrey D. Ullman , (1994) Formal Languages, Automata Theory as computations, Narosa Publications, Indian Student Edition (10th reprint), New Delhi.

2. Rani sironmoney, Formal Languages, CLS Publications
3. Venkatraman M.K., Sridharan .N & N. Chandrasekaran, (2000) Discrete Mathematics, National Publishing & Co.,

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	To Understand Finite Automata and apply formulate regular expressions.
CO2	To Understand the Properties of regular expressions and construct the expressions.
CO3	To Inculcate the concepts on context free grammars and formulate the expressions.
CO4	To Understand Pushdown automata and can find the context free languages.
CO5	To Understand and apply pumping lemma for context languages and properties in the theory of computation.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	1	3	2	1	-	-	-	2
CO 2	3	2	3	3	1	3	2	1	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K- Level**	**No. of Question**	**No. of Question**
1	CO1	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
2	CO2	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
3	CO3	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
4	CO4	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
5	CO5	Up to K3	2	K1 & K1	2(K2 & K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	--	--	10	10	10
K2	--	40	-	40	40	40
K3	-	-	50	50	50	50
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Finite Automata and Regular Expressions:**	**12 Hours**	**Mode**
	a. Finite state system	2	**Chalk & Talk**
	b. deterministic and deterministic finite state automation	2	
	c. non – deterministic and deterministic finite state automation	2	
	d. finite automation with E-moves	2	
	e. Regular expressions	4	
Unit II	**Properties of Regular Expressions**	**12Hours**	**Mode**
	a. Pumping lemma	2	**Chalk & Talk**
	b. Regular sets	2	
	c. Closure	4	
	d. Regular sets	4	
Unit III	**Context Free Grammars**	**12 Hours**	**Mode**
	a. Context free grammar	2	**ICT**
	b. Derivation tree	2	
	c. Simple properties	2	
	d. Normal forms	3	
	e. Chemistry and greibach Normal forms	3	
Unit IV	**Pushdown Automata**	**12 Hours**	**Mode**
	a. Pushdown Automata	2	**Chalk & Talk**
	b. Definition and examples Push down	2	
	c. Push down & context free languages.	8	
Unit V	**Properties of context Free Languages**	**12 Hours**	**Mode**
	a. Pumping lemma	2	**ICT**
	b. Closure of context free languages	4	
	c. properties of context free languages	6	

Course designed by: Dr. S. Ramachandran, Mrs. P. Sathya

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC5P**	**Number of Hours/Cycle**	**2**		
Semester	**V**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**2**		
Core Project I					
Course Title	**Project**		**L**	**T**	**P**
Cognitive Level	**Up to K5**		**-**	**-**	**2**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Course Outcomes

Upon successful completion of this project work the student:

CO1	Will get a little exposure to the field of research in mathematics.
CO2	Able to convert a real life problem into a mathematical model and solve it by mathematical skills
CO3	Able to frame the hypothesis, derivations and conclusions of their mathematical model.
CO4	Will familiarize about various applications of mathematics.

Project work

- Each faculty will be allotted a group of **(3-5)** students for their research project in any one of the areas of Mathematics in consultation with their guide and the Head of the Department.
- The topic/area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation.
- The project report should be submitted to the Head of the Department of Mathematics through the Guide one week prior to the commencement of the summative examination.
- They shall submit **three** copies of their project report for valuation.
- The choice of the topic for the project can be from a wide range of subjects, but a text or topic prescribed for study should be strictly avoided.

Area of work

Differential equations, Statistics, Numerical methods, graph theory, fuzzy mathematics, Number theory.

Each project should contain the following details:

Brief introduction on the topic
Materials and Methods
Results and Discussions
Conclusion / Summary
Bibliography

The project should be at least 25 pages excluding bibliography and appendices.
The marks will be allotted on the prescribed basis as given below:

A. Continuous Internal Assessment

Regularity	15 Marks
Strength of the independent work (utilizing theory and methodology)	25Marks
Total	**40 Marks**

B. End Semester Examination (Viva Voce)

Individual Presentation	30 Marks
Answering the queries	30 Marks
Total	**60 Marks**

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAS51**	**Number of Hours/Cycle**	**2**		
Semester	**V**	**Max. Marks**	**50**		
Part	**IV**	**Credit**	**2**		
Skill Based Course I					
Course Title	**Trignometry and Lattice Theory**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**30**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To understand De'moivre's theorem, Hyperbolic function logarithm of complex number and Lattice theory which will be applied in various concepts of Mathematical Calculation.

Unit I	**Application of De' Moivre's Theorem.**	**6 Hours**
	Expression for Sin nθ, Cos nθ, tan nθ, - Problems on it – Expressions for sin ^{n} θ, and cos ^{n} θ - Problems expressions of sin θ, cos θ, and tan θ in terms of θ - problems,	
Unit II	**Hyperbolic Theorems.**	**6 Hours**
	Definition of hyperbolic function – Theorems – Properties inverse hyperbolic function – properties	
Unit III	**Logarithm of a complex Number.**	**6 Hours**
	Definition - theorems – Properties – Problems	
Unit IV	**Summation of Trignometric series**	**6 Hours**
	Difference method – Angles in arithmetic progression method – Problems	
Unit V	**Lattice Theory**	**6 Hours**
	Definition - Properties - Theorems – Types of Lattices – Distributive Lattice and Modular Lattice.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Books

1. S. Arumugam & Issac, (2012), Trignometry, New Gamma, Palayamkottai.
2. S. Arumugam & Issac, (2016) Modern Algebra, SchiTech Publications, Chennai.

Reference Book(s)

1. Manichavasagam Pillai. T.K. & S. Narayanan(2000), Trigonometry SV Publication PVT Ltd Chennai.
2. Loney Trigonomentry. Stewart J and Lothern Redlin,(2011) Algebra and Trigonometry 3rd Edn Brooks/cole, Cengage Learning, USA.
3. Robert F.Blitzer, Algebra and Trigonometry 5th Edn, Pearson Education, Newyork.

Course outcomes:

CO1	To understand the concepts of De'Moivers's Theorem & evaluate the problems.
CO2	To apply Hyperbolic expressions in the suitable.
CO3	To apply & solve logarithm on complex number concepts.
CO4	To solve the problems on trigonometric series in AP & GP of angles.
CO5	To understand the properties of Lattices and construct various types of Lattices.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	1	3	2	1	-	-	-	2
CO 2	3	2	3	3	1	3	2	1	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**Cos**	**K-Level**	**Section A**	**Section B**
			Either/ or Choice	**Open Choice**
			No. of Questions	**No. of Questions**
1	CO1	Up to K2	2(K2&K2)	1(K2)
2	CO2	Up to K3	2(K2&K2)	1(K3)
3	CO3	Up to K2	2(K2&K2)	1(K2)
4	CO4	Up to K3	2(K2&K2)	1(K3)
5	CO5	Up to K3	2(K2&K2)	1(K3)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1		-	-	-	-
K2	30	10	40	72.72%	73%
K3	-	15	15	27.27%	27%
Total Marks	30	25	55	100.00%	100%

