PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

Criterion 1 – Curricular Aspects

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.3	Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the Mathematics

DEPARTMENT OF MATHEMATICS

SYLLABUS COPY OF THE COURSES HIGHLIGHTINGTHE FOCUS ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT

1. List of courses for the programmes in order of

S. No.	Programme Name
i.	Bachelor of Science (Mathematics)
ii.	Master of Science (Mathematics)

2. Syllabus of the courses as per the list.

Legend :

Words highlighted with **Blue Color** - Entrepreneurship

Words highlighted with **Red Color** - Employability

Words highlighted with **Green Color** - Skill Development

1. List of Courses

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
B.Sc. Mathematics			
Tamil - I	XGT101	2022-23	Employability: Assignment & Seminar. To acquire basic Learning skills
English - I	XGL102	2022-23	Employability: Assignment & Seminar. To acquire basic Learning skills
Differential Calculus and Trigonometry	XMT103	2022-23	Employability: Assignment, Seminar and Quiz
Analytical geometry 3-D and Integral Calculus	XMT104	2022-23	Employability: Assignment, Seminar and Quiz
Physics – I	XPG105	2022-23	Employability: Assignment, Seminar and Quiz
Physics Practical - I	XPG106	2022-23	Employability: Assignment, Seminar and Quiz
Human Ethics. Values, Rights and Gender Equality	XUM001	2022-23	Employability: Assignment, Seminar and Group discussions
Tamil – II	XGT201	2022-23	Employability: Assignment & Seminar. To acquire basic Learning skills
English – II	XGE202	2022-23	Employability: Assignment & Seminar. To acquire basic Learning skills
Classical Algebra	XMT203	2022-23	Employability: Assignment, Seminar and Quiz
Sequence and Series	XMT204	2022-23	Employability: Assignment, Seminar and Quiz
Physics – II	XPG205	2022-23	Employability: Assignment, Seminar and Quiz
Physics Practical - II	XPG206	2022-23	Employability: Assignment, Seminar and Quiz
Quantitative Aptitude – I	XMT207	2022-23	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Environmental Studies	XUM002	2022-23	Employability: Miniproject, Seminar and Group discussions

Logic and Sets	XMT301	2018-19	Employability: Assignment, Seminar and Quiz
Programming in C	XMT302	2018-19	Employability: Assignment, Seminar and Quiz
Real Analysis	XMT303	2018-19	Employability: Miniproject, Seminar and Group discussions
Analytical Geometry 3D	XMT304	2018-19	Employability: Miniproject, Seminar and Group discussions
Open Elective Practical Accounting	XCOOE1	2018-19	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Open Elective Digital Imaging and Editing Techniques	XCAOE2	2018-19	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Programming in C – Practical	XMT305	2018-19	Employability: Miniproject, Seminar and Group discussions
Disaster Management	XUM306	2018-19	Employability: Assignment, Seminar and Quiz
Theory of Equations	XMT401	2018-19	Employability: Assignment, Seminar and Quiz
Introduction to Matlab	XMT402	2018-19	Employability: Miniproject, Seminar and Group discussions
Vector Calculus and Fourier Series	XMT403	2018-19	Employability: Assignment, Seminar and Quiz
Algebra	XMT404	2018-19	Employability: Assignment, Seminar and Quiz
Color Theory and Paints	XAROE3	2018-19	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Introduction to Matlab - Practical	XMT405	2018-19	Employability: Assignment, Seminar and Quiz
Probability and Statistics	XMT501	2018-19	Employability: Assignment, Seminar and Quiz
Matrices	XMT502A	2018-19	Employability: Assignment, Seminar and Quiz
Discrete Mathematics	XMT502B	2018-19	Employability: Assignment, Seminar and Quiz
Numerical Methods	XMT503A	2018-19	Employability: Assignment, Seminar and Quiz
Mechanics	XMT503B	2018-19	Employability: Assignment, Seminar and Quiz

Linear Algebra	XMT504A	2018-19	Employability: Assignment, Seminar and Quiz
Astronomy	XMT504B	2018-19	Employability: Assignment, Seminar and Quiz
Programming in Python	XCAOE6	2018-19	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Multimedia Design and Development	XCSOE4	2018-19	Skill Enhancement: Seminar: To learn about aptitude and reasoning
Graph Theory	XMT601	2018-19	Employability: Assignment, Seminar and Quiz
Complex Analysis	XMT602A	2018-19	Employability: Assignment, Seminar and Quiz
Number Theory	XMT602B	2018-19	Employability: Assignment, Seminar and Quiz
Linear Programming	XMT603A	2018-19	Employability: Assignment, Seminar and Quiz
Stochastic Processes	XMT603B	2018-19	Employability: Assignment, Seminar and Quiz
Project	XMT604	2018-19	Employability: Project
M.Sc. Mathematics			
Algebra - I	YMA101	2022-23	Employability: Assignment, test and case study.
Real Analysis - I	YMA102	2022-23	Employability: Assignment, test and case study.
Graph Theory	YMA103	2022-23	Employability: Assignment, test and case study.
Ordinary Differential Equations	YMA104	2022-23	Employability: Assignment, test and case study.
Optimization Techniques	YMA105	2022-23	Employability: Assignment, test and case study.
Fuzzy sets and Fuzzy logic	YMA1E1	2022-23	Skill Enhancement: Seminar: To learn about application of Fuzzy sets and Fuzzy Logic
Coding Theory	YMA1E2	2022-23	Skill Enhancement: Seminar: To learn about application of coding theory
Neural Networks	YMA1E3	2022-23	Skill Enhancement: Seminar: To learn about application of neural networks
Algebra -II	YMA201	2022-23	Employability: Assignment, test and case study.

Real Analysis -II	YMA202	2022-23	Employability: Assignment, test and case study.
Partial Differential Equations	YMA203	2022-23	Employability: Assignment, test and case study.
Classical Dynamics	YMA204	2022-23	Employability: Assignment, test and case study.
Fluid Dynamics	YMA2E1	2022-23	Employability: Assignment, test and case study.
Combinatorics	YMA2E2	2022-23	Employability: Assignment, test and case study.
Cryptography	YMA2E3	2022-23	Skill Enhancement: Seminar: To learn about application of cryptography
Computer Programming (C++ Theory and Lab)	YMA205	2022-23	Skill Enhancement: Seminar: To learn about application of cryptography
Field Theory	YMA301	2014-15	Employability: Assignment, test and case study
Topology	YMA302	2014-15	Employability: Assignment, test and case study.
Automata Theory	YMA303	2020-21	Employability: Assignment, test and case study
Mathematical Statistics	YMA3E1	2014-15	Skill Enhancement: Seminar: To learn about application of mathematical modeling
Data Analysis using SPSS	YMA3E2	2020-21	Skill Enhancement: Seminar: To learn about application of elements of stochastic processes
Numerical Methods	YMA3E3	2014-15	Employability: Assignment, test and case study.
Commutative Algebra	YMA3E1	2014-15	Employability: Assignment, test and case study.
Complex Analysis	YMA401	2014-15	Employability: Assignment, test and case study.
Functional Analysis	YMA402	2014-15	Employability: Assignment, test and case study.
Mathematical Modeling	YMA403	2014-15	Skill Enhancement: Seminar: To learn about application of data analysis using SPSS
Project work	YMA404	2014-15	Employability: Assignment, test and case study

2. Syllabus of the courses

B.Sc (MATHEMATICS)

COURSE CODE	**XGE102**	**L**	**T**	**P**	**SS**	**H**	**C**
COURSE NAME	**English - I**	**3**	**0**	**0**	**0**	**3**	**3**
C:P: A - 3:0:0							

COURSE OUTCOMES:		**Domain**	**Level**
CO1	***Recall*** the basic grammar and using it in proper context	Cognitive	Remembering
CO2	***Explain*** the process of listening and speaking	Cognitive	Understanding
CO3	***Adapt*** important methods of reading	Cognitive	Creating
CO4	***Demonstrate*** the basic writing skills	Cognitive	Understanding

SYLLABUS		**HOURS**
UNIT I	**Grammar**	
Major basic grammatical categories ii. Notion of correctness and attitude to error correction		9
UNIT II	**Listening and speaking**	
Importance of listening skills iv. Problems of listening to unfamiliar dialects v. Aspects of pronunciation and fluency in speaking vi. Intelligibility in speaking		9
UNIT III	**Basics of Reading**	
Introduction to reading skills viii. Introducing different types of texts – narrative, descriptive, extrapolative		9
UNIT IV	**Basics of Writing**	
Introduction to writing skills x. Aspects of cohesion and coherence xi. Expanding a given sentence without affecting the structure xii. Reorganizing jumbled sentences into a coherent paragraph xiii. Drafting different types of letters (personal notes, notices, complaints, appreciation, conveying sympathies etc.)		9
	Total Hours	**36**

Text books

1. Acevedo and Gower M (1999) Reading and Writing Skills. London, Longman
2. Deuter, M et.al. (2015). Oxford Advanced Learner's Dictionary of English (Ninth Edition). New Delhi, OUP
3. Eastwood, John (2008). Oxford Practice Grammar. Oxford, OUP
4. Hadefield, Chris and J Hadefield (2008). Reading Games. London, Longman
5. Hedge, T (2005). Writing. Oxford, OUP
6. Jolly, David (1984). Writing Tasks: Stuidents' Book. Cambridge, CUP
7. Klippel and Swan (1984). Keep Talking. Oxford, OUP
8. Saraswati, V (2005). Organized Writing 1. Hyderabad, Orient Blackswan
9. Swan, Michael. (1980). Practical English Usage. Oxford, OUP
10. Walter and Swan (1997). How English Works. Oxford, OUP

Course Code		L	T	P	C
Course Name	**தமிழ் - I**	3	0	0	3
Prerequisite		L	T	P	H
C:P:A	3:0:0	3	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
After the completion of the course, students will be able to			
CO1	*Recognize* (அடையாளம் காணுதல்) பல்வேறு அறிஞர் பெருமக்களின் தொண்டுகளைத் தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO2	*Choose* (தெரிவு செய்தல்) பன்முகப் பரிமாணங்களின் கவிதைகளை இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO3	*Describe* (விளக்குதல்) தமிழ் மகளிரின் உரையாடல் சிறப்புச் செய்திகளை உணர்தல்.	Cognitive	Understand
CO4	*Apply* (விளக்குதல்) பல்வேறு கலைத்துறைச் சார்ந்த பிரிவுகள், மண்ணின் பாடல்கள் குறித்துத் தெளிவு பெறல்.	Cognitive	Apply
CO5	*Analyze* (பகுத்தல்) சிறுகதைகளின் தோற்றம் மற்றும் வளர்ச்சி நிலை நாடகங்கள் - கவிதை குறித்துத் தெளிவு பெறுதல்.	Cognitive	Analyze

அலகு-1	**தமிழ் அறிஞர்களும் தமிழ்த்தொண்டும்**	9
பாரதியார், பாரதிதாசன், நாமக்கல் கவிஞர், சி.இலக்குவனார், உ.வே.சாமிநாத அய்யர், தெ.பொ.மீனாட்சி சுந்தரம், கவிமணி தேசியவிநாயகம் பிள்ளை தொடர்பான செய்திகள், சிறந்த தொடர்கள், சிறப்புப் பெயர்கள்.		
அலகு-2	**கவிதைகள் (மரபுக்கவிதை, புதுக்கவிதை)**	9
மரபுக்கவிதை : முடியரசன், வாணிதாசன், சுரதா, கண்ணதாசன், உடுமலை நாராயண கவி, பட்டுக்கோட்டை கல்யாண சுந்தரம், மருதகாசி தொடர்பான செய்திகள். புதுக்கவிதை : ந.பிச்சமூர்த்தி, சி.சு.செல்லப்பா, மு.மேத்தா, ஈரோடு தமிழன்பன், அப்துல் ரகுமான், ஞானக்கூத்தன், ஆலந்தூர் மோகனரங்கன் தொடர்பான செய்திகள்.		
அலகு-3	**உரையாடல்கள், தமிழ் மகளிரின் சிறப்பு**	9
ஜி.யு.போப் மற்றும் வீரமாமுனிவரின் தமிழ்ப்பணி, பெரியார், அண்ணா, முத்துராமலிங்கத்தேவர், அம்பேத்கர், காமராசர், மா.பொ.சிவஞானம், காயிதே மில்லத் சமுதாயத் தொண்டு. அன்னி பெசண்ட் அம்மையார், மூவாலூர் ராமாமிர்தம்மாள், டாக்டர் முத்துலட்சுமி ரெட்டி, வேலுநாச்சியார், வள்ளியம்மை, ராணி மங்கம்மாள் சிறப்பு.		
அலகு-4	**நாட்டுப்புறப்பாடல்**	9
தாலாட்டுப்பாடல், தொழில் பாடல், ஒப்பாரிப் பாடல்.		
அலகு-5	**இலக்கிய வரலாறு**	9
உரைநடை, சிறுகதை, நாடகம், கவிதைகள்.		

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	---	---	45

பாட நூல்கள்:

1. முனைவர் கா.செல்வகுமார் (தொ.ஆ.), பொதுத்தமிழ், மார்ச் - 2022, துரைகோ பதிப்பகம், அரும்பாக்கம், சென்னை – 106. 9884159972.
2. முனைவர் மு.அருணாசலம் (ப.ஆ.) – தமிழ் இலக்கிய வரலாறு – 2012, அருண் பதிப்பகம், தரைத்தளம், பாலாஜி நகர், ஞடீஜ காலனி, கண்டோன்மெண்ட், திருச்சி - 1. 9894440530
3. சு.சக்திவேல் - நாட்டுப்புற இயல் ஆய்வு, மணிவாசகர் பதிப்பகம் - 12, மேலசன்னதி வீதி, சிதம்பரம் - 1.
4. முனைவர் கோ.பெரியண்ணன் - அடிப்படை எளிய தமிழ் இலக்கணம் - 2003 –வனிதா பதிப்பகம், 11- நானா தெரு, பாண்டி பஜார், தி.நகர், சென்னை - 17.

பார்வை நூல்கள்:

1. முனைவர் ந.லெனின், தாலாட்டுப் பாடல், பிப்ரவரி - 2015, பிருந்தா பதிப்பகம், தஞ்சாவூர் - 5.
2. கோ. வெங்கடாசலம் (தொ.ஆ.) - 2005, தமிழ் இலக்கிய கைவிளக்கு, அன்னை சரஸ்வதி பதிப்பகம், குடியாத்தம்.
3. முனைவர் இராஜா வரதராஜா - பயன்முறைத் தமிழ் - ஜூன் 2015, சிவகுரு பதிப்பகம், 7.'.40, கிழக்குச் செட்டித்தெரு, பரங்கிமலை, சென்னை – 16.

Course Name	Differential Calculus and Trigonometry	L	T	P	C
Course Code	XMT103	3	1	0	4
C P A		L	T	SS	H
4 0 0		3	2	0	5
Prerequisite	**Higher Secondary level Mathematics**				

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

	Course Outcomes	Domain	Level
CO 1	**Apply** Leibnitz rule to solve problems related to nth order derivatives	Cognitive	Applying
CO 2	**Identify** maxima and minima of multivariable functions	Cognitive	Applying
CO 3	**Apply** the concept and principles of differential calculus to find the curvature, radius of curvature, envelopes, evolute and involute of different curves	Cognitive	Applying
CO 4	**Demonstrate** the expansions of trigonometric functions in terms of θ	Cognitive	Understanding
CO 5	**Demonstrate** the relations between hyperbolic functions and circular functions	Cognitive	Understanding

UNIT 1	**Successive Differentiation**	**12**

Successive Differentiation – The n^{th} derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product – Proof

UNIT 2	**Partial Differentiation, Maxima and minima of functions of two variables**	**12**

Successive partial derivatives – Function of function rule – Total differential coefficient – Implicit functions – Homogeneous functions – Partial derivatives of a function of two functions – Taylor's expansion of $f(x, y)$ - Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT 3	**Envelopes, Curvature of Plane curve**	**12**

Envelopes – Method of finding envelope – Curvature – Cartesian formula for radius of curvature – The coordinates of centre of curvature – Evolute and involute – Radius of curvature when the curve is given in polar co-ordinates – p-r equation; pedal equation of a curve – Chord of curvature.

UNIT 4	**Expansions**	**12**

Expansions of cos $n\theta$ and sin $n\theta$ - Expansion of tan $n\theta$ in powers of tan θ - Expansion of tan $A + B + C + \cdots$ - Examples on formation of equations – Expansions of cosnθ and sinnθ in terms of functions of multiples of θ - Expansion of cos θ and sin θ in a series of ascending powers of θ.