Lesson Plan

Unit I	**Application of De' Moivre's Theorem**	**6 Hours**	**Mode**
	a. Expression for Sin nθ, Cos nθ, tan nθ	2	**Chalk & Talk**
	b. Problems on it Expressions for $\sin^n\theta$ and $\cos^n\theta$	1	
	c. Problems expressions of sin θ, cos θ, and tan θ in terms of θ	2	
	d. Simple problems	1	
Unit II	**Hyperbolic Theorems**	**6 Hours**	**Mode**
	a. Definition of hyperbolic function	1	**Chalk & Talk**
	b. Theorems	2	
	c. Properties	1	
	d.Inverse hyperbolic function	1	
	e.properties	1	
Unit III	**Logarithm of a complex Number**	**6 Hours**	**Mode**
	a.Definition	2	**ICT**
	b.theorems	1	
	c.Properties	1	
	d.Problems	2	
Unit IV	**Summation of Trignometric series**	**6 Hours**	**Mode**
	a.Definition of Summation on	2	**Chalk & Talk**
	b.Difference Method	1	
	c.Angles in arithmetic progression method	1	
	d.Problems	2	
Unit V	**Lattice Theory**	**6 Hours**	**Mode**
	Definition and Properties	2	**ICT**
	Theorems and Types of Lattices	2	
	Distributive Lattice	1	
	Modular Lattice	1	

Course designed by: Dr. S. Ramachandran, Mr K. Sankar

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAS5P**	**Number of Hours/Cycle**	**2**		
Semester	**V**	**Max. Marks**	**50**		
Part	**IV**	**Credit**	**2**		
Skill Based Practical I					
Course Title	**MATLAB**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**-**	**-**	**30**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To develop the knowledge of solving mathematical problems using MATLAB.

Course outcome

The student will be able to

- Solve mathematical and numerical problems using MATLAB.
- Solve ODE and system of equations using MATLAB.
- Work on Matrix operations and find eigen values and eigen vectors of matrix of higher order.
- Plot 2D graphs and 3D graphs.
- Use MATLAB to fit a straight line, parabola and exponential curve

List of Experiments

1. Write a MATLAB program to solve a system of equations of higher degree and solve the Linear Programming Problem.
2. Write a MATLAB program to determine addition, subtraction and multiplication of two matrices of order 4 $\times$ 4 and higher orders.
3. Write a MATLAB program to determine the transpose, inverse of a matrix of order more than 3$\times$3.
4. Write a MATLAB program to determine the eigen values and eigen vectors of matrix of higher order.
5. Write a MATLAB program to fit a straight line, parabola and exponential curve for a given data.
6. Write a MATLAB program to solve ordinary differential equation of order more than two.
7. Write a MATLAB program to evaluate single and multiple integral with the given limit.
8. Write a MATLAB program to perform union, intersection, complement and Demorgan's Law.
9. Write a MATLAB program to plot various membership functions.
10. Write a MATLAB program to create and plot 2D graphs and 3D graphs.

Text Book

Delores M. Etter, David C. Kuncicky, Holly moore (2012) Introduction to MATLAB 7 Pearson.

Reference Book

1. Palm, W. J. (2005), Introduction to MATLAB 7 for Engineers (Vol. 7). New York: McGraw-Hill.
2. Vipula singh (2012), Digital image processing with MATLAB and lab view, Elsevier First Edition.

Web References

1. https://www.youtube.com/watch?v=zJm8VHg4TbQ

2. https://www.youtube.com/watch?v=1PSFLKiEV7U

Course designed by:Dr. J. Kaliga Rani

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC61**	**Number of Hours/Cycle**	**6**		
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**6**		
Core Course XI					
Course Title	**Linear Algebra**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This Course aims at providing the Students with basic concepts of Vector spaces, Inner products spaces, Linear transformations and to enable Students to induce the skills to construct Higher powers of Matrix.

Unit I	**Vector Spaces**	**18 Hours**
	Vector Spaces : Definition and examples – subspaces – Linear transformation span of a set - Linear independence – Linear dependence.	
Unit II	**Basis &Dimension of a Vector space**	**18 Hours**
	Basis and Dimension – Rank and Nullity – Matrix of a linear transformation – Theorems and problems on transforms.	
Unit III	**Inner Product Spaces**	**18 Hours**
	Inner Product Spaces : Introduction - Definition and examples – Orthogonality – Orthogonal Complements .	
Unit IV	**Matrices and their types & Properties**	**18 Hours**
	Theory of Matrices: Introduction – Algebra of matrices – Types of matrices – The Inverse of a matrix – Elementary transformations - Rank of a matrix – Simultaneous linear equations.	
Unit V	**Cayley Hamilton's Theorem & it's applications & Quadratic forms**	**18 Hours**
	Characteristic equation and Cayley Hamilton theorem – Eigen values and Eigen vectors - Bilinear forms - Introduction – Bilinear forms – Quadratic forms	

Pedagagy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book

1. S. Arumugam & Issac (2008),Modern Algebra, Scitech Publication Chennai.

Reference Books

1. V. Krishna Moorthy ,V.P.Manira,. Introduction to Linear Algebra, J.L Arora Affiliated East - West Press Pvt Ltd

2. Ward Cheney,David Kincaid,(2010) , Linear algebra (Theory and application) Jones & Barttet publishers India Pvt .Ltd.

3. Pramode kumar (2009),Linear algebra Dorling Kindersely (India) Pvt. Ltd.

4. Jimmie Gilbert & Linda Gilbert Elsevier (reprint 2010) , Linear Algebra & matrix theory , –a division of Read Elsevier Pvt. Ltd.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	To Recalling the concept of binary operations on a set for vector space and constructing vector spaces.
CO2	To understand & Construct the vector spaces with basis, dimensions Rank & Nullity.
CO3	To Formulate Inner Product Spaces – Orthogonal Vectors and by Grand Schmidt orthogonalisation Process.
CO4	Acquire the knowledge on matrices & their types and their properties.
CO5	To Construct & Evaluate Characteristics equation of a matrix & Calculate Eigen values & Vector, Quadratic forms.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	1	3	2	1	-	-	-	2
CO 2	3	2	3	3	1	3	2	1	-	-	-	2
CO 3	2	3	3	2	1	3	2	2	-	-	-	2
CO 4	2	3	3	3	1	2	3	1	-	-	-	3
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K1	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1 & K1	2(K2 &K2)	1(K3)
3	CO3	Up to K3	2	K1 & K1	2(K2 &K2)	1(K3)
4	CO4	Up to K3	2	K1 & K1	2(K2 &K2)	1(K3)
5	CO5	Up to K3	2	K1 & K1	2(K2 &K2)	1(K3)

No of Questions to be asked	10		10	5
No of Questions to be answered	10		5	3
Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	--	--	10	10%	10%
K2	--	40	-	40	40%	40%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Vector Spaces**	**18 Hours**	**Mode**
	a.Vector Spaces : Definition and examples	3	**Chalk & Talk**
	b.subspaces	2	
	c.Linear transformation span of a set	3	
	d.Linear independence	5	
	e.Linear dependence	5	
Unit II	**Basis &Dimension of a Vector space**	**18 Hours**	**Mode**
	a.Basis and Dimension	5	**Chalk & Talk**
	b.Rank and Nullity	2	
	c.Matrix of a linear transformation	5	
	d.Theorems and problems on transforms	6	
Unit III	**Inner Product Spaces**	**18 Hours**	**Mode**
	a.Inner Product Spaces	3	**Chalk & Talk ICT**
	b.Definition and examples	5	
	c.Orthogonality & Grandschmidth Theorem	5	
	d.Orthogonal Complements	5	
Unit IV	**Matrices & their types & Properties**	**18 Hours**	**Mode**
	a.Theory of Matrices: Introduction	2	**Chalk & Talk**
	b.Algebra of matrices	2	
	c.Types of matrices	2	
	d.The Inverse of a matrix	2	
	e.Elementary transformations	2	
	f.Rank of a matrix	4	

	g.Simultaneous linear equations.	4	
Unit V	**Cayley Hamilton's Theorem & it's applications & Quadratic forms**	**18 Hours**	**Mode**
	a.Characteristic equation	3	**Chalk & Talk ICT**
	b.Cayley Hamilton theorem	2	
	c.Eigen values and Eigen vectors	3	
	d.Bilinear forms	2	
	e.Introduction	3	
	f.Bilinear forms	2	
	g.Quadratic forms	3	

Course designed by: Dr. S. Ramachandran, Mrs. S. Divya Priya

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAC62**	**Number of Hours/Cycle**	**6**		
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**6**		
Core Course XII					
Course Title	**Complex Analysis**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**90**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble:

To illuminate problem solving ability at various level and to introduce the concept about the elementary transformations and contour integrations.

Unit I	**Analytic function**	**18 Hours**
	Analytic function- C.R equations- Sufficient conditions- Harmonic functions	
Unit II	**Bilinear Transformation**	**18 Hours**
	Elementary Transformation- Bilinear Transformation- Cross ratio- fixed points- Special Bilinear Transformation- Real axis to axis- Unit circle to unit circle and real axis to unit circle only.	
Unit III	**Complex Integration**	**18 Hours**
	Cauchy's Fundamental theorem- Cauchy's integral formulae and formulae for derivatives- Morera's theorem- Cauchy's inequality- Liouville's theorem- Fundamental theorem of algebra.	
Unit IV	**Series Expansion**	**18 Hours**
	Taylor's theorem - Laurent's theorem – Zeros of an analytic function - singular points- Poles- Calculus of residues	
Unit V	**Cauchy's residue theorem**	**18 Hours**
	Cauchy's residue theorem-Argument principle-. Rouche's theorem.-Evaluation of definite integral- Type 1:	

	$\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$, Type 2: $\int_{-\infty}^{\infty} f(x)dx$, Type 3: $\int_{-\infty}^{\infty} \frac{g(x)\cos ax}{h(x)}\, dx$ or $\int_{-\infty}^{\infty} \frac{g(x)\sin ax}{h(x)}\, dx$	

Text Book

1. Dr.Arumugam. S., Thangapandi Isacc and Somasundaram.A.,(2003), "*Complex Analysis*",Sci tech publications(India) Private Limited, Chennai

Reference Books

1. Shanti Narayan, Dr. Mittal.P.K.,(2011), "*Theory of functions of a complex variable*",S.Chand & company,New Delhi.
2. Duraipandian.P., Laxmi duraipandian, Muhilan.D.,(2001), "*Complex Analysis*",Emerald Publishers,Chennai
3. Manicavachagam Pillai.T.K., Dr.Rajagopalan.S.P., Dr.Sattanathan.R.,Viswanathan.S.,(2007), "*Complex Analysis*",S.viswanathan ,Chennai

E-resources

IIT Lectures, UGC Gyan Dharshan videos
http://ndl.iitkgp.ac.in
http://ocw.mit.edu
http://mathforum.org
https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO 1	Solve problems in C.R equations & Harmonic functions.
CO 2	Explain Bilinear transformations & cross ratio
CO 3	Solve problems by applying acquired knowledge in Cauchy's integral formula & Fundamental theorems of Algebra
CO 4	Develop problem solving skills using Cauchy's residue
CO 5	Applying acquired knowledge in definite integral for finding poles lies on the real axis .

Mapping of Programme specific outcomes with Course Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	3	2	3	3	3	3	1	1	1	1	2
CO2	3	2	3	3	1	2	1	1	1	1	1	1
CO3	3	3	2	2	1	3	2	1	1	1	1	1
CO4	3	3	3	3	2	2	2	1	1	1	1	2
CO5	3	3	3	3	1	2	2	1	1	1	1	2

1-Low **2-Moderate** **3-High**

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K- Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K2	2(K3 & K3)	1(K3)
2	CO2	Up to K2	2	K1 & K2	2(K2 & K2)	1(K2)

3	CO3	Up to K3	2	K1 & K2	2(K3 & K3)	1(K3)
4	CO4	Up to K3	2	K1 & K2	2(K3 & K3)	1(K3)
5	CO5	Up to K3	2	K1 & K2	2(K2 & K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	Consolidated (Rounded off)
K1	5	--	--	5	5%
K2	5	16	10	31	31%
K3	--	24	40	64	64%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit	Lesson Plan	Hours	Mode
I	a.Analytic function	4	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b.C.R equations	5	
	c.Sufficient conditions	4	
	d.Harmonic functions	5	
II	a.Elementary Transformation - only	3	Lecture (Chalk & Talk) ICT
	b.Bilinear Transformation	5	
	c.Cross ratio- fixed points	5	
	d.Special Bilinear Transformation	2	
	e.Real axis to axis	1	
	f.Unit circle to unit circle	1	
	g.real axis to unit circle	1	
III	a.Cauchy's Fundamental theorem	3	Lecture (Chalk & Talk) PPT ICT
	b.Cauchy's integral formulae and formulae for derivatives	4	
	c.Morera's theorem	3	
	d.Cauchy's inequality	5	
	e.Liouville's theorem		

	f.Fundamental theorem of algebra.	3	
IV	a.Taylor's theorem	4	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b.Laurent's theorem	4	
	c.Zeros of an analytic function		
	d.singular points	3	
	e.Poles	3	
	f.Calculus of residues	4	
V	a.Cauchy's residue theorem	3	Lecture (Chalk & Talk) PPT ICT
	b.Argument principle-. Rouche's theorem	3	
	c.Evaluation of definite integral- Type 1: $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$,	4	
	d.Type 2: $\int_{-\infty}^{\infty} f(x)dx$ - No poles lies on the real axis,	4	
	e.Type 3: $\int_{-\infty}^{\infty} \frac{g(x)\cos ax}{h(x)}\, dx$ or $\int_{-\infty}^{\infty} \frac{g(x)\sin ax}{h(x)}\, dx$ No poles lies on the real axis	4	

Course designed by: Prof. N. Sakunthala

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAA61**	**Number of Hours/Cycle**	**5**		
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Allied Course VII					
Course Title	**Graph Theory**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**75**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course deals with the Graph theoretical concepts connectivity, planarity and coloring that help to model real life situations.