UNIT 5	**Hyperbolic Functions and Logarithms of Complex quantities**	**12**

Hyperbolic functions – Relations between hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions – Separation into real and imaginary parts – Logarithms of complex quantities – logarithm of $x + iy$ - General value of logarithm of $x + iy$.

Lecture	**45**	**Tutorial**	**15**	**Practical**	**0**	**Total**	**60**

Text Books

1. Calculus Volume I, S. Narayanan and T.K. ManicavachagomPillay, S. Viswanathanpvt. Ltd., 2014.
   Unit I : Chapter III (All sections)
   Unit II : Chapter VIII (Sections 1, 3, 4 & 5)
   Unit III: Chapter X (All sections)
2. Trigonometry, Narayanan and T.K. ManicavachagomPillay, S. Viswanathanpvt. Ltd., 2014.
   Unit IV: Chapter III

Unit V: Chapter IV (All sections) & Chapter V (Section 5)

E-References

1. https://math.Korea. Edu/math_en/calculus/syllabus. Do [Korea University]
2. https://explore course. Stanford. edu/search?q=MATH21 [Stanford University]

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**13**	**8**	**15**	**5**	**3**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name	**Analytical Geometry 3-D and Integral Calculus**	**L**	**T**	**P**	**C**
Course Code	**XMT104**	**3**	**1**	**0**	**4**
C **P** **A**		**L**	**T**	**SS**	**H**
4 **0** **0**		**3**	**2**	**0**	**5**

Prerequisite **Higher Secondary level Mathematics**

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

	Course Outcomes	Domain	Level
CO 1	**Identify** the given lines are coplanar lines and shortest distance between the skew lines	Cognitive	Applying
CO 2	**Identify** the equation of the tangent plane to a given sphere	Cognitive	Applying
CO 3	**Apply** reduction formulae to Integrate functions of a higher degree.	Cognitive	Applying
CO 4	**Apply** the concepts of Beta and Gamma functions and their properties to evaluate definite integral.	Cognitive	Applying
CO 5	**Apply** the concepts of multiple integral for finding the area and volume of the region bounded by curves	Cognitive	Applying
UNIT 1			**12**
Analytical Geometry 3-D – The plane – The straight line – Coplanar lines - skew lines S.D.			
UNIT 2			**12**
Sphere- Tangent plane- intersection of two spheres – Equation of tangent plane to a sphere.			
UNIT 3			**12**
Properties of definite integrals - Reduction formulae of the types: $\int x^n e^{ax} dx, \int x^n \cos ax \, dx, \int \sin^n x \, dx, \int \cos^n x \, dx, \int \sin^m x \cos^n x \, dx, \int \tan^n x \, dx$			
UNIT 4			**12**

Beta and Gamma Functions: Definitions – Convergence of Γ(n) – Recurrence formula of gamma function – Properties of beta function – relation between beta and gamma functions.

UNIT 5		**12**

Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals - Application of multiple integrals.

Lecture	**45**	**Tutorial**	**15**	**Practical**	**0**	**Total**	**60**

Text Books

1. Analytical geometry: T.K. M. Pillai, 2015 (for Unit I & II)
2. Calculus Vol II : T.K. M. Pillai, 2015 (for Unit III, IV & V)

Unit I : Chapter 2 (Sec: 1 – 7), Chapter 3 (Sec: 1 - 8)
Unit II : Chapter 4 (Sec: 1 – 8)
Unit III : Chapter 1 (Sec: 11, 13.1 – 13.6)
Unit IV : Chapter 7 (Sec: 2 – 5)
Unit V : Chapter 5 (Sec: 2 – 5.4)

References

1. Solid Geometry- M.L. Khanna (Jainath& Co Publishers, Meerut)
2. Mathematics for BSc – Vol I and. II - P. Kandasamy. Thilagarathy (S. Chand and Co-2004)

E-References

1. https://sites.math.washington.edu/~m125/ [Washington University]
2. https://courses.maths.ox.ac.uk/node/28 [Oxford University]

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**13**	**8**	**15**	**5**	**3**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name			Physics –I	L	T	P	C
Course Code			XPG105	3	1	0	4
C	P	A		L	T	SS	H
4	0	0		3	1	0	4
Prerequisite			Basic knowledge of physics concepts.				

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

	Course Outcomes	Domain	Level
CO 1	**Identify** the principles of elasticity, **derive** expression for twisting couple and **determine** rigidity modulus of a wire.	Cognitive	Remember, Understand and Apply
CO 2	**Describe** sound, propagation, perception **analysis** of acoustical wave and effect echoes in building.	Cognitive	Understand and apply
CO 3	**Recall** basic concepts of specific heat capacity **List** the laws of thermodynamics.	Cognitive	Remember and understand
CO 4	**Understand** Interference, diffraction and **identify** their applications.	Cognitive	Understand and Analyze
CO 5	**Recall** the general properties of atoms and nucleus, **Discuss** the various models and A**nalyze** various applications of X–ray.	Cognitive	Remember Understand, analyze

UNIT 1	**Elasticity**	12

Stress – Strain –Hooke' law-Different moduli of elasticity - Twisting couple on a cylinder – Determination of Rigidity modulus by Static Torsion method –Bending of beams–Experimental methods for the determination of Young's modulus by non-uniform bending.

UNIT 2	**Sound**	12

Introduction – characteristic of musical sound - Loudness – unit of loudness – Noise - Acoustics of buildings – Reverberation – Reverberation time- requirements for good acoustics of buildings - Echo and Echelon effect.

UNIT 3	**Thermal Physics**	12

Specific Heat – Specific Heat of a Liquid by Joule's Electrical Method – Newton's law of cooling – verification - specific heat capacity of a liquid by cooling– Conduction: Coefficient of thermal conductivity – Lee's disc method for bad conductors – Black body radiation- Stefan's law.

UNIT 4	**Optics**	12

Interference – determination of thickness of a thin wire by air wedge method – Diffraction – Fresnel's and Fraunhofer diffraction – Diffraction grating–Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism.

UNIT 5	**Atomic and Nuclear physics**	12

Atom Physics – Electron - spin quantum numbers – Pauli's exclusion principle – Excitation and ionization potentials – Photoelectric effect –X – rays: continuous and characteristic–applications.
Nuclear Physics: Nuclear size –mass – charge – Mass defect – Binding energy – packing fraction – binding energy – nuclear fission – nuclear fusion– chain reaction –nuclear reactor.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. A Text book of sound - N. Subrahmanyam and BirjLal. Publisher, Vikas Publishing House, 1985
2. Allied physics – A. Sundaravelusamy, Priya Publications, Karur-2.
3. Properties of matter – R. Murugesan. S Chand & Co. Pvt. Ltd., New Delhi. 2

References

1. Concepts of Modern Physics, *Arthur Beiser*, 6th Ed, McGraw Hill (India) Pvt. Ltd., 2009
2. .Senthil Kumar G., "Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011.

E-References[MOOC, SWAYAM, NPTEL, Websites etc.]

1. Biswanath Banerjee and Amit Shaw, Department of Civil Engineering IIT Kharagpur, " THEORY OF ELASTICITY", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/105/105/105105177/
2. NPTEL , Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	15	15	14	11	15	5	6	1	1
SCALED VALUE	3	3	3	3	3	1	2	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name	Physics Practical - I	L	T	P	C
Course Code	XPG106	0	0	4	2

C	P	A	L	T	P	H
0.5	1	0.5	0	0	4	4

Prerequisite Basic knowledge of physics concepts.

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

Course Outcomes		Domain	Level
CO 1	**Describe** sound, propagation, perception **analysis** of acoustical wave.	Cognitive Psychomotor	Knowledge
CO 2	**Identify** the principles of elasticity, **derive** expression for twisting couple and **determine** rigidity modulus of a wire.	Psychomotor: Affective:	Analyze, Mechanism Respond
CO 3	**Define** heat capacity, **recall** the concepts of temperature and **explain** the specific heat capacity.	Cognitive Psychomotor	Evaluate
CO 4	**Explain** interference & diffraction and **analysis** various application of diffraction and interference.	Psychomotor:	Knowledge, Mechanism
CO 5	**Know** the determination of wavelength and size of the micro particle.	Cognitive Psychomotor	Comprehension, Evaluate

Ex. No	Experiments (Any Eight Experiments)	
1.	Torsional pendulum – Determination of the rigidity modulus of thin wire.	CO2
2.	Young's modulus – Non uniform bending –Pin and microscope.	CO2
3.	Lee's disc –Specific heat capacity of the bad conductor.	CO3
4.	Specific heat capacity of liquid – Newton's law of cooling	CO3
5.	Spectrometer – Refractive index of a prism	CO4
6.	Spectrometer grating – a wavelength of various spectral line by normal incidence	CO4
7.	Air wedge – Thickness of wire	CO4
8.	Sonometer – verification of laws	CO1
9.	Determination specific heat capacity using Spherical Calorimeter	CO3
10.	Laser grating – Determination of wave length and To find the size of the micro particle.	CO5

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

1. C. L. Arora,"B.Sc. Practical Physics",S. Chand & Company Ltd. Ram Nagar, New Delhi, 2007.
2. R. K. Shukla &Anchal Srivastava. "Practical Physics," New Age International (P) Ltd, Publishers, New Delhi, 2006.

References

1. Indu Prakash and Ramakrishna, "A Text Book of Practical Physics," 11th Edition, KitabMahal, New Delhi, 2011.
2. C. Ouseph,K. Rangarajan, "A Text Book of Practical Physics", Volume I & II, S.Viswanathan Publishers,1997.

E-References

COURSE CODE	XGE202	L	T	P	SS	H	C
COURSENAME	ENGLISH II	2	1	0	0	3	3
C:P:A- 3:0:0							

COURSEOUTCOMES:		Domain	Level
CO1	***Explain*** the basic grammar and using it in proper context	Cognitive	Understand
CO2	***Categorize*** the process of listening and speaking	Cognitive	Analyze
CO3	***Examine*** the important methods of reading	Cognitive	Evaluate
CO4	***Compose*** the basic writing skills	Cognitive	Create

SYLLABUS		HOURS
UNIT-I	**Advanced Reading**	
i. Reading texts of different genres and of varying length ii. Different strategies of comprehension iii. Reading and interpreting non-linguistic texts iv. Reading and understanding incomplete texts (Cloze of varying lengths and gaps; distorted texts.)		12
UNIT-II	**Advanced Writing**	
v. Analysing a topic for an essay or a report vi. Editing the drafts arrived at and preparing the final draft vii. Re-draft a piece of text with a different perspective (Manipulation exercise) viii. Summarize a piece of prose or poetry ix. Using phrases, idioms and punctuation appropriately		11
UNIT-III	**Principles of communication and communicative competence**	
x. Introduction to communication–principles and process xi. Types of communication–verbal and non-verbal xii. Identifying and overcoming problems of communication xiii. Communicative competence		11
UNIT-IV	**Cross Cultural Communication**	
xiv. Cross-cultural communication		11
	Total Hours	**45**

Textbooks

1) Bailey, Stephen(2003).Academic Writing. London and New York, Routledge.
2) Department of English, Delhi University(2006).Fluency in English Part II. New Delhi, OUP
3) Grellet, F (1981).Developing Reading Skills: A Practical Guide to Reading Skills. New York, CUP
4) Hedge, T.(2005). Writing. London, OUP
5) Kumar, S and Pushp Lata (2015).Communication Skills. New Delhi, OUP
6) Lazar, G.(2010).Literature and Language Teaching. Cambridge, CUP
7) Nuttall, C(1996).Teaching Reading Skills in a Foreign Language. London, Macmillan
8) Raman,MeenakshiandSangeetaSharma(2011).TechnicalCommunication:PrinciplesandPractice.NewDelhi, OUP

Table1: Mapping of Cos with POs:

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO2	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO3	1	0	0	0	0	0	1	0	1	0	0	0	0	0
CO4	2	0	0	0	0	0	1	0	1	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scal edV alue	2	0	0	0	0	0	2	0	1	0	0	0	0	0
	1	0	0	0	0	0	1	0	1	0	0	0	0	0

1-5= 1, 6-10 = 2, 11-15= 3

0-NoRelation,1-Low Relation,2–MediumRelation,3-HighRelation

Course Code	XGT201	L	T	P	C
Course Name	தமிழ்-II	2	1	0	3
Prerequisite		L	T	P	H
C:P:A	3:0:0	2	1	0	3
COURSE OUTCOMES		DOMAIN		LEVEL	
After the completion of the course, students will be able to					
CO1	Recognize (அடையாளம் காணுதல்) பல்வேறு இலக்கணக் குறிப்புகள், கலைச்சொல்லாக்க உத்திகள் போன்றவற்றைத் தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.			Cognitive	Remember
CO2	Choose (தேர்வு செய்தல்) வடமொழிக் கோச்சொற்கள், ஒலி வேறுபாடறிந்து, பழந்தமிழ் இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.			Cognitive	Remember
CO3	Describe (விளக்குதல்) நிருக்குறள் மூலம் அறச் செய்திகளை உணர்தல்.			Cognitive	Understand
CO4	Apply (விளக்குதல்) பல்வேறு அலுவல் சார்ந்த கடிதப் பிரிவுகள், குறித்துத் தெளிவு பெறல்.			Cognitive	Apply
CO5	Analyze (பகுத்தல்) கலைகளின் தோற்றம் மற்றும் வளர்நிலை சமுதாயப் பங்கு குறித்துத் தெளிவு பெறுதல்.			Cognitive	Analyze
அலகு-1	**இலக்கணம்**				9
பொருத்துதல்: பொருத்தமான பொருளைத் தேர்வு செய்தல், புகழ் பெற்ற நூல் மற்றும் நூலாசிரியர், தொடரால் குறிக்கப்படும் சான்றோர், அடைமொழியால் குறிக்கப்படும் நூல்கள். பிரித்து எழுதுக: எதிர்ச்சொல்லை எடுத்து எழுதுக, பொருத்தம் சொல்லைக் கண்டறிதல், பிழைத் திருத்தம், சந்திப்பிழையை நீக்குதல், ஒருமை பன்மை பிழைகளை நீக்குதல், மரபுப் பிழைகள் - வழுஉச்சொல் - பிறமொழிச் சொற்களை நீக்குதல்.					
அலகு-2	**கோச்சொல் அறிதல்**				9
ஆங்கிலச் சொல்லுக்கு நேரான தமிழ்ச் சொல்லை அறிதல் - ஒலி வேறுபாடறிந்து சரியான பொருளை அறிதல், ஒருமுத்து ஒருமொழிக்குரிய பொருளைக் கண்டறிதல் - கோச்சொல் விளைமுற்று-வினையெச்சம் - தொழிற்பெயர், அகர வரிசைப்படுத்துதல்.					
அலகு-3	**இலக்கியம்**				9
நிருக்குறள் தொடர்பான செய்திகள் மேற்கோள்கள் தொடரை நிரப்புதல், அன்பு, பண்பு, கல்வி, கேள்வி, அறிவு, அடக்கம், ஒழுக்கம், பொறை, நட்பு, கேள்வி, அறிவு - வாய்மை, கொலை, வஞ்சகமுடைமை, இன்னா செய்யாமை. அறநூல்கள்: நாலடியார், நான்மணிக்கடிகை, பழமொழி, திரிகடுகம், இன்னா நாற்பது பாடல்கள் தொடர்பான செய்திகள்					
அலகு-4	**பயன்பாட்டுத்தமிழ்**				9
அலுவல்கள் கடிதம், ஆசிரியர் கடிதம், நாளாக்கப் பணி, மெய்ந்நிகழ்ச்சி, விளம்பரத் தமிழ்					
அலகு-5	**பல்வேறு கலைகளின் கல்வி சிந்தனை**				9
மொழியியல் கல்வி, சமுதாயக் கல்வி, சேய்மைக் கல்வி, இக்காலக் கல்வி, கலை அறிவியல் வகைகளின் விளக்கங்கள்					

LECTURE	TUTORIAL	PRACTICAL	TOTAL
30	15	---	45

பாட நூல்கள்

1. கமட்டமரிநாகன், மொழிப் பயன்பாடு, நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்., 41,பி, சிட்கோ இண்டஸ்ட்ரியல் எஸ்டேட், அம்பத்தூர், சென்னை.