Unit I	**Graphs**	**15 Hours**
	Basics – Graphs – Pictorial representation – Subgraphs – isomorphism and degrees – Walk and connected graphs – Cycles in graphs – cut-vertices and cut-edges.	
Unit II	**Eulerian and Hamiltonian graphs**	**15 Hours**
	Eulerian, Hamiltonian graphs – Eulerian graphs – Fleury's algorithm - Hamiltonian graphs – Weighted graphs.	
Unit III	**Bipartite graphs**	**15 Hours**

	Bipartite graphs – Marriage Problem – Trees – Connector Problem – Kruskal's Algorithm – Prim's Algorithm	
Unit IV	**Matrix and Planar graphs**	**15 Hours**
	Matrix representation - Planar graphs – Euler formula – Platonic solids – Dual of a plane graph – Characterisation of Planar graphs.	
Unit V	**Colouring and Directed graphs**	**15 Hours**
	Vertex colouring – Edge colouring – An algorithm for vertex colouring - Directed graphs.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book

1.S. A. Choudum, (1987), A First Course in Graph Theory, Macmillan India Ltd., Mumbai

Reference Book

1. S. Arumugam, S. Ramachandran, (2007), Invitation to Graph Theory, Scitech Publications Pvt. Ltd., Chennai.

2. S. Kumaravelu, Susila Kumaravelu (1999), Graph Theory, SKV Publications, Nagar Koil.

3. M. Murugan, (2000), Graph Theory and Algorithms, Muthali Publishing House, Chennai.

E-Resources

1. //nptel.ac.in/courses/111/106/111106050/
2. https://www.britannica.com/topic/graph-theory

Course Outcomes

After completion of this course, the students will be able to:

CO1	Understand and apply the basic concepts of Graph.
CO2	Construct algorithm by using Euler and Hamiltonian graphs.
CO3	Explain Bipartite graphs and trees & develope Algorithms.
CO4	Apply Matrix representation in graphs and Classify the planar graphs.
CO5	Utilize algorithms in coloring of graphs.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO 1	3	3	3	3	2	3	2	1	-	-	-	2
CO 2	3	2	3	3	2	3	2	1	-	-	-	2

CO 3	2	3	3	2	2	3	2	2	-	-	-	2
CO 4	3	3	3	3	2	2	3	1	-	-	-	3
C05	3	2	3	2	2	2	3	1	-	-	-	2

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K- Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1&K1	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K1	2(K2 & K2)	1(K3)
4	CO4	Up to K3	2	K1&K1	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	10	-	-	10	10	10
K2	-	40	-	40	40	40
K3	-	-	50	50	50	50
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I		**Graphs**	**15 Hours**	**Mode**
	a.	Basics, Graphs, Pictorial representation	3	
	b.	Subgraphs	2	

	c.	Isomorphism and degrees	3	**Chalk & Talk**
	d.	Walk and connected graphs	3	
	e.	Cycles in graphs	2	
	f.	Cut-vertices and cut-edges	2	
		Eulerian and Hamiltonian graphs	**15 Hours**	**Mode**
Unit II	a.	Eulerian graphs	4	**Chalk & Talk**
	b.	Fleury's algorithm	4	
	c.	Hamiltonian graphs	3	
	d.	Weighted graphs	4	
		Bipartite Graphs	**15 Hours**	**Mode**
Unit III	a.	Bipartite graphs	3	**Chalk & Talk ICT**
	b.	Marriage Problem	3	
	c.	Trees	3	
	d.	Connector Problem , Kruskal's Algorithm	3	
	e.	Prim's Algorithm.	3	
		Matrix and Planar graphs	**15 Hours**	**Mode**
Unit IV	a.	Matrix representation	2	**Chalk & Talk**
	b.	Planar graphs	3	
	c.	Euler formula	2	
	d.	Platonic solids	3	
	e.	Dual of a plane graph	3	
	f.	Characterization of Planar graphs	2	
		Colouring and Directed graphs	**15 Hours**	**Mode**
Unit V	a.	Colourings	2	**Chalk & Talk**
	b.	Vertex colouring	3	
	c.	Edge colouring	3	
	d.	Related Theorems	3	
	e.	An algorithm for vertex colouring	2	
	f.	Directed graphs	2	

Course designed by Dr. P. Pandiammal

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAA62**	**Number of Hours/Cycle**	**5**		
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**5**		
Allied Course VIII					
Course Title	**Mathematical Statistics- II**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**75**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This is the second segment of a sequential course as a tool for solving problems in real life. The aim of this course is to enable the students to understand statistics. The course deals with analysis of variance, theory of attributes and statistical quality control.

Unit I	**Test of Significance - Large Samples**	**15 Hours**
	Tests of Significance for Large samples – Sampling – Sampling distribution – Testing of hypothesis – Procedure Test of Significance for proportions and percentages – Test of Significance for means – Test of Significance for	

	difference of sample means –Test for standard deviation – Test of Significance for correlation Coefficient.	
Unit II	**Test of Significance - Small Samples**	**15 Hours**
	Small samples – Test of significance based on t-distribution – Test of significance based on F - test – Test for significance of an observed sample correlation. Test Based on χ^2 Distribution – Introduction – χ^2 - test for population variance – χ^2 - test to test the goodness of fit – test for independence of attributes.	
Unit III	**Index numbers**	**15 Hours**
	Index Numbers – Aggregate method – Average of price relatives method – Weighted index numbers – consumer price index numbers –conversion of chain base index number into fixed base index and conversely – Related Problems.	
Unit IV	**Theory of attributes**	**15 Hours**
	Theory of attributes – Introduction – Attributes – Dichotomisation – consistency of Data – Independence and association of data – Related Problems.	
Unit V	**Analysis of variance**	**15 Hours**
	Analysis of Variance – Introduction – One criterion of classification – Two criteria of classification – Three criteria of classification (Latin square) – Related Problems.	

Pedagagy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Book

1.Arumugam. S and Thangapandian Isaac.A,(2016) Statistics, New Gamma Publications Private Limited.

Unit I: Chapter 14
Unit II: Chapter 15 and 16
Unit III: Chapter 9
Unit IV: Chapter 8
Unit V: Chapter 17

Reference Books

1. Dr. S.P. Gupta, Dr. M.P. Gupta (2010),Business Statistics, Sultan Chand & Sons Educational Publishers, New Delhi.
2. P.R. Vittal (2002), Mathematical Statistics, Margham Publications, Chennai.
3. Gupta. S.C and Kapoor.V.K, Mathematical Statistics,(2008) Sultan Chand and Sons.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Distinguish between a population and a sample and explain testing of hypothesis
CO2	Explain chi square distribution, t- distribution and describe their various applications is Statistics and Interpret statistical and practical significance

CO3	Calculate various index numbers.
CO4	Develop the statistical techniques used in the theory of attributes
CO5	Define F- distribution and apply it to solve problems in analysis of variance.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	3	2	2	2	3	2	-	-	-	2
CO2	3	2	3	2	2	2	3	2	-	-	-	2
CO3	2	3	3	2	2	3	2	2	-	-	-	2
CO4	2	3	3	3	1	2	3	2	-	-	-	2
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K- Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2 &K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	-	-	5	5%	5%
K2	5	40	-	45	45%	45%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Test of Significance - Large Samples**	**15 Hours**	**Mode**
	a. Sampling	2	**Chalk & Talk ICT**
	b. Sampling distribution	1	
	c. Testing of hypothesis & Procedure Test of Significance for proportions and percentages	4	
	d. Test of Significance for means	2	
	e. Test of Significance for difference of sample means	2	
	f. Test for standard deviation	2	
	g. Test of Significance for correlation Coefficient.	2	
Unit II	**Test of Significance - Small Samples**	**15 Hours**	**Mode**
	a. Test of significance based on t-distribution.	3	**Chalk & Talk ICT**
	b. Test of significance based on F test	2	
	c. Test for significance of an observed sample correlation	2	
	d. Test Based on χ^2 Distribution – Introduction	1	
	e. χ^2 - test for population variance	2	
	f. χ^2 - test to test the goodness of fit	2	
	g. Test for independence of attributes.	3	
Unit III	**Index numbers**	**15 Hours**	**Mode**
	a. Index Numbers	1	**Chalk & Talk ICT**
	b. Aggregate method	2	
	c. Average of price relatives method	3	
	d. Weighted index numbers	4	
	e. Consumer price index numbers	2	
	f. conversion of chain base index number into fixed base index and conversely	3	
Unit IV	**Theory of attributes**	**15 Hours**	**Mode**
	a.Theory of attributes – introduction	1	**Chalk & Talk ICT**
	b. Attributes	4	
	c. Dichotomisation	2	
	d. consistency of Data	4	
	e. Independence and association of data	4	
Unit V	**Analysis of variance**	**15 Hours**	**Mode**
	a. Analysis of Variance- Introduction	2	**Chalk & Talk ICT**
	b. One criterion of classification-	4	
	c. Two criteria of classification	4	
	d. Three criteria of classification (Latin square)	5	

Course designed by Dr. C. Subramani

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**

Course Code	**20UMAE61**	**Number of Hours/Cycle**	**4**		
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**3**		
Core Elective Course II A					
Course Title	**Logic and Boolean Algebra**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**60**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To provide the students, the basic knowledge of logic, normal forms ,theory of inference and make the students to learn lattices through algebraic operations.

Unit I	**Logic**	**12 Hours**
	Introduction-TF–Statements-Connectives-Conjunction-Disjunction- Negation-Conditional Statements-Biconditional Statements-Truth table of a formula	
Unit II	**Normal Forms**	**12 Hours**
	Tautology-Tautological implications and Equivalence of formulae-Normal Forms	
Unit III	**Theory of Inference**	**12 Hours**
	Principal Normal Forms-Theory of inference-Quantifiers	
Unit IV	**Relations and Lattices**	**12 Hours**
	Relations - Equivalence Relation - Lattices- Hasse Diagrams-Definitions-Some Properties of Lattices-Duality Principle-Lattice through Algebraic operations	
Unit V	**Boolean Algebra**	**12 Hours**
	New Lattices-Lattice Homomorphism-Modular and Distributive Lattices-Boolean Algebra	

Classroom lectures, ICT, Participatory method of teaching ,group discussion and Quiz.

Text Book

1.Dr.M.K.Venkataraman,Dr.N.Sridharan,N.Chandrasekaran,(2007),Discrete Mathematics, The National Publishing Company, Chennai.

Reference Book(s)

1.Seymour Lipschutz, Marc Lars Lipson,(2010),Discrete Mathematics, Tata McGraw Hill Education Private Limited, New Delhi.
2.T.Veerarajan,(2014),Discrete Mathematics with GRAPH THEORY and COMBINATORICS, McGraw Hill Education(India) Private Limited, New Delhi.
3.G.Balaji,(2015),Discrete Mathematics, G.Balaji Publishers, Chennai.

E-Resources

- http://ndl.iitkgp.ac.in
- http://ocw.mit.edu
- http://mathforum.org
- https://nptel.ac.in/course.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Apply Logic in Mathematics that can be defined as the study of valid reasoning.
CO2	Apply Tautological implications and Equivalence, also learn Normal form.
CO3	Learn and apply theory of inferences and Quantifiers.
CO4	Recall relations and apply through Algebraic operations.
CO5	Understand and apply the concepts and significance of lattices and Boolean algebra which are widely used in computer science.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	2	3	3	2	-	-	-	2
CO2	2	3	3	2	2	3	3	2	-	-	-	2
CO3	3	2	3	2	2	3	2	2	-	-	-	2
CO4	2	2	3	2	2	3	2	2	-	-	-	2
C05	3	2	3	2	2	3	2	2	-	-	-	2

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K- Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
2	CO2	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
3	CO3	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
4	CO4	Up to K3	2	K1 & K1	2(K2& K2)	1(K3)
5	CO5	Up to K3	2	K1 & K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	-	-	10	10%	10%
K2	-	40	-	40	40%	40%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Logic**	**12Hours**	**Mode**
	a. Introduction-TF–Statements	2	Chalk & Talk ICT
	b. Connectives-Conjunction	2	
	c. Disjunction- Negation	2	
	d. Conditional Statements-Biconditional statements	3	
	e. Truth table of a formula	3	
Unit II	**Normal Forms**	**12 Hours**	**Mode**
	a. Tautology	3	Chalk & Talk ICT
	b. Tautological implications and Equivalence of formulae	4	
	c. Normal Forms	5	
Unit III	**Theory of Inference**	**12Hours**	**Mode**
	a. Principal Normal Forms	4	Chalk & Talk ICT
	b. Theory of inference	4	
	c. Quantifiers	4	
Unit IV	**Relations and Lattices**	**12 Hours**	**Mode**
	a. Relations-Equivalence Relation	2	Chalk & Talk ICT
	b. Lattices-Hasse Diagrams- Definitions	2	
	c. Some Properties of Lattices	2	
	d. Duality Principle	3	
	e. Lattice through Algebraic operations	3	
Unit V	**Boolean Algebra**	**12Hours**	**Mode**
	a. New Lattices	3	Chalk & Talk ICT
	b. Lattice Homomorphism	3	
	c. Modular and Distributive Lattices	3	
	d. Boolean Algebra	3	

Course designed by Dr. J.Kaliga Rani

Programme	**B.Sc**	**Programme Code**	**UMA**
Course Code	**20UMAE62**	**Number of Hours/Cycle**	**4**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
Core Elective Course II A			
Course Title	**Fuzzy Sets**		
Cognitive Level		**Up to K3**	

Preamble

On the successful completion of the course,students will be able to understand the concept of uncertainty and fuzziness. Analyze fuzzy relationspracticing fuzzy arithmetic and construction of fuzz y sets.

Unit I	**Fuzzy Set**	**12 Hours**
	Fuzzy Set: Introduction- Visual basic types –basic concepts – Fuzzy sets verses crisp Sets: -Additional properties of α- Cuts –Representation of Fuzzy sets – Extension Principle for fuzzy sets	
Unit II	**Operation on Fuzzy Sets**	**12 Hours**
	Operation on Fuzzy Sets: Types of Operations –Fuzzy Complements – Fuzzy intersections – fuzzy Unions – Combination of operations	
Unit III	**Fuzzy arithmetic operation**	**12 Hours**
	Fuzzy arithmetic – Fuzzy numbers – linguistic variables – arithmetic operations on intervals – arithmetic operations on Fuzzy numbers – la ttice of Fuzzy numbers – Fuzzy equations	
Unit IV	**Fuzzy relations**	**11 Hours**
	Fuzzy relations – binary Fuzzy relations – binary relatio n on a single set –Fuzzy equivalence relation - Fuzzy ordering relation	
Unit V	**Constructing Fuzzy sets**	**13 Hours**
	Constructing Fuzzy sets – method of construction- direct method with one expert - direct method with multiple expert – indirect method with one expert – constructions from sample data – Lagrange interpolation – least square curve fit ting	

Pedagogy

Classroom lectures, ICT, Participatory method of teaching, group discussion and Quiz

Text Book

1. George J. Klir and Bo Yuan,(2005), "*Fuzzy Sets and Fuzzy Logic Theory and Applications*", Prentice - Hall of India.

Reference Book(s)