2. முனைவர் கா.சொக்கலிங்கம், (தொ.) 2022. துணைப் பாடநூல், அருள்மாக்கம், சென்னை - 106.
3. முனைவர் ந.மெய்ஞ்ஞானி, மார்ச் - 2016, முதல் தமிழ் இலக்கிய இலக்கண வினா-விடைகள், பிரிந்தா பதிப்பகம், தஞ்சாவூர் - 5.
4. முனைவர் இராஜா வசந்தராஜா - பயன்முறைத் தமிழ் - ஜூன் 2015, சீதைநாடு பதிப்பகம், 7/40, கிழக்குச் சேட்டித்தெரு, பரங்கிமலை, சென்னை - 16

பார்வை நூல்கள்:

1. முனைவர் இராஜ.வசந்தராஜா - பயன்முறைத் தமிழ்
2. டாக்டர் வா.செ.குழந்தைசாமி - அறிவியல் தமிழ் - ஜூன் 2006 (ஏழாம் பதிப்பு) —பாரதி பதிப்பகம் - 126/108, உஸ்மான் சாலை, தி.நகர், சென்னை - 17.
3. முனைவர் கோ.பெரியண்ணன் - அடிப்படை எளிய தமிழ் இலக்கணம் - 2003 —வானதி பதிப்பகம், 11- தணிகை நெடு, பாண்டி பஜார், தி.நகர், சென்னை - 17.

Course Name	Classical Algebra	L	T	P	C
Course Code	XMT203	3	1	0	4

C	P	A	L	T	SS	H
4	0	0	3	1	0	4

Prerequisite Basic knowledge of Polynomials, logarithmic functions.

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

Course Outcomes		Domain	Level
CO 1	**Utilize**Cayley Hamilton Theorem to find inverse and power of a given matrix	Cognitive	Applying
CO 2	**Utilize** Newton's method to find the sum of the roots of a given polynomial equation	Cognitive	Applying
CO 3	**Apply** Descartes' rule of signs technique to find the maximum number of positive real zeros of a polynomial function	Cognitive	Applying
CO 4	**Utilize** the binomial theorem to expand polynomials and to identify terms for a given polynomial	Cognitive	Applying
CO 5	**Utilize** logarithmic functions to solve equations involving exponential functions	Cognitive	Applying

UNIT 1 MATRICES **12**

Characteristic roots and characteristic vectors - Linear transformation – the characteristic equation of transformation – Cayley-Hamilton theorem – Diagonalisation of a matrix – orthogonal matrices.

UNIT 2 THEORY OF EQUATIONS **12**

Relation between roots and coefficients- symmetric functions of the roots in terms of the coefficients- imaginary roots and irrational roots- sum of the powers of the roots of an equation.

UNIT 3 TRANSFORMATION OF EQUATIONS **12**

Transformation of equations – Reciprocal equations- standard forms to increase and decrease the roots of a given equation by a given quantity- Removal of terms- Descartes' rule of sign.

UNIT 4 BINOMIAL THEOREM **12**

Binomial theorem – positive integral index – the greatest coefficient in the expansion of $(1 + x)^n$ – Binomial theorem for a rational index – particular cases of the Binomial expansions – Numerically greatest terms – summation of a series

UNIT 5 EXPONENTIAL AND LOGARITHMIC SERIES **12**

Exponential limit – the exponential theorem – summation – Logarithmic series - modification of the logarithmic series – summation

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. Engineering Mathematics, Vol.I. P.Kandasamy, K.Thilagavathi, K.Gunavathi, S.Chand& sons, second edition,1996
   Unit – I: Matrices: Chapter 5
2. Algebra Volume I, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.
   Unit II : Chapter 6 (Sections 1 - 13)
   Unit III : Chapter 6 (Sections 15 – 19, 24)
   Unit IV : Chapter 3 (Sections 1, 5, 6, 8, 10)
   Unit V : Chapter 4 (Sections 1, 2, 3, 5, 6, 9)

References

1. S. Arumugam and A. ThangapandiIssac,Theory of equations and Trigonometry, New Gamma Publishing House, Palayamkottai, 2011.
2. A. Singaravelu, Engineering Maths Volume I, Meenakshi Agency 2019 Edition

E-References

1. https://explore course. Stanford. edu/search?q=MATH51[Stanford University]
2. https://courses.maths.ox.ac.uk/node/37616[Oxford University]

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**15**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name	Sequence and Series	L	T	P	C
Course Code	XMT204	3	1	0	4
C P A		L	T	SS	H
4 0 0		3	1	0	4

Prerequisite	Basic knowledge of numbers.

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

Course Outcomes		Domain	Level
CO 1	**Determine** if an infinite sequence is bounded, monotonic or oscillating	Cognitive	Evaluating
CO 2	**Determine** the series whether it is convergent or divergent by using the appropriate tests.	Cognitive	Understanding
CO 3	**Determine** the series whether it is convergent or divergent by using the appropriate tests.	Cognitive	Evaluating
CO 4	**Identify** the sequence of partial sum for a given infinite series	Cognitive	Applying
CO 5	**Demonstrate** the concepts about the Weirstrass inequalities and Cauchy's inequality	Cognitive	Understanding

UNIT 1 **12**

Sets, Sequences – Aggregate: Upper and lower bounds – Bounded sequences - monotonic sequence always tends to a limit, finite or infinite.

UNIT 2 **12**

Some general theorems concerning infinite series – series of positive terms – comparison tests – Cauchy's condensation test – D-Alembert's ratio test - Definition of convergence, Divergence and Oscillation- Necessary condition for convergence- convergence of $\sum \frac{1}{n^p}$ and Geometric series.

UNIT 3 **12**

Cauchy's root test and their simple problems - Raabe's test – Absolutely convergent series - Alternative series with simple problems.

UNIT 4 **12**

Summation of series – Summation by different series – recurring series.

UNIT 5 **12**

Inequalities- Geometric and Arithmetic means- Weirstrass inequalities- Cauchy's inequality.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. Algebra Volume I, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.
   Unit I :Chapter 2 (Sec: 4 – 7), Pages: 20 - 40
   Unit II :Chapter 2 (Sec: 8 – 16), Pages: 41 - 68
   Unit III:Chapter 2 (Sec: 17 – 19, 21 – 24), Pages: 68 - 88
   Unit IV:Chapter 5 (Sec: 1 – 7), Pages: 246 – 281
2. Algebra Volume II, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.
   Unit V :Chapter 4 (Sec: 1 – 12), Pages: 179 - 212

Reference

1. Sequence and series: S. Arumugam and Isaac, New Gamma Publishing House – 2002 Edition

E-References

1. https://courses.maths.ox.ac.uk/node/43846[Oxford University]
2. https://explore course. Stanford. edu/search?q=MATH21[Stanford University]

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	3	3	1	2	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	3	3	1	2	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	15	15	13	11	15	5	5	5	5
SCALED VALUE	3	3	3	3	3	1	1	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name			Physics –II	L	T	P	C
Course Code			XPG205	3	1	0	4
C	P	A		L	T	SS	H
2.8	0.8	0.4		3	1	0	4

Prerequisite	Basic knowledge of Physics.

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

Course Outcomes		Domain	Level
CO 1	**Recall** Ohms law, **learn** about resistors and capacitors and**apply** knowledge to calibrate low voltmeter using potentiometer.	Cognitive	Understand
CO 2	**Recall** Biot–Savart's law, **explain** current passing through straight conductor, coil and **distinguish** various properties of magnetic materials.	Cognitive	Remember, understand, analyze
CO 3	**Recall** basic of semiconductor **distinguish** different types of diodes and their applications.	Cognitive	Understand apply
CO 4	**Examine** the structure of number systems, **perform** the conversion among different number systems and **discuss** operation of all the gates.	Cognitive	Understand Apply
CO 5	**Illustrate** reduction of logical expressions **using** Boolean algebra and k-map.	Cognitive	Understand Apply

UNIT I	ELECTRICITY	9+3

Ohms law – Law of resistance in series in parallel – Specific resistance – Capacitors: capacitors in series and parallel – Kirchhoff's laws – Wheatstone's Bridge – Carey Foster's bridge – measurement of specific resistance - Potentiometer – Principle – Calibration of voltmeter.
Electromagnetic induction: Laws of electromagnetic induction – self-induction - Mutual induction of coil.

UNIT II	MAGNETISM	9+3

Biot–Savart's law – Ampere's circuital law – Magnetic properties of materials: magnetic intensity, magnetic induction, permeability, magnetic susceptibility – brief introduction of dia, para and ferro magnetic materials. – Magnetic field due to current carrying conductor – field along the axis of a coil.

UNIT III	SEMICONDUCTOR	9+3

Properties of semiconductors – Types of semiconductors– PN junction diode –V I Characteristics– full wave and Bridge rectifiers – Zener diode– characteristics of Zener diode –Zener diode as voltage regulator– Photo Diode and Uses.

UNIT IV	NUMBER SYSTEM AND LOGIC GATES	9+3

Number System: Decimal – Binary – Octal – Hexadecimal Number Systems – Binary Arithmetic Operations – Addition – Subtraction – Multiplication – Division – 1's Complement – 2's Complement Binary Operation.
Logic Gates: Basic Logic Gates AND, OR, NOT, NAND, NOR, XOR, X – NOR – Universal Building Blocks.

UNIT V	BOOLEAN ALGEBRA AND KARNAUGH MAPS	9+3

Basic law of Boolean algebra – Demorgan's theorems – Duality Theorem – Reducing Boolean expressions Using Boolean laws – Minterms – Maxterms – Sum of Products – Products of Sums. 3 Variable K – Map – 4 - Variable K – Map sum of product only –Simplification of K-Maps.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. R Murugeshan, “Modern Physics”, 3rd Edition, S. Chand Publishing, New Delhi, 2004.
2. Electricity and Magnetism , R. Murugesan, Revised Edition , S. Chand & Co., New Delhi, Reprint (2014)
3. M. Morris Mano and Michael D. Ciletti, ―Digital Design‖, 5th Edition, Pearson, 2014.
4. Albert Paul Malvino; Donald P Leach; GoutamSaha, “Digital principles and applications”, 8th Edition, McGraw Hill Education, New Delhi, 2015.

References

1. Thomas L. Floyd, ―Digital Fundamentals‖, 10th Edition, Pearson Education Inc, 2011.
2. Jacob Millman, Christos Halkias, “Analog and Digital Circuit and Systems”, 2nd Edition, Tata McGraw–Hill Education, 2017.

E-References

1. Biswanath Banerjee and Amit Shaw, Department of Civil Engineering IIT Kharagpur, “THEORY OF ELASTICITY”, National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/105/105/105105177/
2. Prof. GoutamSaha, Department of Electronics & Communication Engineering IIT Kharagpur, “DIGITAL ELECTRONIC CIRCUITS”, National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/108/101/108101091/
3. Prof. S. Srinivasan Department of Electrical Engineering, IIT Madras, “Digital Circuits and Systems”, National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	3	3	1	2	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**14**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 → 1, 6-10 → 2, 11-15 → 3

Course Name	Physics Practical - II	L	T	P	C
Course Code	XPG206	0	0	4	2

C	P	A	L	T	P	H
0.5	1	0.5	0	0	4	4

Prerequisite	Basic knowledge of Physics.

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

	Course Outcomes	Domain	Level
CO1	**Explain** specific resistance and **demonstrate** calibration of voltmeter using a potentiometer.	Psychomotor Affective	Analyze, Mechanism Respond
CO2	**Measure** different physical parameters with maximum accuracy.	Cognitive Psychomotor	Evaluate
CO3	**Recall** Magnetic laws, **explain** current passing through coil, solenoid	Psychomotor Affective	Analyze, Mechanism
CO4	**Construct** simple circuits using logic gates.	Cognitive Psychomotor	Synthesis
CO5	**Know** the conceptual difference between analog and digital circuits.	Cognitive Psychomotor	Comprehension

Ex. No	Experiments (Any Eight Experiments)	
1.	Potentiometer – low range voltmeter	CO1
2.	Carey Foster's Bridge – Specific Resistance Determination	CO1
3.	Deflection Magnetometer – Tan A.	CO3
4.	Field along the axis of the coil	CO3
5.	P.O Box – Specific Resistance	CO1
6.	Logic gates (AND, OR, NOT) – using discrete components	CO5
7.	NAND & NOR as Universal Logic gates.	CO5
8.	Basic Logic gates IC's verification.	CO2
9.	Verification of De Morgan's theorem.	CO4
10.	Half adder & Half subtractor using basic gate.	CO4

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

1. C. L. Arora,"B.Sc. Practical Physics",S. Chand & Company Ltd. Ram Nagar, New Delhi, 2007.
2. R. K. Shukla &Anchal Srivastava. "Practical Physics," New Age International (P) Ltd, Publishers, New Delhi, 2006.

References

1. Indu Prakash and Ramakrishna, "A Text Book of Practical Physics," 11th Edition, KitabMahal, New Delhi, 2011.
2. C. Ouseph,K. Rangarajan, "A Text Book of Practical Physics", Volume I & II, S.Viswanathan Publishers,1997.

E – References

1. Amal Kumar Das, Department of Physics, IIT Kharagpur ,"Experimental Physics – II", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/115/105/115105120/
2. S. Srinivasan, Department of Electrical Engineering, IIT Madras, " Digital Circuits and Systems", National Programme on Technology Enhanced Learning (NPTEL),

https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	3	3	1	2	1	1
CO 2	3	3	3	3	3	1	3	1	1
CO 3	3	3	3	3	3	1	2	1	1
CO 4	3	3	3	3	3	1	3	1	1
CO 5	3	3	3	3	3	1	3	1	1
TOTAL	15	15	15	15	15	5	13	5	5
SCALED VALUE	3	3	3	3	3	1	3	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 $\rightarrow$ 1, 6-10 $\rightarrow$ 2, 11-15 $\rightarrow$ 3

Course Name			Quantitative Aptitude I	L	T	P	C
Course Code			XMT207	2	0	0	2
C	P	A		L	T	P	H
2	0	0		2	0	0	2

Prerequisite Basic mathematical knowledge.

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

	Course Outcomes	Domain	Level
CO1	**Explain** the basic concepts of Numbers, H.C.F. &L.C.M of Numbers and to solve the problems	Cognitive	Understanding
CO2	**Explain** the basic concepts of Decimal Fractions, Simplification and to solve the problems	Cognitive	Understanding
CO3	**Explain** the basic concepts of Square Roots & Cube Roots, Average and to solve the problems	Cognitive	Understanding
CO4	**Explain** the basic concepts of Problems on Numbers, Problems on Ages and to solvethe problems	Cognitive	Understanding
CO5	**Explain** the basic concepts of Surds & Indices, Percentage and to solvethe Problems	Cognitive	Understanding

UNIT 1 **6**

Numbers, H.C.F. &L.C.M of Numbers.

UNIT 2 **6**

Decimal Fractions, Simplification

UNIT 3 **6**

Square Roots & Cube Roots, Average.

UNIT 4 **6**

Problems on Numbers, Problems on Ages.

UNIT 5 **6**

Surds & Indices, Percentage.

Lecture	30	Tutorial	0	Practical	0	Total	30

Text Book

1. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S Chand; 20th edition (2013)

References

1. Banking awareness by SangramKeshari Rout and SoumyaRanjanBehera, B.K. Publications Pvt. Ltd.; Second edition (2014).
2. UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
3. Fast Track Objective Arithmetic by Rajesh Verma, ArihantPublication, Edition 2012.

E-References

1. www.careerbless.com
2. www.jagranjosh.com
3. www.bestguru.com

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**10**	**5**	**15**	**1**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5 $\rightarrow$ 1, 6-10 $\rightarrow$ 2, 11-15 $\rightarrow$ 3

COURSE CODE			COURSE NAME	L	T	P		C
XMT301			LOGIC AND SETS	2	0	0		2
C	P	A		L	T	P	SS	H
2	0	0		2	0	0	2	4

PREREQUISITE: Foundation course in Mathematics

Course outcomes:	Domain	Level
CO1:Define and Explain Statements and Notations, Connectives, Statements formula and truth tables-Conditional and biconditional, Well formed formulae- Equivalence of formulae and Normal forms.	Cognitive	Remembering Understanding
CO2: Define and Explain Theory of inference for a statement calculus, rules of inference, related problems and Indirect method of proof.	Cognitive	Remembering Understanding
CO3:Define and Explain Predicate Calculus, The statement functions, variables and quantifiers predicate formulae, free and bounded variables and the universe of discourse.	Cognitive	Remembering Understanding
CO4:Define and Explain The rule of sum and product – permutation – combination of binomial theorem – Multinomial theorem.	Cognitive	Remembering Understanding
CO5: Define and Explain Mathematical Induction, The pigeon hole principle and The principle of inclusive and exclusive Derangements.	Cognitive	Remembering Understanding

UNIT I	**6**
Statements and Notations- Connectives- Statements formula and truth tables-Conditional and biconditional – Well formed formulae- Equivalence of formulae- Normal forms.	
UNIT II	**6**
Theory of inference for a statement calculus – rules of inference – related problems – Indirect method of proof.	
UNIT III	**6**
Predicate Calculus – The statement functions – variables and quantifiers – predicate formulae – free and bounded variables – the universe of discourse.	
UNIT IV	**6**
The rule of sum and product – permutation – combination of binomial theorem – Multinomial theorem.	
UNIT V	**6**
Mathematical Induction – The pigeon hole principle – The principle of inclusive and exclusive Derangements.	