1. Ganesh .M ,(2010), "*Introduction to Fuzzy Sets and Fuzzy Logic*", Prentice - Hall of India.
2. Pundir.pundir,(2008), "*Fuzzy sets and their applications*", pragathi edition.
3. H.J. Zimmermann,(1996), "*Fuzzy sets theory*",Allied Pulishers limited, NewDelhi

E-Resources

- https://en.wikipedia.org/wiki/Fuzzy_set
- http://www.sciencedirect.com/science/article/pii/S001999586590241X/pdf
- https://www.researchgate.net/publication/260990913_Fuzzy_Sets_Fuzzy_Logic_Fuzzy_Methods_with_Applications

Course Outcomes

After completion of this course, the students will be able to:

CO1	Understand basic concepts on fuzzy sets and crisp set, applying properties of α-cuts can represent fuzzy sets.
CO2	Understand types of unary, binary and combinations of operations.
CO3	Define fuzzy arithmetic, fuzzy numbers, Linguistic variables, fuzzy equations.
CO4	Illustrate fuzzy relations, composition of fuzzy relations and ordering relation.
CO5	Learn direct and indirect methods of construction and Lagrange interpolation, least square curve fitting.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	**1**	**1**	**1**	**1**	**2**	**1**	1	1	1	1	1	1
CO2	**1**	**3**	**2**	**1**	**1**	**1**	1	1	1	1	1	1
CO3	**2**	**3**	**1**	**2**	**1**	**1**	1	1	1	1	1	1
CO4	**2**	**3**	**1**	**2**	**1**	**1**	1	1	1	1	1	1
CO5	**1**	**3**	**2**	**2**	**1**	**1**	1	1	1	1	1	1

1.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels (Model)

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	-	-	10	10%	10%
K2	-	40	-	40	40%	40%
K3	-	-	50	50	50%	50%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I		**Fuzzy Set**	**12 Hours**	**Mode**
	a.	Introduction	1	ICT, Chalk & Talk
	b.	Visual basic types	2	
	c.	Fuzzy sets verses crissets	2	
	d.	Additional properties of α- Cuts	2	
		Representation of Fuzzy sets	2	
		Extension Principle for fuzzy sets	3	
Unit II		**Operation on Fuzzy Sets**	**12 Hours**	**Mode**
	a.	Types of Operations	1	ICT, Chalk & Talk
	b.	Fuzzy Complements	3	
	c.	Fuzzy intersections	3	
	d.	Fuzzy Unions	3	
	e.	Combination of operations	2	
Unit III		**Fuzzy arithmetic Operations**	**12 Hours**	**Mode**
	a.	Fuzzy numbers	3	ICT, Chalk & Talk
	b.	Linguistic variables	1	
	c.	Arithmetic operations on intervals	3	
	d.	Lattice of Fuzzy numbers	2	
	e.	Fuzzy equations	3	
Unit IV		**Fuzzy relations**	**11 Hours**	**Mode**
	a.	Binary Fuzzy relations	2	ICT, Chalk & Talk
	b.	Binary relation on a single set	2	
	c.	Fuzzy equivalence relation	4	
	d.	Fuzzy ordering relation	3	
Unit V		**Constructing Fuzzy sets**	**13 Hours**	**Mode**
	a.	Direct method with one expert	3	ICT, Chalk & Talk
	b.	Direct method with multiple expert	3	
	c.	Indirect method with one expert	3	
	d.	Lagrange interpolation	2	
	e.	Least square curve fitting method of construction	2	

Course designed by: Mrs. S. Divya Priya

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**
Course Code	**20UMAE63**	**Number of**	**4**

		Hours/Cycle			
Semester	**VI**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**3**		
Core Elective Course II B					
Course Title	**Mathematical Modelling**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**60**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble:

The aim of this course is to enable the students to acquire basic technique of mathematical modelling through ODE of first and second order , Differential Equations and Graphs and problem solving ability at various level.

Unit I	**Mathematical Modelling through ordinary differential equations of first order**	**12 Hours**
	Mathematical Modelling through ordinary differential equations of first order – Linear and nonlinear growth and decay models – Compartment models.	
Unit II	**Mathematical Modelling through system of ordinary differential equations of first order**	**12 Hours**
	Mathematical Modelling in population Dynamics - Mathematical Modelling of epidemics -Compartment models. - Mathematical Modelling in Economics.	
Unit III	**Mathematical Modelling through ordinary differential equations of second order**	**12 Hours**
	Mathematical Modelling of Planetary motions - Mathematical Modelling of circular motion and Motion of Satellites	
Unit IV	**Mathematical Modelling through difference equation**	**12 Hours**
	The need for Mathematical Modelling through Difference equations.- Basic theory of linear Difference Equations with constant coefficients- Mathematical Modelling through Difference equations in Economics and Finance	
Unit V	**Mathematical Modelling through Graphs**	**12 Hours**
	Situations that can be Modelled through Graphs – Mathematical models in terms of Directed Graphs Mathematical models in terms of Signed Graphs.- Mathematical modellings in terms of Weighted Digraphs	

Text Book

1.J.N. Kapur (2013) ," Mathematical Modelling ",New Age International Publishers,New Delhi

Reference Book(s)

1. J.N. Kapur (1995) , ” Mathematical Modelling in Biology and Medicine “, East West Press,.
2. Singh ,(1985) ” Mathematical Modelling “,International Book House ,
3. Frank R.Giordano William P.Fox ,Steven B.Horton ,”A First Course in Mathematical Modeling” (2015) V Edition ,Cengage Learning

E-resources

IIT Lectures, UGC Gyan Dharshan videos
http://ndl.iitkgp.ac.in
http://ocw.mit.edu
https://www.open.ac.uk/courses/modules/mst210
https://nptel.ac.in/course.html

Course Outcomes

CO 1	Understand the Mathematical modeling of ordinary differential equation of first order.
CO 2	Understand the importance of Mathematical modeling in the field of Epidemic ,population dynamics and Economics.
CO 3	Apply the concept of DE to study planetary motion , circular motion on motion of satellite.
CO 4	Develop problem solving skills using linear difference equations with constant coefficients.
CO 5	Identify and appreciate the unifying influence of mathematical modeling in Graph theory.

Mapping of Programme specific outcomes with Course Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	3	2	2	3	3	3	1	1	1	1	2
CO2	3	3	3	3	1	2	1	1	1	1	1	1
CO3	3	3	2	2	1	3	2	1	1	1	1	1
CO4	3	3	3	3	2	2	2	1	1	1	1	2
CO5	3	3	3	2	1	3	2	1	1	1	1	2

1-Low 2-Moderate 3-High

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
2	CO2	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1&K2	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1-Remembering and recalling facts with specific answers
K2-Basic understanding of facts and stating main ideas with general answers
K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	Consolidated (Rounded off)
K1	5	--	--	5	5%
K2	5	40	-	45	45%
K3	--	-	50	50	50%
Total Marks	10	40	50	100	100%

Lesson Plan

Unit	Lesson Plan	Hours	Mode
I	a. Mathematical Modelling through ordinary differential equations of first order	4	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b. Linear and nonlinear growth and decay models	4	
	c. Compartment model	4	
II	a. Mathematical Modelling in population Dynamics	3	Lecture (Chalk & Talk) ICT
	b. Mathematical Modelling of epidemics	3	
	c. Compartment models	3	
	d. Mathematical Modelling in Economics	3	
III	a. Mathematical Modelling of Planetary motions	4	Lecture (Chalk & Talk) PPT ICT
	b. Mathematical Modelling of circular motion and	4	
	c. Motion of Satellites	4	
IV	a. The need for Mathematical Modelling through Difference equations	4	Lecture (Chalk & Talk) PPT ICT Group discussion Quiz
	b. Basic theory of linear Difference Equations with constant coefficients	4	
	c. Mathematical Modelling through Difference equations in Economics and Finance	4	
V	a. Situations that can be Modelled through Graphs	3	Lecture (Chalk & Talk) PPT ICT
	b. Mathematical models in terms of Directed Graphs	3	
	c. Mathematical models in terms of Signed Graphs	3	
	d. Mathematical modellings in terms of Weighted Digraphs	3	

Course designed by: Mrs. N. Sakunthala

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**		
Course Code	**20UMAS61**	**Number of Hours/Cycle**	**2**		
Semester	**VI**	**Max. Marks**	**50**		
Part	**IV**	**Credit**	**2**		
Skill Based Course II					
Course Title	**Number Theory and Inequality**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**30**	**-**	**-**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

This course provides the basic concepts of number join as Divisibility, Euler's function, Congruences, Fermat's theorem, Wilson's theorem and Lagrange's theorem.

Unit I		**6 Hours**
	Prime and composite numbers - Sieve of Eratosthenes – Divisors of a given number N – Simple problems.	
Unit II		**6 Hours**
	Euler's function – Integral part of a real number – The highest power of a prime p contained in n! – The product of r consecutive integers is divisible by r! - Simple problems.	
Unit III		**6 Hours**
	Congruences – Numbers in arithmetical progression - Simple problems.	
Unit IV		**6 Hours**
	Triangle inequalities – The Arithmetic and Geometric mean – Simple problems.	
Unit V		**6 Hours**
	The Harmonic mean – Cauchy-Schwartz inequality – Simple problems.	

Pedagogy

Classroom lectures, ICT , Participatory method of teaching ,group discussion and Quiz.

Text Books

1. Manikavachakam Pillay.T.K., Natarajan. T. & Ganapathy. K.S., (2011), Algebra vol.-II, S.Viswanathan (Printers & Publishers) Pvt Ltd., Chennai.
2. Dr. S. Arumugam, A. Thangapandi Isaac, (2011), "Algebra, Theory of Equations, Theory of Numbers and Trignometry", New Gamma Publishing House, Palayamkottai.

Reference Books

1. Dr. Arumugam. S & Issac , (2003), "Classical Algebra", New Gamma Publishing House, Palayamkottai.
2. Dr. Venkartaraman. M.K., (2010), "Theory of Equations & Number Theory and Inequality", The National Publishing Company, Chennai.

E-Resources

- https://www.britannica.com/science/number-theory
- https://www.cs.utexas.edu/~isil/cs311h/lecture-num-theory1-6up.pdf
- http://discrete.openmathbooks.org/dmoi2/sec_addtops-numbth.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Define and Interpret the basic concepts of divisors and Sieve of Eratosthenes.
CO2	Explain Euler's function and solve the integral part of real number.
CO3	Define and develop the concepts of congruences.
CO4	Derive Triangle inequality and Define Arithmetic and Geometric mean.
CO5	Define Harmonic mean and Derive Cauchy-Schwartz inequality.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	3	3	1	3	2	1	-	-	-	2
CO2	3	2	3	3	1	3	3	1	-	-	-	3
CO3	2	3	3	2	1	3	2	2	-	-	-	2
CO4	2	3	3	3	1	2	3	1	-	-	-	2
C05	3	2	3	2	1	2	3	2	-	-	-	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A	Section B
			Either/ or Choice	Open Choice
			No. of Questions	No. of Question
1	CO1	Up to K2	2(K2&K2)	1(K2)
2	CO2	Up to K3	2(K2&K2)	1(K3)
3	CO3	Up to K2	2(K2&K2)	1(K2)
4	CO4	Up to K3	2(K2&K2)	1(K3)
5	CO5	Up to K3	2(K3&K3)	1(K3)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	-	-	-	-	-
K2	24	10	34	61.82%	62%
K3	6	15	21	38.18%	38%
Total Marks	30	25	55	100.00%	100%

Lesson Plan

		6 Hours	Mode
Unit I	a. Introduction - Prime and composite numbers	1	Chalk & Talk
	b. Sieve of Eratosthenes	1	
	c. Divisors of a given number N	2	
	d. Simple problems	2	
		6 Hours	**Mode**
Unit II	a. Euler's function	1	Chalk & Talk
	b. Integral part of a real number	1	
	c. The highest power of a prime p contained in n!	1	
	d. The product of r consecutive integers is divisible by r!	2	
	e. Simple problems	1	
		6 Hours	**Mode**
Unit III	a. Congruences	2	Chalk & Talk ICT
	b. Numbers in arithmetical progression	2	
	c. Simple problems	2	
		6 Hours	**Mode**
Unit IV	a. Triangle inequality	2	Chalk & Talk
	b. The Arithmetic mean	2	
	c. The Geometric mean and simple problems	2	
		6 Hours	**Mode**
Unit V	a. The Harmonic mean	2	Chalk & Talk
	b. Cauchy Schwarz inequality	2	
	c. Simple problems	2	

Course designed by: Dr. P. Pandiammal

Programme	B.Sc Mathematics	Programme Code	UMA

Course Code	**20UMAS6P**	**Number of Hours/Cycle**	**2**		
Semester	**VI**	**Max. Marks**	**50**		
Part	**IV**	**Credit**	**2**		
Skill Based Practical II					
Course Title	**R Programming**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**-**	**-**	**30**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Preamble

To develop the computational skills of the students to solve various statistical problems by numerical techniques using R programming.

Course Outcomes:

The student will be able to

1. To show the installation of R programming environment
2. Summarize the fundamental knowledge on basics of data science and R programming.
3. Develop programming in R language for understanding and visualization of data using statistical functions and plots.
4. Create and edit visualization with R.
5. Understand the basics in R programming in terms of constraints, control statements, string functions.

List of Experiments:

1. Write a progam in R to create vectors.
2. Write a progam in R to create matrices.
3. Write a progam in R to create different charts for visualization of given set of data.
4. Write a progam in R to calculate the Mean, Median and Mode of a set of observations.
5. Write a progam in R to calculate standard deviation of a set of observations.
6. Write a progam in R to calculate the Karl Pearson's coefficient of correlation.
7. Write a progam in R to calculate Spearman's Rank correlation coefficients.
8. Write a progam in R to find Regression coefficients and draw regression lines.
9. Write a progam in R test of significance using Chi-square test.
10. Write a progam in R test of significance using Student's t- test.
11. Write a progam in R test of significance using F-test.
12. Write a progam in R to calculate one way and two way classification.

References:

1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, (2018) 2nd Edition, Pearson Education.
2. S.R Mani Sekhar and T V Suresh Kumar, (2017) Programming with R, 1st Edition, Cengage India Private Limited.