LECTURE		**TOTAL**
30		**30**

TEXTBOOK

1. R.P. Grimaldi, “Discrete Mathematics and Combinatorial Mathematics”, Pearson Education, 1998.

REFERENCES

1. P.R. Halmos, Naive “Set Theory”, Springer, 1974.
2. E. Kamke, “Theory of Sets”, Dover Publishers, 1950.
3. G. Ramesh and Dr.C. Ganesamoorthy, “Discrete Mathematics”, Research gate, Feb, 2018.

TABLE 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2	1	1	1	1	1		1
CO 2	3	2	1	1	1	1	1		1
CO 3	3	2	1	1	1	1	1		1
CO 4	3	2	1	1	1	1	1		1
CO 5	3	2	1	1	1	1	1		1
	15	10	5	5	5	5	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE	COURSE NAME	L	T	P	C
XMT302	PROGRAMMING IN C	3	1	0	4

C	P	A
3	0.5	0.5

L	T	P	H
3	1	0	4

PREREQUISITE: Nil

Course Outcomes:	Domain	Level
CO1: Explain Constants, Variables, Data types , Operator and Expressions.	Cognitive	Understanding
CO2:Explain Input and Output operations, Decision Making and Branching, Decision making and Looping.	Cognitive Psychomotor	Understanding Guided Response
CO3: Explain Character Arrays and Strings and User defined Functions.	Cognitive	Understanding
CO4:Explain and Apply Structures and unions, Pointers and File management in C.	Cognitive	Understanding Applying
CO5:Apply Dynamic memory allocation, Linked lists, Pre-processors and Programming Guide lines.	Cognitive Affective	Applying Receiving

UNIT I	**12**
Introduction to C – Constants, Variables, Data types – Operator and Expressions.	
UNIT II	**12**
Managing Input and Output operations – Decision Making and Branching – Decision making and Looping.	
UNIT III	**12**
Arrays – Character Arrays and Strings – User defined Functions.	
UNIT IV	**12**
Structures and unions – Pointers – File management in C.	
UNIT V	**12**
Dynamic memory allocation – Linked lists- Preprocessors – Programming Guide lines.	

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXT BOOK

1. Balagurusamy E.,"Programming in ANSI C", Sixth Edition, McGraw-Hill, 2012.

REFERENCE

1. Bichkar, R.S., "Programming with C", University Press, 2012.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Valued Function	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT303			REAL ANALYSIS	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE:			Nil				
Course Outcomes:							

	Domain	Level
CO1: Explain The field axioms, Field properties, Order in R, Absolute value, Completeness , Representation of Real numbers on a straight line , Intervals , Countable and Uncountable sets.	Cognitive	Understanding
CO2: Define and Explain Open sets, Closed sets, Limit points of a set and Closure of a set.	Cognitive	Remembering Understanding
CO3: Define and Explain Limits, Continuous functions, Types of discontinuities, Algebra of Continuous functions and Boundedness of continuous functions.	Cognitive	Remembering Understanding
CO4: Define and Explain Derivability and continuity, Algebra of derivatives, Inverse function theorem for derivatives and Darboux's theorem.	Cognitive	Remembering Understanding
CO5: State and Explainconditions for integrability, properties of integrable functions, continuity and derivability of integral functions, Mean value theorems, the fundamental theorem of Calculus and the first mean value theorem.	Cognitive	Remembering Understanding

UNIT I Real numbers	**15**
The field axioms- Field properties-Order in R- Absolute value- Completeness – Representationof Real numbers on a straight line – Intervals – Countable and Uncountable sets.	
UNIT II Neighbourhoods and limit points	**15**
Open sets – Closed sets –Limit points of a set – Closure of a set.	
UNIT III Limits and Continuity	**15**
Limits – Continuous functions – Types of discontinuities- Algebra of Continuous functions – Boundedness of continuous functions.	
UNIT IV Derivatives	**15**
Introduction – Derivability and continuity- Algebra of derivatives – Inverse function theorem for derivatives – Darboux's theorem.	
UNIT V	**15**
Riemann Integration- Definition – Daurboux's theorem – conditions for integrability – properties of integrable functions – continuity and derivability of integral functions – Mean value theorems – the fundamental theorem of Calculus and the first mean value theorem.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXT BOOKS
1. M.K.Singhal and Asha Rani Singhal , "A first course in Real Analysis"., R. Chand & Co., June,1997 (Units I to IV). 2. Shanthi Narayan, "A Course of Mathematical Analysis", S.Chand & Co. 1995 (Unit-V). Unit-I Chapter 1, Sec. 1.1 – 1.10 Unit-II Chapter 2 Sec 2.1 – 2.6 Unit-III Chapter 5 Sec 5.1 – 5.5 Unit – IV Chapter 6 Sec 6.1 – 6.5 Unit – V Chapter 6 Sec 6.2 , 6.3 & 6.5 6.7 6.8, 6.9 of [2]

Table 1: COs VS POs Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT304			ANALYTICAL GEOMETRY 3D	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE: Nil

Course outcomes:	Domain	Level
CO1:Find coordinates in space, direction cosines of a line , angle between line and to **explain** angle between planes and distance of a plane from a point.	Cognitive	Remembering Understanding
CO2: Find line of intersection of planes, coplanar lines, skew lines, Shortest distance between skew lines.	Cognitive	Remembering
CO3:Explain section of sphere by plane-tangent planes , condition of tangency and system of spheres generated by two spheres.	Cognitive	Understanding
CO4: Explain and to **find t**he equation of surface, cone, intersection of straight line and quadric cone , tangent plane and normal.	Cognitive	Remembering Understanding
CO5: Explain the condition for plane to touch the quadric cone, condition that the cone has three mutually perpendicular generators and condition for the plane to touch the conicoid.	Cognitive	Understanding

UNIT I	**15**
Coordinates in space-Direction cosines of a line in space-angle between lines in space – equation of a plane in normal form. Angle between planes – Distance of a plane from a point.	
UNIT II	**15**
Straight lines in space – line of intersection of planes – plane containing a line. Coplanar lines – skew lines and shortest distance between skew lines- length of the perpendicular from point to line.	
UNIT III	
General equation of a sphere-Section of sphere by plane-tangent planes –condition of tangency-system of spheres generated by two spheres - System of spheres generated by a sphere and plane.	
UNIT IV	**15**
The equation of surface – cone – intersection of straight line and quadric cone – tangent plane and normal	
UNIT V	**15**
Condition for plane to touch the quadric cone - angle between the lines in which the plane cuts the cone. Condition that the cone has three mutually perpendicular generators- Central quadrics – intersection of a line and quadric – tangents and tangent planes – condition for the plane to touch the conicoid.	

	LECTURE	TUTORIAL	TOTAL
	60	15	75

TEXT BOOK
1. Shanthi Narayanan and Mittal P.K,"Analytical Solid Geometry" 16th Edition S.Chand & Co., New Delhi,2005. 2. Narayanan and Manickavasagam Pillay, T.K.," Treatment as Analytical Geometry"' S.Viswanathan (Printers & Publishers) Pvt. Ltd.,2008 Unit I : Chapter I, Sec 1.5 to 1.9, Chapter II Sec 2.1 to 2.3, Pages : 10-31 Chapter II Sec 2.4 to 2.8 pages : 32-47 of [1] Unit II : Chapter III section 3.1-3.7, pages 55-89 of [1] Unit III : Chapter VI Sec. 6.1 to 6.6 pages : 121-143 of [1] Unit IV : Chapter V Sec.43 to 47 pages : 103-113 of [2] Unit V : Chapter V Sec.49 to 53, Pages:115-125 of [2]
REFERENCE
1. P.Duraipandian & others, "Analytical Geometry 3 Dimensional", Edition, 1998.

Table 1: COs VS POs Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT 305			PROGRAMMING IN C (PRACTICAL)	0	0	2	2
C	P	A		L	T	P	H
2	0	0		0	0	2	4
PREREQUISITE: Nil							

COURSE OUTCOMES:

Course Outcomes:	Domain	Level
CO1: Apply Constants, Variables, Data types , Operator and Expressions to write simple programmes	Cognitive	Understanding
CO2:Apply Input and Output operations, Decision to write simple programmes	Cognitive Psychomotor	Understanding Guided Response
CO3: Apply Character Arrays and Strings and User defined Functions to write simple programmes	Cognitive	Understanding
CO4:Apply Structures and unions, Pointers and File management in C to write simple programmes	Cognitive	Understanding Applying
CO5:Apply Dynamic memory allocation, Linked lists, Preprocessors and Programming Guide lines to write simple programmes	Cognitive Affective	Applying Receiving

List of Programmes

1. Write a Program to convert temperature from degree Centigrade to Fahrenheit.
2. Write a Program to find whether given number is Even or Odd.
3. Write a Program to find greatest of three numbers.
4. Sorting given list of names in alphabetical order
5. Sorting given list of numbers in ascending order
6. Write a Program to using switch statement to display Monday to Sunday.
7. Write a Program to display first Ten Natural Numbers and their sum.
8. Write a Program to find Sum and Multiplication of Two Matrices.
9. Write a Program to find the maximum number in Array using pointer.
10. Write a Program to reverse a number using pointer.
11. Write a Program to solve Quadratic Equation using functions.
12. Write a Program to find factorial of a number using Recursion.
13. Write a program to calculate Mean, Variance and SD of N numbers
14. Write a Program to create a file containing Student Details.

Course Name	**DISASTER MANAGEMENT**	
Course Code	**XUM306**	
Prerequisite	**NIL**	**L –T –P –C** **3- 0 – 0- 0**
C : P : A **2.64 : 0.24 :0.12**		**L -T - P- H** **3 - 0 – 0 - 3**

Course Outcome		**Domain** **C or P or A**
CO1	**Understanding** the concepts of application of types of disaster preparedness	C(Application)
CO2	**Infer**the end conditions&**Discuss** the failures due to disaster.	C(Analyze)
CO3	**Understanding** of importance of seismic waves occurring globally	C(Analyze)
CO4	**Estimate** Disaster and mitigation problems.	C(Application)
CO5	Keen **knowledge** on essentials of risk reduction	C(Application)

UNIT I	**INTRODUCTION**	**9 hrs**
	Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management–Alternative to dominant approach – disaster – development linkages - Principle of risk partnership	
UNIT II	**APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION**	**9 hrs**
	Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.	
UNIT III	**AWARENESS OF RISK REDUCTION**	**9 hrs**
	Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness	
UNIT IV	**DEVELOPMENT PLANNING ON DISASTER**	**9 hrs**
	Implication of development planning – Financial arrangements – Areas of improvement – Disaster preparedness – Community based disaster management– Emergency response.	
UNIT V	**SEISMICITY**	**9 hrs**
	Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes	
	L -45 hrs Total-45 hrs	

TEXT BOOKS

1 Siddhartha Gautam and K Leelakrisha Rao, “Disaster Management Programmes and Policies”, Vista International Pub House, 2012

2 Arun Kumar, “Global Disaster Management”, SBS Publishers, 2008

REFERENCES

1. Encyclopaedia Of Disaster Management, Neha Publishers & Distributors, 2008
2. Pardeep Sahni, Madhavi malalgoda and ariyabandu, “Disaster risk reduction in south

asia", PHI, 2002
3. Amita sinvhal, "Understanding earthquake disasters" TMH, 2010.
4. Pardeep Sahni, Alka Dhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2000

Table 1: Mapping of COs with Pos

	PO 1	PO 2	PO 3	P O4	PO 5	P O6	P O7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO2
CO1	1					5	2							
CO2	2					1	2					1		
CO3	1					2	2	1				2		
CO4	1					2	2	1				1		
CO5						5	2	3				1		
	5					15	10	5				5		

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

IV SEMESTER

COURSE CODE			COURSE NAME	L	T	P		C
XMT401			THEORY OF EQUATIONS	2	0	0		2
C	P	A		L	T	P	SS	H
2	0	0		2	0	0	2	4

PREREQUISITE: Foundation Course in Mathematics

Course outcomes:	Domain	Level
CO1:Explain Graphical representation of a polynomials, maximum and minimum values of a polynomials.	Cognitive	Remembering Applying
CO2: Apply General properties of equations, Descarte's rule of signs positive and negative rule to find the Relation between the roots and the coefficients of equations.	Cognitive	Remembering Applying
CO3:Define and **Explain**Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets.	Cognitive	Remembering Applying
CO4: Define and Explain with Examples Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.	Cognitive	Understanding Applying
CO5: Solve reciprocal and binomial equations, and to find algebraic solutions of the cubic and biquadratic with Properties of the derived functions.	Cognitive	Understanding

UNIT I	**6**
General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials.	
UNIT II	**6**
General properties of equations, Descarte's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations.	
UNIT III	**6**
Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets.	
UNIT IV	**6**
Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.	
UNIT V	**6**
Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic and biquadratic. Properties of the derived functions.	
LECTURE	**TOTAL**

	30		**30**

TEXTBOOKS

1 W.S. Burnside and A.W. Panton, “The Theory of Equations”, Dublin University Press, 1954.

2. C. C. MacDuffee, “Theory of Equations”, John Wiley & Sons Inc., 1954.

TABLE 1: COs VS POs Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	2	1	1	1	1	1		1
CO 2	3	2	1	1	1	1	1		1
CO 3	3	2	1	1	1	1	1		1
CO 4	3	2	1	1	1	1	1		1
CO 5	3	2	1	1	1	1	1		1
	15	10	5	5	5	5	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT402			INTRODUCTION TO MATLAB	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE: Nil

Course Outcomes:	Domain	Level
CO1: Apply Variables, assignment, statements, expressions, characters, encoding,vectors and matrices.	Cognitive	Applying
CO2: Explain aboutcreating row vectors and column vectors, dimensions in using functions with vectors and matrices.	Cognitive	Understanding Applying
CO3:Apply Matlab Scripts, Input and Output, scripts with input and output, user defined functions in simple applications.	Cognitive	Applying
CO4: Apply Selection Statement, relational expressions,SWITCH statement, menu function, looping, FOR loop, nested FOR loop, WHILE loop.	Cognitive	Applying
CO5: Apply String manipulations, creating string variable, operations on strings, fundamentals of arrays, structure and file operations with simple applications.	Cognitive	Applying

UNIT I	**12**
Introduction to MATLAB – Variables and assignment statements –expressions – characters and encoding – vectors and matrices.	
UNIT II	**12**
Creating row vectors and column vectors – matrix variables – dimensions in using functions with vectors and matrices.	
UNIT III	**12**
MATLAB Programmes – Matlab Scripts, Input and Output, scripts with input and output, Introduction to file input and output – user defined functions – simple applications.	
UNIT IV	**12**
Selection Statement – relational expressions, SWITCH statement, menu function, looping – FOR loop, nested FOR loop, WHILE loop.	
UNIT V	**12**
String manipulations, creating string variable, operations on strings, fundamentals of arrays, structure and file operations- simple applications on the above.	

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXT BOOK

1.Stormy Attaway, “MATLAB - A Practical Approach”, Butterworth-Heinemann Publications, 2009.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE	COURSE NAME	L	T	P	C
XMT403	VECTOR CALCULUS & FOURIER SERIES	4	1	0	5

C	P	A	L	T	P	H
5	0	0	4	1	0	5

PREREQUISITE: **Differential Calculus and Integral Calculus**

Course Outcomes:	Domain	Level
CO1: Find Gradient of a vector, Directional derivative, divergence & curl of a vector, solenoidal & irrigational vector functions, Laplacian double operator and to **solve** simple problems.	Cognitive Psychomotor	Remembering Applying **Guided Response**
CO2: Find vector integration ,tangential line integral, conservative force field, scalar potential, work done by a force, Normal surface integral, Volume integral and to **solve** simple problems.	Cognitive	Remembering Applying
CO3: Use Gauss Divergence Theorem, Stoke's Theorem, green's Theorem and to **solve** Simple problems & Verification of the theorems for simple problems.	Cognitive	Remembering Applying
CO4: Explain Fourier Series expansion of periodic functions with Period 2π Make **Use** of odd &even functions in Fourier Series.	Cognitive	Understanding Applying
CO5: Explain Half-range Fourier cosine Series & sine series, Change of interval & Combination of series.	Cognitive Affective	Understanding Receiving

UNIT I	**15**
Vector differentiation –velocity & acceleration-Vector & scalar fields –Gradient of a vector-Directional derivative – divergence & curl of a vector solenoidal & irrotational vectors – Laplacian double operator –simple problems.	
UNIT II	**15**
Vector integration –Tangential line integral –Conservative force field –scalar potential-Work done by a force - Normal surface integral- Volume integral – simple problems.	
UNIT III	**15**
Gauss Divergence Theorem – Stoke's Theorem- Green's Theorem – Simple problems & Verification of the theorems for simple problems.	
UNIT IV	**15**
Fourier series- definition - Fourier Series expansion of periodic functions with period 2π – Use of odd & even functions in Fourier Series.	
UNIT V	**15**
Half-range Fourier Series – definition- Development in Cosine series & in Sine series - change of interval – Combination of series.	

	LECTURE	TUTORIAL	TOTAL
	60	15	75

TEXT BOOKS

1.M.L. Khanna, “Vector Calculus”, Jai Prakash Nath and Co., 8th Edition, 1986.

2. S. Narayanan, T.K. Manicavachagam Pillai, “Calculus”, Vol. III, S. Viswanathan Pvt Limited and Vijay Nicole Imprints Pvt Ltd, 2004.

UNIT – I - Chapter 1 Section 1 & Chapter 2 Sections 2.3 to 2.6 , 3 , 4 , 5 , 7 of [1]

UNIT – II - Chapter 3 Sections 1 , 2 , 4 of [1]

UNIT – III - Chapter 3 Sections 5 & 6 of [2]

UNIT – IV - Chapter 6 Section 1, 2, 3 of [2]

UNIT – V - Chapter 6 Section 4, 5.1, 5.2, 6, 7 of [2]

REFERENCES

1. P.Duraipandiyan and Lakshmi Duraipandian, “Vector Analysis”, Emarald publishers 1986.

2. Dr. S.Arumugam and prof. A.Thangapandi Issac, “Fourier series”, New Gamma publishing House 2012.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10	0	5	3	0	5	5	5
Total	3	2	0	1	1	0	1	1	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT404			ALGEBRA	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE: Nil

Course outcomes:	Domain	Level
CO1:Define groups, abelian and non-abelian groups with examples and to explain integer under addition and multiplication modulo n.	Cognitive Psychomotor	Remembering **Guided Response**
CO2: Explain Cyclic groups from number systems, complex roots of unity, circle group, the general linear group GLn (n,R), groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions.	Cognitive	Understanding
CO3:Explain Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group.	Cognitive	Understanding
CO4: State and Explain Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups, Quotient groups.	Cognitive	Remembering Understanding
CO5: Define and **Explain** rings, commutative and non-commutative rings with rings from number systems, Zn the ring of integers modulo n, rings of matrices, polynomial rings, and rings of continuous functions.	Cognitive Affective	Remembering Understanding Receiving

UNIT I	**15**
Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n and the group U(n) of units under multiplication modulo n.	
UNIT II	**15**
Cyclic groups from number systems, complex roots of unity, circle group, the general linear group GLn (n,R), groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions.	
UNIT III	
Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group.	
UNIT IV	**15**
Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.	
UNIT V	**15**

Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, Zn the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields: Zp, Q, R, and C. Field of rational functions.

	LECTURE	TUTORIAL	TOTAL
	60	15	75

TEXT BOOKS

1. S. Narayanan& T. K. ManickavasagamPillai, "Algebra", Vol. 1, S. Viswanathan Pvt. Ltd.,
   Chennai, 2004.
2. S. Narayanan& T. K. ManickavasagamPillai, "Algebra", Vol. 2, S. Viswanathan Pvt. Ltd.
   Chennai, 2004.
3. Joseph A Gallian, "Contemporary Abstract Algebra", 4th Ed., Narosa, 1999.
4. George E Andrews, "Number Theory", Hindustan Publishing Corporation, 1984.

REFERENCES

1. John B. Fraleigh, "A First Course in Abstract Algebra", 7th Ed., Pearson, 2002.
2. M. Artin, "Abstract Algebra", 2nd Ed., Pearson, 2011.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10	0	5	3	0	5	5	5
Total	3	2	0	1	1	0	1	1	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT 405			INTRODUCTION TO MATLAB PRACTICAL	0	0	2	2
C	P	A		L	T	P	H
2	0	0		0	0	2	4
PREREQUISITE: Nil							

Course Outcome	Domain	Level
CO1: Apply Variables, assignment, statements, expressions, characters, encoding, vectors and matrices.	Cognitive	Applying
CO2: Explain aboutcreating row vectors and column vectors, dimensions in using functions with vectors and matrices.	Cognitive	Understanding Applying
CO3:Apply Matlab Scripts, Input and Output, scripts with input and output, user defined functions in simple applications.	Cognitive	Applying
CO4: Apply Selection Statement, relational expressions, SWITCH statement, menu function, looping, FOR loop, nested FOR loop, WHILE loop.	Cognitive	Applying
CO5: Apply String manipulations, creating string variable, operations on strings, fundamentals of arrays, structure and file operations with simple applications.	Cognitive	Applying

Assessment Plan for Formative Assessment:

(CIA -1) LabExperiment: No. of Experiments: 15 (30 marks)
1: Aim & Apparatus Required (understanding) (10 marks)
2. Procedure / Programme (applying) (30 marks)
3. Output (Applying) (10 marks)

(CIA Lab 2) (30 marks)
1. Aim & Apparatus Required (10%) Cog (U) CO1, CO2 & CO3 (10 marks)
2. Procedure & programme(30%) Cog (Ap) CO1, CO2 & CO3 (30 marks)
3. Output (10%) Cog (Ap) (10 marks)

(CIA -3) Project FA-(10marks)
1.Aim & Apparatus Required (10%) Cog (U) Psy(3) Aff(1)CO4 (10 marks)
2. Procedure & programme(30%) Cog (Ap) Psy(4) Aff(2)CO4 (30 marks)
3. Output (10%) Cog (Ap) (10 marks)

COURSE CODE			COURSE NAME	L	T	P		C
XMT501			Probability and Statistics	2	0	0		2
C	P	A		L	T	P	SS	H
2	0	0		2	0	0	2	4

PREREQUISITE:Algebra

Course outcomes:	Domain	Level
CO1:Define and Explain Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, and probability mass/density functions.	Cognitive	Remembering Understanding
CO2:Define and Explain Mathematical expectation, moments, moment generating function, characteristic function.	Cognitive	Remembering Understanding
CO3:Define and Explain Discrete distributions: uniform, binomial, Poisson, continuous distributions: uniform, normal, exponential.	Cognitive	Remembering Understanding
CO4: Define and Explain Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions.	Cognitive	Remembering Understanding
CO5: Define and Explain Expectation of function of two random variables, conditional expectations, and independent random variables.	Cognitive	Remembering Understanding

UNIT I	**6**
Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, and probability mass/density functions.	
UNIT II	**6**
Mathematical expectation, moments, moment generating function, characteristic function.	
UNIT III	**6**
Discrete distributions: binomial, Poisson, continuous distributions: uniform, normal, exponential.	
UNIT IV	**6**
Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions.	
UNIT V	**6**
Expectation of function of two random variables, conditional expectations, independent random variables.	

	LECTURE	TOTAL
	30	30

TEXTBOOK

1. S.C.Gupta and Kapoor, “Fundamentals of Mathematical Statistics”, tenth revised edition Sultan Chand and Sons, New Delhi, 2002.

REFERENCES

1. Irwin Miller and Marylees Miller, John E. Freund, “Mathematical Statistics withApplication”, 7th Ed., Pearson Education, Asia, 2006.
2. Sheldon Ross, “Introduction to Probability Model”, 9th Ed., Academic Press, Indian Reprint, 2007.

TABLE 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2	1	1	1	1	1		1
CO 2	3	2	1	1	1	1	1		1
CO 3	3	2	1	1	1	1	1		1
CO 4	3	2	1	1	1	1	1		1
CO 5	3	2	1	1	1	1	1		1
Scaled Value	15	10	5	5	5	5	5	0	5
Total	3	2	1	1	1	1	1	0	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE	COURSE NAME	L	T	P	C
XMT502B	Discrete Mathematics	4	2	0	6

C	P	A	L	T	P	H
6	0	0	4	2	0	6

PREREQUISITE:Logic and Sets

Course Outcomes:	Domain	Level
CO1:Define and Apply truth tables and the rules of propositional and predicate calculus.	Cognitive	Remembering Applying
CO2: Apply the following methods direct proof, indirect proof, and proof by contradiction, and case analysis to formulate short proofs.	Cognitive	Applying
CO3:Solve linear recurrence relation with constant coefficients, non homogeneous recurrence relations and non homogeneous recurrence relations using methods of generating functions.	Cognitive	Applying
CO4: Explain Basic theorems on Boolean Algebra, Duality Principle, Boolean functions.	Cognitive	Understanding
CO5: Apply Boolean algebra, Logic gates and circuits combinatorial circuits, Boolean expression and karnaugh map.	Cognitive	Applying

UNIT I	**18**
Mathematical Logic- Propositional calculus- Basic Logical operators- conditional statements- Bi conditional statement- tautologies- contradictions- equivalence implications.	
UNIT II	**18**
Norms forms- Theory of inference for the statement calculus- The predicate calculus inference theory and predicate calculus.	
UNIT III	**18**
Recurrence relations and generating functions- recurrence relation- solution of linear recurrence relation with constant coefficients- Non homogeneous recurrence relations solution of Non – homogeneous recurrence relations- Methods of generating functions.	
UNIT IV	**18**
Basic theorems on Boolean Algebra- Duality principle Boolean functions.	
UNIT V	**18**
Boolean functions- Applications of Boolean algebra- Logic gates and circuits -combinatorial circuits- Boolean expression – karnaugh map.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOK

1. J.B.Tremblay, R. Manohar, “Discrete Mathematical structures with applications to Computer Science”, Tata McGraw Hill, International edition New Delhi, 1997, Reprint 2007.

REFERENCE

1.M.K. Venkatraman, N.Sridharan & N.Chandrasekaran, “Discrete Mathematics”, The National Publishing company India, 2000.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE	COURSE NAME	L	T	P	C
XMT503A	Numerical Methods	4	2	0	6

C	P	A	L	T	P	H
6	0	0	4	2	0	6

PREREQUISITE: Differential Calculus and Integral Calculus

Course Outcomes:	Domain	Level
CO1:Explain and Solve Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method.	Cognitive	Remembering Applying
CO2: Solve system of linear equations using iterative methods Gauss-Jacobi, Gauss-Seidel and SOR iterative methods.	Cognitive	Remembering Applying
CO3:Explain Lagrange and Newton interpolation: linear and higher order, finite difference operators.	Cognitive	Remembering Applying
CO4: Apply forward difference, backward difference and central Difference to find Numerical differentiation:	Cognitive	Understanding Applying
CO5: Solve Integration using trapezoidal rule, Simpson's rule, and Euler's method.	Cognitive	Understanding

UNIT I	**18**
Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method.	
UNIT II	**18**
Secant method, LU decomposition, Gauss-Jacobi, Gauss-Seidel and SOR iterative methods.	
UNIT III	**18**
Lagrange and Newton interpolation: linear and higher order, finite difference operators.	
UNIT IV	**18**
Numerical differentiation: forward difference, backward difference and central Difference.	
UNIT V	**18**
Integration: trapezoidal rule, Simpson's rule, Euler's method.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOKS

1.B. Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, India, 2007.

2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", 5th Ed., New age International Publisher, India, 2007.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
	15	10	0	5	3	0	5	5	5

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT504A			Linear Algebra	4	2	0	6
C	P	A		L	T	P	H
6	0	0		4	2	0	6

PREREQUISITE:Matrices

COURSE OUTCOMES:	Domain	Level
CO1:Define and **Explain** vector spaces, subspaces, linear transformation, and span of a set with examples.	Cognitive	Remembering Understanding
CO2: Define Linear Independence, Basis and Dimension and to **find**Rank and Nullity.	Cognitive	Remembering
CO3:Explain matrix of a linear transformation ,Inner product space and to **Define** with examplesorthogonality, Gram Schmidt orthogonalisation process and orthogonal complement.	Cognitive	Remembering Understanding
CO4: Define Algebra of Matrices, Types of Matrices and to find the inverse of a matrix and Rank of a matrix.	Cognitive	Remembering
CO5: Explain Characteristic equation and Cayley -Hamilton theorem and to **find** Eigen values and Eigen vectors.	Cognitive	Remembering Understanding

UNIT I Vector Spaces	18
Vector spaces – Definition and examples – Subspaces-linear transformation – Span of a set.	
UNIT II Basis and Dimension	**18**
Linear Independence – Basis and Dimension –Rank and Nullity.	
UNIT III : Matrix and Inner Product Space	**18**
Matrix of a linear transformation -Inner product space – Definition and examples – Orthogonality – Gram Schmidt orthogonalisation process – Orthogonal Complement.	
UNIT IV : Theory of Matrices	**18**
Algebra of Matrices - Types of Matrices – The Inverse of a Matrix – Elementary Transformations – Rank of a matrix.	
UNIT V: Characteristic equation and Bilinear forms	**18**
Characteristic equation and Cayley -Hamilton theorem – Eigen values and Eigen vectors	

LECTURE	TUTORIAL	TOTAL
60	**30**	**90**

TEXT BOOK

1. Arumugam S and Thangapandi Isaac A, "Modern Algebra", SciTech Publications (India) Ltd., Chennai, Edition 2012.

Unit1: Chapter 5, Sec 5.1 to 5.4

Unit2: Chapter 5, Sec 5.5 to 5.7 Unit3: Chapter 5,Sec 5.8, Chapter 6, Sec 6.1 to 6.3 Unit4: Chapter 7 Sec 7.1 to 7.5 Unit5: Chapter 7, Sec 7.7, 7.8
REFERENCE
1. I. N. Herstein, “Topics in Algebra”, Second Edition, John Wiley & Sons (Asia), 1975.

Table 1: COs VS POs Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10		5	3		5	5	5
Total	3	2		1	1		1	1	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

VI SEMESTER

COURSE CODE			COURSE NAME	L	T	P		C
XMT601			Graph Theory	2	0	0		2
C	P	A		L	T	P	SS	H
2	0	0		2	0	0	2	4

PREREQUISITE: Matrices

Course outcomes:	Domain	Level
CO1:Define andExplain The Konigsberg Bridge Problem, Graphs and subgraphs, Degrees, Subgraphs , Isomorphism. , independent sets and coverings.	Cognitive	Remembering Applying
CO2: Define and Explain Matrices, Operations on Graphs, Walks, Trails and Paths, Connectedness and Components and Eulerian Graphs.	Cognitive	Remembering Applying
CO3:Define and Explain Hamiltonian Graphs, Characterization of Trees and Centre of a Tree.	Cognitive	Remembering Applying
CO4: Define and Explain Planarity, Properties and Characterization of Planar Graphs.	Cognitive	Understanding Applying
CO5: Define and Explain Directed Graphs, Basic Properties,Some Applications, Connector Problem , Kruskal's algorithm , Shortest Path Problem and Dijkstra's algorithm.	Cognitive	Understanding

UNIT I	**6**
Introduction - The Konigsberg Bridge Problem - Graphs and subgraphs: Definition and Examples - Degrees - Subgraphs – Isomorphism. –independent sets and coverings.	
UNIT II	**6**
Matrices - Operations on Graphs - Walks, Trails and Paths – Connectedness and Components - Eulerian Graphs.	
UNIT III	**6**
Hamiltonian Graphs (Omit Chavatal Theorem) - Characterization of Trees - Centre of a Tree.	
UNIT IV	**6**
Planarity: Introduction - Definition and Properties - Characterization of Planar Graphs.	
UNIT V:	**6**
Directed Graphs: Introduction - Definitions and Basic Properties – Some Applications: Connector Problem - Kruskal's algorithm - Shortest Path Problem – Dijkstra's algorithm.	

LECTURE		**TOTAL**
30		**30**

TEXT BOOK

1. S. Arumugam and S. Ramachandran, “Invitation to Graph Theory”, SciTech Publications (India) Pvt. Ltd., Chennai, 2006.

Unit-I Chapter-1 Sec 1.0, 1.1 and Chapter -2 Sec 2.0, 2.1, 2.2, 2.3, 2.4.2.6

Unit-II Chapter-2 Sec 2.8,2.9 ,Chapter-4 Sec 4.1,4.2 and Chapter-5 Sec 5.0,,5.1

Unit-III Chapter-5 Sec 5.2, Chapter-6 Sec 6.0, 6.1, 6.2.

Unit-IV Chapter-8 Sec 8.0, 8.1, 8.2.