E-Resources

1. https://www.tutorialspoint.com/r/r normal_distribution.html
2. https://www.r-project.org/

Course designed by: Dr. P. Pandiammal

Value Added Courses

Programme	B.Sc Mathematics	Programme Code	UMA		
Course Code	20CMAT3P	Number of Hours/Cycle	2		
Semester	III	Max. Marks	50		
Part	-	Credit	2		
Value Added Course I					
Course Title	PYTHON Programming		L	T	P
Cognitive Level	Up to K3		-	-	30

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

(For DBT star college scheme, for those who join in 2021 and after)

Preamble

To enable the student to acquire knowledge in Python Programming and to understand basic concepts of programming. Also to emphasize the significance of programming and practice them to write the programme.

Course outcome:

The student will be able to

- Understand the basics of algorithmic problem solving.
- Learn to solve problems using python conditionals and Loops.
- Define Python functions and use function calls to solve problems.
- Implement matrix addition and multiplication.
- Find the largest number in a list.
- Draw a circle of square using turtle

List of Experiments:

1. Write a python program to print pyramid pattern of given numbers.
2. Write a python program to find the roots a quadratic equation.
3. Write a python program to find the factorial of the given number using function.
4. Write a python program to implement matrix addition and multiplication.
5. Write a python program to find the largest number in a list using function.
6. Write a python program to find the area of shapes using function.
7. Write a python program to find reverse string, string palindrome, character count and replacing string.
8. Write a python program to create EB bill.
9. Write a python program to swap two variables.
10. Write a python program to draw a circle of square using turtle.

Text Book

1. C.H.Satyanarayana, M. Radhika mani, B. N Jagaderh(2018), PYTHON Programming Margham Publications University press Chennai.

Reference Books

1. Reema Thareja(2017) PYTHON PROGRAMMING using problem solving Approach Oxford university press, NewDelhi.
2. Jeeva Jose and P Sojan Lal(2016), " Introduction to computing and Problem Solving with PYTHON", Khanna Book Publishing Co. (P) Ltd, New Delhi.

E-Resources

1. https://www.youtube.com/watch?v=kqtD5dpn9C8
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm

Course designed by: Dr. J. Kaliga Rani

Programme	B.Sc Mathematics	Programme Code	UMA

Course Code	**22CMAT4P**	**Number of Hours/Cycle**	**2**		
Semester	**IV**	**Max. Marks**	**50**		
Part	**-**	**Credit**	**2**		
Value Added Course II					
Course Title	**SAGEMATH**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**-**	**-**	**30**

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

(For DBT star college scheme, for those who join in 2021 and after)

Preamble

To develop the computational skills of the students to solve various statistical problems by numerical techniques using R programming.

Course outcome

The student will be able to use SAGEMATH as a calculator, implement and illustrate 2-D graphs and 3-D graphs, solving mathematical problems and to plot, using templates and handling mathematical concepts and visualize theoretical concepts.

List of Experiments

1. Finding all local extrema and inflection points of a function.
2. Creating and plotting 2-D graphs and 3-D graphs.
3. Finding the surface area of given surface using package.
4. Finding the approximate roots using Newton's method.
5. Plotting and finding area between curves using integrals.
6. Finding the given group is abelian or not.
7. Finding the volume of solid of revolution.
8. Finding the solution for a system of linear equations.
9. Finding the divergence and curl of vector valued functions.
10. Using differential calculus to analyse a quintic polynomials features, for finding the optimal

graphing window.

Reference Book:

1. Razvan A. Mezei, An Introduction to SAGE Programming: With Applications to SAGE, Wiley, 2016

Web References:

1. https://doc.sagemath.org/pdf/en/tutorial/SageTutorial.pdf

Course designed by: Dr. S. Ramachandran

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**

Course Code	**20CMAT5P**	**Number of Hours/Cycle**	**2**		
Semester	**V**	**Max. Marks**	**50**		
Part		**Credit**	**2**		
Value Added Course III					
Course Title	**Office Automation Practical**		**L**	**T**	**P**
Cognitive Level			**-**	**-**	**30**

(For DBT star college scheme, for those who join in 2020 and after)

Preamble

To provide the students with basic knowledge in MS-word, Relate real life MS Excel application for Provisional or Personal use ,Create a PowerPoint presentation and navigate a slide show in PowerPoint

LIST OF PROGRAMS:-

1. Design a document with atleast 2 pages using MS– Word with different font style, different font size and Header and Footer ,with page number
2. Create a daily attendance sheet of a class room for a week with heading, day, Period etc.
3. Design an invitation with two column break, use word to insert picture, design Border shading.
4. Create a yearly Salary report in Excel work sheet, use auto fill to enter the month and to sum the column and row total, to calculate DA and others, to insert date and time function in the footer.
5. Create yearly budget of a company and create different types of chart for a data in MS-Excel.
6. Create Students Mark list for three subjects and to list the result and rank by using string function and logical function
7. Present the college or any publishing work using auto content wizard with 8 slides in MS- Power Point.
8. Create a slide show using blank presentation with atleast 10 slides
9. Create a main document and database of Address and merge them using mail-merge tools.

Course Outcomes

After completion of this course, the students will be able to:

- Demonstrate fundamental knowledge of Ms word
- Understand a word processor, create edit and format document
- Determine and use various workplace application software to develop, document, manage office project, procedure and system.
- Create different type of chart using Ms-Excel for real life applications
- Apply Power point technique to create promotional handouts

Text Book

1. C.Nellai Kannan,(2008),MS-OFFICE,Nels Publications,Tirunrlveli Town,Tamilnadu.

Course designed by Dr. P. Pandiammal

Programme	**B.Sc Mathematics**	**Programme Code**	**UMA**

Course Code	20CMAT6P	Number of Hours/Cycle	2		
Semester	VI	Max. Marks	50		
		Credit	2		
Value Added Course IV					
Course Title	LATEX		L	T	P
Cognitive Level	Up to K3		-	-	30

(For DBT star college scheme, for those who join in 2020 and after)

Preamble

To provide the students the basic concepts of LaTeX and the students will be able to create and design documents in LaTeX and presentations.

List Of Programs

1. Type a document in different alignment (Left, Right, Center, Justify).
2. Type a Letter for applying a job.
3. Type your own Bio-Data.
4. Draw a Table structure.
5. Type a given Mathematical expression using Differentiation ,Integration and Trigonometry
6. Type a given expression using all inequalities.
7. Draw any picture on insert in LateX file.
8. Type a given Question paper
9. Convert one LateX file into power point presentation
10. Type a given Science Direct Journal

Course Outcomes

After completion of this course, the students will be able to:

- Demonstrate fundamental knowledge of typing LATEX
- Apply the commands and create a document ,list, boxes and tables
- Determine and use various application software to document in Research area
- Apply Mathematical Environment to type Mathematical expression using Differentiation, Integration and Trigonometry
- Able to draw any picture on insert in LateX file

Text Book

1. Helmut Kopka, Patrick W.Daly(1999), A Guide to LATEX Document Preparation for Beginners and Advanced Users, Addison Wesley, England.

Reference Books

1. David F-Griffiths and Desmond J. Higham(1996), Learning LATEX, SIAM(Society for Industrial and Applied Mathematics), Publishers, Phidelphia,.
2. Martin J.Erickson and Donald Bindner,(2011), A Student's Guide to the study, Practice and Tools of Modern Mathematics,CRC Press, Boca Raton ,FI .
3. K B M Nambudiripad,(2018), Latex for beginners, Narosa Publishing House,Private limited, New Delhi.

Course designed by: Dr. J. Kaliga Rani