Unit-V Chapter-10 Sec 10.0, 10.1 Chapter-11 Sec 11.0, 11.1, 11.2

REFERENCES

1. Narsingh Deo, “Graph Theory with applications to Engineering and Computer Science”, Prentice Hall of India, 2004.
2. Gary Chartrand and Ping Zhang, “Introduction to Graph Theory”, Tata McGraw-Hill Edition, 2004.

Table 1: CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10	0	5	3	0	5	5	5
Total	3	2		1	1		1	1	1

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT602A			Complex Analysis	4	2	0	6
C	P	A		L	T	P	H
6	0	0		4	2	0	6

PREREQUISITE: Differential Calculus and Integral Calculus

Course outcomes:	Domain	Level
CO1:Use CR Equations in cartesian and polar co-ordinates to find analytic function and to **Explain** Harmonic function Properties and applications.	Cognitive	Understanding Applying
CO2: Explain Conformal mappings - Linear and Non-linear transformations and to **Apply** cross ratio to constructBilinear transformations.	Cognitive	Understanding Applying
CO3:Solve the integral using cauchy's integral theorem, cauchy's integral formula and to **Explain** Liouville's theorem , Maximum modulus theorem and to apply them in simple problems.	Cognitive	Understanding Applying
CO4: Using Taylors series and laurent's seriesExpansion of functions in Power series and to explain types of singularities.	Cognitive	Applying
CO5: Apply Cauchy residue theorem to **Solve** Integration of functions of the type involving cosx, sinx.	Cognitive	Applying

UNIT I : Analytic Functions	**18**
Analytic function - Cauchy Riemann Equation in Cartesian and polar co-ordinates - Harmonic function Properties and applications.	
UNIT II : Conformal Mappings and Transformations	**18**
Conformal mappings - Linear and Non-linear transformations – Bilinear transformations - Properties and applications	
UNIT III : Complex Integration	**18**
Integration in the Complex plane - Cauchy's Integral theorem - Cauchy's Integral formula - Liouville's theorem - Maximum modulus theorem - Applications and simple problems.	
UNIT IV : Complex Differentiation	**18**
Taylor's and Laurent's series - Expansion of functions in power series - Singular points - Types of singularities - Properties of singularities - Identification of singularities.	
UNIT V: Calculus of Residues	**18**
Calculus of Residues: Residue theorem - Integration of functions of the type involving cosx, sinx- Applications and problems relating to residues.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOK

1. S. Narayanan & T.K. ManickavasagamPillai, “Complex Analysis”, S. Viswanathan Publishers, Chennai, 1997.

Unit 1: Chapter 1

Unit 2: Chapter 2

Unit 3: Chapter 3

Unit 4: Chapter 4

Unit 5: Chapter 5

REFERENCES

1. S. Arumugam, A. Thangapandi Isaac& A. Somasundaram, “Complex Analysis”, SciTech Publications, India, Pvt. Ltd., 2004.
2. S. Ponnusamy, “Foundations of Complex Analysis”, 2ndEdition, Narosa Publication, New Delhi, 2005.
3. R. V. Churchill & J.W.Brown, “Complex variables and applications”, 5thEdition, McGraw Hill, Singapore, 1990.

Table 1: CO Vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10	0	5	3	0	5	5	5
Total	3	2		1	1		1	1	1

$1 – 5 \rightarrow 1$, $6 – 10 \rightarrow 2$, $11 – 15 \rightarrow 3$

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			COURSE NAME	L	T	P	C
XMT603A			LINEAR PROGRAMMING	4	2	0	6
C	P	A		L	T	P	H
5	0.5	0.5		4	2	0	6

PREREQUISITE: NIL

Course outcomes:	Domain	Level
CO1: Find Graphical Solution, **Solve** LPP using Simplex Method, Big Method and Two Phase Method.	Cognitive	Remembering Applying
CO2: Solve Linear Programming problem Formulation of Primal Dual Pairs, Duality and Simplex Method.	Cognitive Psychomotor	Applying Guided Response
CO3:Solve Transportation Problems, finding initial basic feasible solution using North West Corner Rule and Vogel's approximation method , **Solve** unbalanced Transportation Problems, Assignment Problems and Routing Problems.	Cognitive	Applying
CO4: Solve Sequencing Problems, Problems with 'n' jobs and 'k' machines, Problems with 'n' jobs and 2 machines, Problems with 2 jobs and k machines and Problems with 2 jobs and 3 machines.	Cognitive Affective	Applying Receiving
CO 5: Solve Game Theory problems Two persons Zero sum games , maximin and minimax principle, Games without saddle points , Mixed strategies, using Graphical method and Dominance property.	Cognitive	Applying

UNIT I	**18**
Introduction to convex sets - Mathematical Formulation of LPP - Graphical Solution - Simplex Method – Big M Method - Two Phase Method.	
UNIT II	**18**
Duality in Linear Programming: Formulation of Primal - Dual Pairs - Duality and Simplex Method - Dual Simplex Method	
UNIT III	**18**
Transportation Problems: Mathematical formulation of the problem - finding initial basic feasible solution using North West Corner Rule and Vogel's approximation method - Moving towards Optimality - Unbalanced Transportation Problems. Assignment Problems: Mathematical formulation of Assignment Problems - Assignment algorithm – Routing Problems.	
UNIT IV	**18**
Sequencing Problems: Problems with 'n' jobs and 'k' machines - Problems with 'n' jobs and 2 machines- Problems with 2 jobs and k machines - Problems with 2 jobs and 3 machines.	
UNIT V	**18**
Game Theory: Two persons Zero sum games - maximin and minimax principle - Games without saddle points - Mixed strategies - Graphical method - Dominance property.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOK

1. KantiSwarup, P. K. Gupta& Man Mohan, "Operations Research", Sultan Chand& Sons, New Delhi, Twelfth Revised Edition, 2005.

Unit 1: chapter 2: 2.1, 2.2, chapter 3: 3.2, chapter 4; 4.1, 4.4.

Unit 2: chapter 5: 5.2, 5.3, 5.7, 5.9.

Unit 3: Chapter 10: 10.2, 10.9, 10.14, Chapter 11: 11.2, 11.3.

Unit 4: Chapter 12: 12.1 – 12.6.

Unit 5: Chapter 17: 17.1 – 17.7.

REFERENCES

1. P. K. Gupta & D. S. Hira, "Operations Research", S. Chand &Company Ltd., New Delhi, 2002.
2. J. K. Sharma, "Operations Research theory and its applications", 2nd Edition, Macmillan, New Delhi, 2006.
3. R. Panneerselvam, "Operations Research", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Scaled Value	15	10	0	5	3	0	5	5	5
Total	3	2		1	1		1	1	1

$1 – 5 \rightarrow 1$, $6 – 10 \rightarrow 2$, $11 – 15 \rightarrow 3$

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

M.SC (MATHEMATICS)
I SEMESTER

COURSE NAME			**ALGEBRA - I**	**L**	**T**	**P**	**C**
COURSE CODE			**YMA101**	**4**	**1**	**0**	**5**
C	**P**	**A**		**L**	**T**	**P**	**H**
5	**0**	**0**		**4**	**1**	**0**	**5**

PREREQUISITE Basics of sets, relations and functions

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

	COURSE OUTCOMES	**DOMAIN**	**LEVEL**
CO 1	**Construct**Cayley table for the given symmetric group of degree 2 and 3	Cognitive	Applying
CO 2	**Extend** group structure to finite permutation groups	Cognitive	Understanding
CO 3	**Classify** groups of finite order upto 120 using Sylow's theorems	Cognitive	Analyzing
CO 4	**Identify** the quotient field of the given integral domain	Cognitive	Applying
CO 5	**Categorize** the factorization of polynomials over a field	Cognitive	Analyzing

UNIT 1	**15 hours**

Binary Operations – Groups - Subgroups – Permutations I – Permutations II – Cyclic Groups

UNIT 2	**15 hours**

Isomorphisms – Direct Products – Finitely Generated Abelian groups - Groups of Cosets - Normal subgroups and factor groups- Homomorphisms

UNIT 3	**15 hours**

Series of Groups – Isomorphism theorems- Proof of the Jordan Holder theorem—Group action on a set- Applications of G-sets to counting - Sylow's theorems –ApplicationsofSylow theorems

UNIT 4	**15 hours**

Rings – Integral Domains - Some non-commutative examples –The Field of quotients – Quotient rings and Ideal.

UNIT 5	**15 hours**

Homomorphism of Rings – Rings of polynomials – Factorization of Polynomialsoverafield – Euclideandomains-Gaussian integers and norms

LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**

TEXT BOOK

1. John B. Fraleigh, A First Course in Abstract Algebra, Narosa Publishing House, Third edition, 1992.

UNIT – I Chapter 1, 2, 3,4,5,6

UNIT – II Chapter 7,8,9,11,12,13

UNIT – III Chapter 14,15,16,17,18,19

UNIT – IV Chapter 23,24,25,26,27,28

UNIT – V Chapter 29,30,31,33,34

REFERENCES

1.P.B. Bhattacharya et al., Basic Abstract Algebra, 2nd edition, Cambridge University Press, 1995

2.I.N.Herstein, Topics in Algebra, John Wiley, 2nd Edition, 1975.

3.R. Solomon, Abstract Algebra, AMS Indian edition, 2010.

CO Vs PO

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	1	3	1	1	1	1
CO 4	3	3	3	1	3	1	1	1	1
CO 5	3	3	3	1	3	1	1	1	1
TOTAL	**15**	**15**	**14**	**6**	**15**	**5**	**4**	1	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	1	**1**	1	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			REAL ANALYSIS - I	L	T	P	C
COURSE CODE			YMA102	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basic concepts of real numbers

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the concepts of real number system and its algebraic properties	Cognitive	Understanding
CO 2	**Explain** the concepts of metric space and its properties	Cognitive	Understanding
CO 3	**Apply** convergence sequence in metric space	Cognitive	Applying
CO 4	**Classify** the characterization of compact metric space geometrically	Cognitive	Analyzing
CO 5	**Utilize** the Banach contraction principle in formulating and solving given problems	Cognitive	Applying

UNIT 1		15 hours

Sets and Functions, Mathematical Induction, Finite and Infinite sets. Real Number system: Algebraic and Order properties: Infimum, Supremum, LUB Axiom. Countable and uncountable sets.

UNIT 2		15 hours

Metric spaces – Definition and examples - open balls and open sets

UNIT 3		15 hours

Sequences and Series of real numbers – limit theorems – monotone sequences – Cauchy criterion – limsup, liminf - Convergent sequences in metric spaces – limit and cluster points – Cauchy sequences – Bounded sets – Dense sets.

UNIT 4		15 hours

Continuous functions – Equivalent Definitions of Continuity – Uniform Continuity - Limit of a function – Discontinuities of a Real Valued function - Compact spaces and their properties – Continuous functions on Compact spaces- Characterization of Compact Metric spaces.

UNIT 5		15 hours

Connectedness: Connected spaces – Complete metric spaces – Examples- BaireCategory Theorem – Banach Contraction Principle.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOKS

1. R.G. Bartle and D.R. Sherbert,Introduction to Real Analysis 3rdEdn,John Wiley &Sons, 2000.

2. S.Kumaresan,Topologyof MetricSpaces,NarosaPublishingHouse,New Delhi,2005.

UNIT–I- Chapters 1 and 2from [1]

UNIT–II - Chapter1from [2]

UNIT–III-Chapter3from [1]andChapter2sections 2.1to2.5 from[2]

UNIT–IV-Chapter3, Chapter4from[2](sections3.3and 3.6omitted)and Chapter5 from [1]

UNIT-V-Chapter 5section5.1andChapter 6sections 6.1,6.3and6.4(section6.2,6.3.16 and6.3.17 omitted)from [2]

REFERENCES

1. EdwardD.Gaughan,IntroductiontoAnalysis,AMS,Indianedition,2010.
2. KennethA. Ross,ElementaryAnalysis:TheTheoryofCalculus,Springer Verlag,2004.
3. WalterRudin,PrinciplesofMathematicalAnalysis,ThirdEdition,McGrawHill,1976.

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**13**	**9**	**15**	**5**	**4**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			GRAPH THEORY	L	T	P	C
COURSE CODE			YMA103	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basic concepts of Graphs

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain**basic concepts of **graphs**	Cognitive	Understanding
CO 2	**Explain** vertex connectivity and edge connectivity in graphs	Cognitive	Understanding
CO 3	**Explain**Eulerian Graphs and Hamiltonian Graphs	Cognitive	Understanding
CO 4	**Apply** coloring principle for solving problems in Vertex colorings and Edge coloring	Cognitive	Applying
CO 5	**Demonstrate** planar graphs	Cognitive	Understanding

UNIT 1	Basic Results	15 hours

Basic Concepts - Subgraphs - Degrees of Vertices - Paths and ConnectednessOperations on Graphs - Directed Graphs: Basic Concepts - Tournaments.

UNIT 2	Connectivity	15 hours

Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, Trees:Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula.

UNIT 3	Independent Sets and Matchings	15 hours

Vertex Independent Sets and Vertex Coverings - Edge Independent Sets -Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs.

UNIT 4	Graph Colourings	15 hours

Vertex Colouring - Critical Graphs - Triangle - Free Graphs - Edge Colourings of Graphs - Chromatic Polynomials.

UNIT 5	Planarity	15 hours

Planar and Nonplanar Graphs - Euler Formula and its Consequences - K5 and K3,3 are Nonplanar Graphs - Dual of a Plane Graph - The Four-Colour Theorem and the Heawood Five-Colour Theorem- Kuratowski's Theorem.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.Douglas B. West, "Introduction to Graph Theory", Prentice Hall of India, Second Edition, 2002.

REFERENCES

1. Bondy J. A, and Murty U. S. R., "Graph Theory", Springer, 2008.

2. Balakrishnan R. and Ranganathan K., "A textbook of Graph Theory", Springer, 2012.
3. Graham R.L., Rothschild B.L and Spencer J.H., "Ramsey Theory", Wiley Publishers, Second Edition, 1990.
4. Biggs N., "Algebraic Graph Theory", Cambridge Tracts in Mathematics 67, Cambridge University Press, 1994. MX8003 Algebraic Theory of Semigroups.

COs VS POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**12**	**7**	**15**	**5**	**2**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			ORDINARY DIFFERENTIAL EQUATIONS	L	T	P	C
COURSE CODE			YMA104	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Knowledge in differentiation				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Utilize** the theory of power series when solving second order differential equations	Cognitive	Applying
CO 2	**Solve** the problems arises in mathematical physics using properties of Bessel functions	Cognitive	Applying
CO 3	**Apply** Picard's theorem for calculating exact solution for a given initial value problem	Cognitive	Applying
CO 4	**Examine** the classical vibrating string problem through eigenvalues and eigenfunctions with given boundary conditions	Cognitive	Analyzing
CO 5	**Identify** critical points and phase portrait of nonlinear equations	Cognitive	Applying

UNIT 1		15 hours

The general solution of the homogeneous equation – The use of one known solution to find another – The method of variation of parameters – Power Series solutions. A review of power series – Series solutions of first order equations – Second order linear equations; Ordinary points.

UNIT 2		15 hours

Regular Singular Points – Gauss's hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

UNIT 3		15 hours

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.

UNIT 4		15 hours

Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions– Sturm Comparison Theorems – Eigenvalues, Eigenfunctions and the Vibrating String.

UNIT 5		15 hours

Nonlinearequations:AutonomousSystems;thephaseplaneanditsphenomena–Types of criticalpoints;Stability – critical points and stability for linear systems – StabilitybyLiapunov's direct method – Simple critical pointsof nonlinear systems.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.G.F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 1974.

UNIT – I -Chapter 3: Sections 15, 16, 19 and Chapter 5: Sections 25 to 27

UNIT – II -Chapter 5: Sections 28 to 31 and Chapter 6: Sections 32 to 35

UNIT – III -Chapter 7: Sections 37, 38 and Chapter 11: Sections 55, 56

UNIT – IV -Chapter 4: Sections 22 to 24

UNIT – V -Chapter 8: Sections 40 to 44

REFERENCES

1. M.E. Taylor, Introduction to Differential Equations, AMS Indian Edition, 2011.
2. M. Braun, Differential Equations and Their Applications, Springer, 1992.
3. E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill, 1955.

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	15	15	15	11	15	5	6	5	5
SCALED VALUE	3	3	3	3	3	1	2	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			OPTIMIZATION TECHNIQUES	L	T	P	C
COURSE CODE			YMA105	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Probability and random process

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the systematic way of approaching a decision theory to get desired outcome of where the possibility of occurrence of different outcomes are evaluated in advance.	Cognitive	Understanding
CO 2	**Solve** the abilities in project evaluation techniques using PERT, CPM	Cognitive	Applying
CO 3	**Explain** the dynamics of inventory management's principles, concepts, and techniques	Cognitive	Understanding
CO 4	**Solve** fourth order polynomial function using Newton Raphson Method	Cognitive	Applying
CO 5	**Apply**the direct search method and gradient method for obtaining optimal solutions for the given function	Cognitive	Applying

UNIT 1	DECISION THEORY	15 hours

Steps in Decision theory Approach - Types of Decision-Making Environments - Decision Making Under Uncertainty - Decision Making under Risk - Posterior Probabilities and Bayesian Analysis - Decision Tree Analysis - Decision Making with Utilities

UNIT 2	PROJECT MANAGEMENT: PERT AND CPM	15 hours

Basic Differences between PERT and CPM - Steps in PERT/CPM Techniques - PERT/CPM Network Components and Precedence Relationships - Critical Path Analysis - Probability in PERT Analysis - Project time-cost Trade Off - Updating the Project - Resource Allocation

UNIT 3	DETERMINISTIC INVENTORY CONTROLMODELS	15 hours

Meaning of Inventory Control - Functional Classification - Advantage of Carrying Inventory - Features of Inventory System - Inventory Model building - Deterministic Inventory Models with no shortage - Deterministic Inventory with ShortagesProbabilistic Inventory Control Models:Single Period Probabilistic Models without Setup cost - Single Period Probabilities Model with Setup cost.

UNIT 4	Classical Optimization Theory	15 hours

Unconstrained Problems-Necessary and Sufficient Conditions- The Newton-Raphson Method- Constrained Problems- Equality Constraints- Inequality Constraints.

UNIT 5	Nonlinear Programming Algorithms	15 hours

Unconstrained Algorithms- Direct Search Method- Gradient Method- Constrained Algorithms- Quadratic Programming- Chance-Constrained Programming

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.J.K.Sharma, "Operations Research Theory and Applications", Third Edition, Macmillan India Ltd., 2007

Unit I - Chapter-11 (Section 11.1 - 11.8)

Unit II - Chapter-13 (Section 13.1 - 13.9)

Unit III - Chapter-14 (Section 14.1 - 14.8); Chapter-15: (Section15.1 - 15.4)

2.Hamdy A Taha, Operations Research: An Introduction, Eighth Edition, University of Arkansas, Fayetteville, PEARSON Prentice Hall. © 2007 by Pearson Education, Inc.

Unit IV-Chapter 18 – Section 18.1.1, 18.1.2, 18.2.1, 18.2.2

Unit V-Chapter 19 – Section 19.1.1, 19.1.2, 19.2.2 and 19.2.3

REFERENCES

1. HillierF.S. andJ.Lieberman, "Introduction to Operations Research" (8th Edition), Tata McGraw Hill Publishing Company, New Delhi, 2006.
2. Beightler. C, D.Phillips, B. Wilde, "Foundations of Optimization" (2nd Edition) Prentice Hall Pvt Ltd., New York,1979
3. Bazaraa, M.S; J.J.Jarvis, H.D.Sharall, "Linear Programming and Network flow", John Wiley and sons, New York,1990.
4. Gross, D and C.M.Harris, "Fundamentals of Queueing Theory", (3rd Edition), Wiley andSons, New York, 1998.
5. Hamdy A. Taha, "Operations Research" (sixth edition), Prentice - Hall of India PrivateLimited, New Delhi.2007

COs VS POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**11**	**6**	**15**	**5**	**1**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			FUZZY SETS AND FUZZY LOGIC	L	T	P	C
COURSE CODE			YMA1E1	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE	Basic concepts of sets

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Compare** the relationship between Crisp sets and Fuzzy sets	Cognitive	Applying
CO 2	**Explain** operation on Fuzzy Sets	Cognitive	Understanding
CO 3	**Compare** Fuzzy Relations and crisp relations	Cognitive	Applying
CO 4	**Demonstrate** the propositional calculus	Cognitive	Understanding
CO 5	**Explain** the concepts of fuzzy logic	Cognitive	Understanding

UNIT 1	Crisp Sets and Fuzzy Sets	9 hours

Crisp sets basic definitions - the notion of fuzzy sets - basic concepts of fuzzy sets

UNIT 2	Operation on FuzzySets	9 hours

Fuzzy complement - fuzzy union - fuzzy intersection - combination and general aggregation operations

UNIT 3	Fuzzy Relations	9 hours

Crisp and fuzzy relations - binary relation - equivalence and similarity relations - tolerance relations- orderings

UNIT 4	Classical Logic	9 hours

Tautologies - contradictions - equivalence - exclusive OR and exclusive NOR - logical proofs

UNIT 5	Fuzzy Logic	9hours

Fuzzy logic - approximate reasoning - fuzzy tautologies - contradictions - equivalence and logical proofs

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

1. George J. Klir& Tina A. Folger, “Fuzzy Sets, Uncertainty, and Information”, Prentice Hall of India Pvt. Ltd., New Delhi, 1988
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, 3rd edition, McGraw-Hill. Inc, 2010.

REFERENCES

1. Zimmermann. H.J, “Fuzzy Set Theory and Its Applications”, 4th edition, Springer, Netherlands,2015.
2. Bart Kosko, “Neural Networks and Fuzzy Systems”, Prentice-Hall International,1992.

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**12**	**7**	**15**	**5**	**2**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			CODING THEORY	L	T	P	C
COURSE CODE			YMA1E2	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Linear algebra				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Utilize** the maximum likelihood decoding rule to decode the received words	Cognitive	Applying
CO 2	**Identify** a generator matrix and parity check matrix for the given binary linear code	Cognitive	Applying
CO 3	**Explain** various bounds involved in coding theory	Cognitive	Understanding
CO 4	**Construct** the generator polynomial for all binary cyclic codes of given length	Cognitive	Applying
CO 5	**Examine** the decoding of narrow-sense binary BCH codes	Cognitive	Analyzing

UNIT 1	9hours

Error detection, Correction and decoding: Communication channels – Maximum likelihood decoding – Hamming distance – Nearest neighborhood minimum distanced coding – Distance of a code

UNIT 2	9hours

Linear codes: Linear codes – Self orthogonal codes – Self dual codes – Bases forlinear codes – Generator matrix and parity check matrix – Encoding with a linear code – Decoding of linear codes – Syndrome decoding.

UNIT 3	9 hours

Bounds in coding theory: The main coding theory problem – lower bounds -Sphere covering bound – Gilbert Varshamov bound – Binary Hamming codes – q-ary Hamming codes – Golay codes – Singleton bound and MDS codes – Plotkin bound

UNIT 4	9 hours

Cyclic codes: Definitions – Generator polynomials – Generator matrix and parity check matrix – Decoding of Cyclic codes.

UNIT 5	9 hours

Special cyclic codes: BCH codes – Parameters of BCH codes – Decoding of BCHcodes – Reed Solomon codes.

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOK

1.San Ling and Chaoping Xing, Coding Theory: A First Course, Cambridge University Press, 2004.

Unit 1: Sections 2.1, 2.2, 2.3, 2.4, 2.5

Unit 2: Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8

Unit 3: Sections 5.1, 5.2, 5.3, 5.4, 5.5,

Unit 4: Sections 7.1, 7.2, 7.3, 7.

Unit 5: Sections 8.1, 8.2

REFERENCES

1. S. Lin &D. J. Costello, Jr., Error Control Coding: Fundamentals andApplications, Prentice-Hall, Inc., New Jersey,1983.
2. Vera Pless, Introduction to the Theory of Error Correcting Codes, Wiley, NewYork, 1982.
3. E. R Berlekamp, Algebraic Coding Theory, Mc Graw-Hill,1968.
4. H. Hill, A First Course in Coding Theory, OUP,1986

COs VS POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	15	15	14	10	15	5	6	5	5
SCALED VALUE	3	3	3	2	3	1	2	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			NEURAL NETWORKS	L	T	P	C
COURSE CODE			YMA1E3	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Linear algebra				

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

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Summarize** different neuron network models	Cognitive	Understanding
CO 2	**Explain** Perceptron Architectures and Learning Rules	Cognitive	Understanding
CO 3	**Apply**Hebb rule for finding the appropriate weight matrix for the given linear associator	Cognitive	Applying
CO 4	**Construct** back propagation algorithm for the given network	Cognitive	Applying
CO 5	**Identify** the second order Taylor series expansions for the given function about the two minima	Cognitive	Applying

UNIT 1	Neuron Model and Network Architectures	9 hours

Mathematical Neuron Model- Network Architectures- Perceptron-Hamming Network- Hopfield Network-Learning Rules.

UNIT 2	Perceptron Architectures	9 hours

Perceptron Architectures and Learning Rule with Proof of Convergence. Supervised Hebbian Learning - Linear Associator.

UNIT 3	Supervised Hebbian Learning	9 hours

The Hebb Rule-Pseudo inverse Rule-Variations of Hebbian Learning-Back Propagation - Multilayer Perceptron

UNIT 4	Back Propagation	9 hours

Back propagation Algorithm-Convergence and Generalization - Performances Surfaces and Optimum Points-Taylor series.

UNIT 5	PerformanceSurfacesandPerformanceOptimizations	9 hours

Directional Derivatives - Minima-Necessary Conditions for Optimality-Quadratic Functions-Performance Optimizations-Steepest Descent-Newton's Method-Conjugate Gradient.

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOK

1.Martin T. Hagan, Howard B. Demuth and Mark Beale, Neural Network Design, Vikas Publishing House, New Delhi,2002.

REFERENCES

1. James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications and Programming Techniques, Pearson Education, 2003.
2. Robert J. Schalkoff, Artificial Neural Network, McGraw-Hill International Edition, 1997.

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**13**	**8**	**15**	**5**	**3**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			ALGEBRA - II	L	T	P	C
COURSE CODE			YMA201	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	YMA101

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the concepts of prime ideal and Maximal ideal	Cognitive	Understanding
CO 2	**Explain** the concepts of splitting fields	Cognitive	Understanding
CO 3	**Explain** the proof solvability by radicals	Cognitive	Understanding
CO 4	**Explain** the concepts of Galois's Extensions	Cognitive	Understanding
CO 5	**Explain** the proof of fundamental theorem of Galois's Theory	Cognitive	Understanding

UNIT 1		15 hours
Prime ideals and Maximal Ideals, Irreducible polynomials.		
UNIT 2		**15 hours**
Classical Formulas, Splitting Fields		
UNIT 3		**15 hours**
The Galois Group, Roots of Unity, Solvability by Radicals.		
UNIT 4		**15 hours**
Independence of Characters, Galois Extensions		
UNIT 5		**15hours**
The Fundamental theorem of Galois theory, Applications, Galois Great Theorem.		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.Joseph Rotman, Galois Theory, 2nd edition, Springer Verlag, 1990.

UNIT – I Pages 31 - 43

UNIT – II Pages 44 -58

UNIT – III Pages 59 - 75

UNIT – IV Pages 76-82

UNIT – V Pages 83-95

REFERENCES

1. DavidS. DummitandRichardM.Foote,AbstractAlgebra,2nd Edition,Wiley StudentEdition, 2008.
2. SergeLang. Algebra-Revisedthird edition-Springer–Verlag-2002.
3. IanStewart,GaloisTheory,ChapmanandHall,1973

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**15**	**5**	**15**	**5**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**1**	**3**	**1**	**0**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			REAL ANALYSIS - II	L	T	P	C
COURSE CODE			YMA202	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basic concepts of convergence and uniform convergence

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** mean value theorem and functions of bounded variations	Cognitive	Understanding
CO 2	**Compare** mean value theorems for Riemann Stieltjes Integrals	Cognitive	Applying
CO 3	**Explain** uniform convergence and integration and differentiation	Cognitive	Understanding
CO 4	**Explain** directional derivatives and total derivative	Cognitive	Understanding
CO 5	**Explain** Inverse function theorem and Implicit function theorem	Cognitive	Understanding

UNIT 1		15 hours

Differentiation of single variable: Derivatives – The chain rule – local extrema – Rolle's theorem – Mean Value Theorem – Taylor's formula – Derivatives of vector – valued functions – Functions of Bounded variation and rectifiable curves – Total variation – Functions of bounded variation – Equivalence of paths – Change of parameter.

UNIT 2		15 hours

Riemann – Stieltjesintegral:Definition –linearpropertiesoftheintegral– Necessary conditions for the existence -First fundamental theorem of Integral calculus -Mean Value Theorem for integrals – Second fundamental theorem of Integral calculus-Change of variable in a Riemann integral – Second Mean value Theorem for Riemannintegrals.

UNIT 3		15 hours

Sequence and series of functions–Pointwise convergence–Uniform convergence–Uniformconvergence and integration–Uniform convergence and Differentiation– Sufficient conditions for uniform convergence of a series.

UNIT 4		15 hours

Functions of Several variables – Directional derivative –Total derivative – Jacobian – Chain rule –Mean Value Theorem – Taylor's formula.

UNIT 5		15hours

Inverse function theorem – Implicit function theorem – Extremum problems with side conditions.							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**

TEXT BOOK

TomM.Apostol, Mathematical Analysis Second Edition, Narosa Publishing House,NewDelhi,1985.
UNIT–I-Chapter5 and 6
UNIT–II-Chapter7Section 7.1-7.22
UNIT–III- Chapter 9Section 9.1 - 9.11 and 9.14 -9.18
UNIT–IV-Chapter12
UNIT–V-Chapter13

REFERENCES

1. WalterRudin,PrinciplesofMathematicalAnalysis,ThirdEdition,McGrawHill,1976.
2. TomApostol,CalculusII,McGrawHill,1983.

COs VS POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	15	15	11	6	15	5	1	5	5
SCALED VALUE	3	3	2	2	3	1	1	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
COURSE CODE			YMA203	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Knowledge in Undergraduate differential equations

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Summarize** the first order partial differential equations	Cognitive	Understanding
CO 2	**Analyze**the different methods of Partial Differential Equations of the Second Order	Cognitive	Analyzing
CO 3	**Apply**the method of variable separable for solving Laplace Equation	Cognitive	Applying
CO 4	**Apply**the partial differential equations for obtaining general solutions of wave equation	Cognitive	Applying
CO 5	**Utilize** Green's Function for finding solutions of diffusion equation	Cognitive	Applying

UNIT 1	Partial Differential Equations of the First Order	15 hours

PartialDifferentialEquations–OriginsofFirstOrderDifferentialEquations–Cauchy'sProblem for first order equations– Linear Equations of the first order– Nonlinear partialdifferential equations of the first order – Cauchy's method of characteristics – Compatiblesystemof Firstorder Equations–Solutions satisfying given Condition- Jacobi's method.

UNIT 2	Partial Differential Equations of the Second Order	15 hours

The Origin of Second Order Equations – Linear partial Differential Equations with constantcoefficients – Equations with variable coefficients – Separation of variables – The method ofIntegralTransforms– Non – linearequations of thesecond order.

UNIT 3	Laplace's Equation	15 hours

Elementary solutions of Laplace equation – Families of Equipotential Surfaces – Boundary value problems – Separation of variables – Surface Boundary Value Problems – Separation ofVariables – Problems with Axial Symmetry – The Theory of Green's Function for Laplace Equation.

UNIT 4	The Wave Equation	15 hours

TheOccurrenceofthewaveequationinPhysics–ElementarySolutionsoftheOne–dimensional Wave equations – Vibrating membrane, Application of the calculus of variations –Three-dimensional problem– General solutions of the Waveequation

UNIT 5	The Diffusion Equation	15hours

Elementary Solutions of the Diffusion Equation – Separation of variables – The use of Integral Transforms – The use of Green's functions

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill International Book Company, New Delhi, 1983

REFERENCES

1. M. D. Rai Singhania, Advanced Differential Equations, S. Chand and Company Ltd., New Delhi, 2001.
2. K. Sankara Rao, Introduction to Partial Differential Equations, Second edition, Prentice-Hall of India, New Delhi, 2006.
3. J. N. Sharma and K. Singh, Partial Differential Equations for Engineers and Scientists, Narosa Publishing House, 2001.

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	3	3	1	2	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	15	15	14	10	15	5	5	5	5
SCALED VALUE	3	3	3	2	3	1	1	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			CLASSICAL DYNAMICS	L	T	P	C
COURSE CODE			YMA204	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Trigonometry and Statics

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the mechanical system, energy and momentum.	Cognitive	Understanding
CO 2	**Explain** Lagrange's equation and integrals of motion.	Cognitive	Understanding
CO 3	**Explain**Rayleigh's dissipation function and impulsive motion	Cognitive	Understanding
CO 4	**Explain**Hamilton's principle andHamilton's equations	Cognitive	Understanding
CO 5	**Explain**Hamilton's Principal Function, The Hamilton and Jacobi's equation	Cognitive	Understanding

UNIT 1		15 hours

Introductory concepts: The mechanical system - Generalized Coordinates - constraints - virtual work - Energy and momentum.

UNIT 2		15 hours

Lagrange's equation: Derivation and examples - Integrals of the Motion - Small oscillations.

UNIT 3		15 hours

Special Applications of Lagrange's Equations: Rayleigh's dissipation function - impulsive motion - Gyroscopic systems - velocity dependent potentials.

UNIT 4		15 hours

Hamilton's equations: Hamilton's principle - Hamilton's equations - Other variational principles - phase space.

UNIT 5		15hours

Hamilton - Jacobi Theory: Hamilton's Principal Function – The Hamilton – Jacobi's equation - Separability.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.Donald T. Greenwood,Classical Dynamics, PHI Pvt. Ltd., New Delhi-1985. UNIT – I Chapter 1: Sections 1.1 to 1.5 UNIT – II Chapter 2: Sections 2.1 to 2.4 UNIT – III Chapter 3: Sections 3.1 to 3.4 UNIT – IV Chapter 4: Sections 4.1 to 4.4 UNIT – V Chapter 5: Sections 5.1 to 5.3

REFERENCES

1.H. Goldstein, Classical Mechanics, (2nd Edition), Narosa Publishing House, New Delhi.

2. Narayan Chandra Rana&PromodSharad Chandra Joag, Classical Mechanics, Tata McGrawHill, 1991.

COs VS POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**10**	**5**	**15**	**5**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			COMPUTER PROGRAMMING (C++ Theory and Lab)	L	T	P	C
COURSE CODE			YMA205	3	0	2	5
C	P	A		L	T	P	H
5	0	0		3	0	2	5
PREREQUISITE							

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

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Explain** C programming fundamentals	Cognitive	Understanding
CO 2	**Apply** structure and union for various functions	Cognitive	Applying
CO 3	**Explain** advanced concept of pointers and files	Cognitive	Understanding
CO 4	**Explain**Object oriented technologies	Cognitive	Understanding
CO 5	**Explain** Algorithms Using Functions and Objects	Cognitive	Understanding

UNIT 1	INTRODUCTION TO C LANGUAGE	15 hours

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input/Output Operations – Formatted I/O – Decision Making - Branching –- if, nested if, switch, goto and Looping- while, do, for statements.

Lab:

1.Program to implement formatted I/O operations
2. Program to implement formatted I/O operations
3.Program to implement control structures

UNIT 2	ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS	15 hours

Arrays – dynamic and multi-dimensional arrays - Character arrays and Strings – String handling Functions - User defined Functions – Categories of Functions – Recursion - Structures and Unions – Array of Structures – Structures and Functions

Lab:

4. Program using 2D arrays
5.Program to implement calling the function through call by value method&call by reference
6.Program to implement Structures

UNIT 3	POINTERS AND FILE MANAGEMENT	15 hours

Pointers – Declaration, Accessing a variable, character strings, pointers to functions and structures - File Management in C – Dynamic Memory allocation – Linked Lists – Preprocessors.

Lab:

7.Program to implement dynamic memory allocation
8.Program to implement pointer to function
9.Program to implement an array of pointers

UNIT 4	INTRODUCTION TO C++	15 hours

Overview of C++-Classes and Objects-Friend Functions-Friend Classes-Inline Function-Static Members-Arrays-Pointers-References-Dynamic Allocation- Function Overloading-Overloading Constructor Functions-Copy Constructors-Default Argument-Operator Overloading-Member Operator Overloading

Lab:

10. Demonstrate Inline Functions
11.Implement Class and Subclass
12. Demonstrate Constructors & Destructors.

UNIT 5	ADDITIONAL FEATURES	15 hours

Inheritance-Base Class-Access Control-Virtual Functions-Pure Virtual Functions-Templates-Generic Functions-Applying Generic Functions-Generic Classes-Exception Handling-C++ I/O Streams-File I/O-STL-Overview-Container Classes-Lists-Maps-Algorithms Using Functions and Objects-String Class

Lab:

13. Implement Virtual Function
14.Programs to implement the concept of exception handling
15. Program to implement file operations.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOKS

1. E.Balagurusamy, Programming in ANSI C, Tata McGraw Hill, 2008
2. Herbert Schildt, C++ The Complete Reference, Tata McGrawHill Edition, 2014

REFERENCES

1. Deitel and Deitel, C How to Program, Addison Wesley, 2011
2. K. N. King,C Programming: A Modern Approach, 2nd Edition**,** W. W. Norton & Company; 2 edition,2008
3. Robert Lafore, OOP in Turbo C++,Galgotia Publications, 2001

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**11**	**6**	**15**	**5**	**1**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			FLUID DYNAMICS	L	T	P	C
COURSE CODE			YMA2E1	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Trigonometry				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	Recall the basic concepts of velocity, density and curvilinear co-ordinates.	Cognitive	Remembering
CO 2	Understand the concepts and equations of fluid dynamics	Cognitive	Understanding
CO 3	Analyze and understand the concepts of the force experienced by a two-dimensional fixed body in a steady irrotational flow	Cognitive	Understanding Analyze
CO 4	Analyze the approximate solutions of the Navier – Stokes equation.	Cognitive	Applying
CO 5	Apply the appropriate method to solve integral equation of boundary layer, Blasius equation and its series solution	Cognitive	Applying

UNIT 1	Bernoulli's Equation and Equations of Motion	9 hours

Introductory Notions – Velocity – Stream Lines and Path Lines – Stream Tubes and Filaments – Fluid Body – Density – Pressure. Differentiation with respect to the time – Equation of continuity – Boundary conditions – Kinematical and physical – Rate of change of linear momentum – Equation of motion of an inviscid fluid.

UNIT 2	Equations of Motion (Contd)	9 hours

Euler's momentum Theorem – Conservative forces – Bernoulli's theorem in steady motion – energy equation for inviscid fluid – circulation – Kelvin's theorem – vortex motion – Helmholtzequation.

UNIT 3	Two-Dimensional Motion	9 hours

Two-Dimensional Motion – Two Dimensional Functions – Complex Potential – basic singularities – source – sink – Vortex – doublet – Circle theorem. Flow past a circular cylinder with circulation – Blasius Theorem – Lift force. (Magnus effect)

UNIT 4	Dynamics of Real Fluids	9 hours

Viscous flows – Navier-Stokes equations – Vorticity and circulation in a viscous fluid – Steady flow through an arbitrary cylinder under pressure – Steady Couette flow between cylinders in relative motion – Steady flow between parallel planes.

UNIT 5	The Laminar Boundary Layer in Incompressible Flow	9hours

Boundary Layer concept – Boundary Layer equations – Displacement thickness, Momentum thickness –

Kinetic energy thickness – integral equation of boundary layer – flow parallel to semi-infinite flat plate – Blasius equation and its solution in series.

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

1. Units I and II: L. M. Milne Thomson, Theoretical Hydro Dynamics, Macmillan Company, 5th Edition (1968). Chapter I: Sections 1.0 – 1.3., 3.10-3.41 (omit 3.32) Chapter III: Sections 3.42 – 3.53 (omit 3.44)
2. Units III, IV and V: Modern Fluid Dynamics Volume I, N. Curle and H. J. Davies, D. Van Nostrand Company Limited, London, 1968. Chapter III: Sections 3.1 – 3.7.5 (omit 3.3.4, 3.4, 3.5.2,3.6) Chapter V: Sections 5.2.1– 5.3.3 Chapter VI: Sections 6.1 – 6.3.1 (omit 6.2.2., 6.2.5)

REFERENCES

1. F. Chorlton, Textbook of Fluid Dynamics, CBS Publishers, New Delhi, 2004.
2. A. J. Chorin and A. Marsden, A Mathematical Introduction to Fluid Dynamics, SpringerVerlag, New York, 1993.

E – Resources (MOOC, SWAYAM, NPTEL, Websites etc)

1. https://nptel.ac.in/courses/112/106/112106200/

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**10**	**5**	**15**	**5**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			COMBINATORICS	L	T	P	C
COURSE CODE			YMA2E2	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Basics of sets				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the distributions of distinct objects and non-distinct objects	Cognitive	Understanding
CO 2	**Apply** diverse counting strategies to solve varied problems involving strings, combinations, distributions, and partitions	Cognitive	Applying
CO 3	**Solve** linear recurrence relations by recognizing homogeneity, linearity, constant coefficients, degree, and characteristic equation	Cognitive	Applying
CO 4	**Identify** the number of permutations with forbidden positions using rook polynomials	Cognitive	Applying
CO 5	**Apply**Polya's theorem for finding number of permutations of given objects	Cognitive	Applying

UNIT 1	Permutations and combinations	9 hours

Distributions of distinct objects – Distributions of non-distinct objects – Stirling's formula.

UNIT 2	Generating functions	9 hours

Generating function for combinations – Enumerators for permutations distributions of distinct objects into non distinct cells – partitions of integers – Ferrers graphs – Elementary relations.

UNIT 3	Recurrence relation	9hours

Linear recurrence relations with constant coefficients- solutions by the technique of generating functions – A special class of nonlinear difference equations – Recurrence relations with two indices.

UNIT 4	The principle of inclusion and exclusion	9 hours

General formula – Permutations with restriction on relative positions – Derangements – Rook polynomials – permutations with forbidden positions.

UNIT 5	Polya's theory of counting	9 hours

Equivalence classes under a permutation group – Burnside theorem – Equivalence classes of functions – Weights and inventories of functions – Polya's fundamental theorem – Generalization of Polya's theorem

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

1. Cameron, P.J. (1998) Combinatorics: Topics, Techniques, Algorithms. Cambridge: Cambridge University Press.
2. Liu, C.L., Eddberg, M. (1968).Solution to problems in Introduction to Combinatorial Mathematics. New York: McGraw-Hill Book & Co.

REFERENCES

1. Liu, C.L. (1968). Introduction of Combinatorial Mathematics. New York: McGraw Hill Book Co.
2. Stanley, R.P.(1997). Enumerative Combinatorics, Volume I, Cambridge Studies in Advanced Mathematics, Volume 49. Cambridge University Press.

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	15	15	14	9	15	5	4	5	5
SCALED VALUE	3	3	3	2	3	1	1	1	1

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSE NAME			CRYPTOGRAPHY	L	T	P	C
COURSE CODE			YMA2E3	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE	Basic concepts of number theory

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Apply** the concept and properties of modular arithmetic in various algorithms to find the solution	Cognitive	Applying
CO 2	**Utilize** Pollard's rho method for solving the elliptic curve discrete logarithm problem	Cognitive	Applying
CO 3	**Utilize** basic properties of finite fields for factoring polynomials over finite fields	Cognitive	Applying
CO 4	**Demonstrate** the concepts of stream ciphers and block ciphers	Cognitive	Understanding
CO 5	**Analyze** the concepts of public key cryptography, RSA and Elliptic curve cryptography	Cognitive	Applying

UNIT 1		9 hours

Introduction – Encryption and Secrecy – The objective of Cryptography - Number Theory – Introduction – Modular Arithmetic.

UNIT 2		9 hours

Integer factorization problem – Pollard's rho factoring – Elliptic curve factoring – Discrete logarithm problem.

UNIT 3		9 hours

Finite fields – Basic properties – Arithmetic of polynomials –Factoring polynomials over finite fields – Square free factorization.

UNIT 4		9 hours

Symmetric key encryption – Stream ciphers – Block Ciphers – DES.

UNIT 5		9hours

Public key cryptography – Concepts of public key cryptography – Modular arithmetic – RSA – Discrete logarithm – Elliptic curve cryptography.

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

1. Hans Delfs, Helmut Knebl, Introduction to Cryptography, Springer Verlag, 2002.

2. Alfred J. Menezes, Paul C. Van Oorschot, Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2000.
3. William Stallings, Cryptography and Network Security, Prentice Hall of India, 2000.

REFERENCES

1. Pachghare V.K., Cryptography and Information Security, PHI Learning Pvt. Ltd., New Delhi, 2009
2. Behrouz A. Forouzan and DebdeepMukhopathyey, Cryptography and Network Security, 2013, second edition, McGraw Hill Education Pvt. Ltd., New Delhi.

COs VS POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**14**	**9**	**15**	**5**	**4**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

1-5→1, 6-10→2, 11-15→3

COURSECODE			COURSETITLE	L	T	P	C
YMA301			FIELD THEORY	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Algebra

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Extension fields – Finite Extension – Algebraic Extension - Transcendence of e.	Cognitive	Remembering Understanding
CO2: Define and Explain Roots of Polynomials.- Remainder Theorem – Splitting field - More about roots.	Cognitive	Remembering Understanding
CO3: Define and Explain Elements of Galois Theory- Fixed field – Normal extension- Fundamental Theorem.	Cognitive	Remembering Understanding
CO4: Define and Explain Solvability by radicals – Solvable group – Galois group over the rational.	Cognitive	Remembering Understanding
CO5: Define and Explain Finite fields - Wedderburn's theorem on finite division rings – A Theorem of Frobenius.	Cognitive	Remembering Understanding

UNIT I	**12**
Extension fields – Finite Extension – Algebraic Extension - Transcendence of e.	
UNIT II	**12**
Roots of Polynomials.- Remainder Theorem – Splitting field - More about roots.	
UNITIII	**12**
Elements of Galois Theory- Fixed field – Normal extension- Fundamental Theorem.	
UNIT IV	**12**
Solvability by radicals – Solvable group – Galois group over the rational.	
UNIT V	**12**
Finite fields - Wedderburn's theorem on finite division rings – A Theorem of Frobenius.	

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

1. N. Herstein,"Topics in Algebra", Willey Eastern, 1975.

REFERENCES

1. John B. Fraleigh,"A First Course in Abstract Algebra", Narosa Publication, Third Edition,2013
2. P. M. Cohn,"Basic Algebra", Springers Publications, Second Edition,2003.

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2			1	1	1	1	1
CO2	3	2			1	1	1	1	1
CO3	3	2			1	1	1	1	1
CO4	3	2			1	1	1	1	1
CO5	3	2			1	1	1	1	1
Total	15	10			5	5	5	5	5
Scaled Value	3	2			1	1	1	1	1

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA302			TOPOLOGY	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Analysis

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Topological Spaces	Cognitive	Remembering Understanding
CO2: Define and Explain Continuous Functions	Cognitive	Remembering Understanding
CO3: Define and Explain Connectedness	Cognitive	Remembering Understanding
CO4: Define and Explain Compactness	Cognitive	Remembering Understanding
CO5: Define and Explain Countability and Separation Axiom	Cognitive	Remembering Understanding

UNIT I Topological Spaces **15**

Topological spaces - Basis for a topology - The order topology - The product topologyon X x Y - The subspace topology.

UNIT II Continuous Functions **15**

Closed sets and limit points-Continuous functions - the product topology - The metrictopology. - The metric topology (continued) - Uniform limit theorem.

UNIT III Connectedness **15**

Connected spaces - connected subspaces of the Real line - Components and local connectedness.

UNIT IV Compactness **15**

Compact spaces - compact subspaces of the Real line - Limit Point Compactness – LocalCompactness.

UNIT V Countability and Separation Axiom **15**

The Countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization Theorem - The Tietz extension theorem.

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

1. James R. Munkres, “Topology”, (2nd Edition) PHI Learning Pvt. Ltd., (Third Indian Reprint) NewDelhi,2014Unit I - Chapter 2: Sections 12 to 17Unit II - Chapter 2: Sections 18 to 21 (Omit Section 22)Unit III - Chapter 3: Sections 23 to25Unit IV - Chapter 3: Sections 26 to29 Unit V - Chapter 4: Sections 30 to 35

REFERENCES

1. J. Dugundji, “Topology”, Prentice Hall of India, New Delhi,1975.
2. George F.Sinmons, “Introduction to Topology and Modern Analysis”, McGraw Hill Book Co., 1963.
3. J.L. Kelly, “General Topology”, Van Nostrand, Reinhold Co., NewYork.1995
4. L.Steen and J.Subhash, “Counter Examples in Topology”, Holt, Rinehart and Winston, New York,1970.
5. S.Willard, “General Topology”, Addison - Wesley,Mas.1970.

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2			1	1	1	1	1
CO2	3	2			1	1	1	1	1
CO3	3	2			1	1	1	1	1
CO4	3	2			1	1	1	1	1
CO5	3	2			1	1	1	1	1
Total	15	10			5	5	5	5	5
Scaled Value	3	2			1	1	1	1	1

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA303			AUTOMATA THEORY	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Analysis

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Strings,Alphabets and Languages	Cognitive	Remembering Understanding
CO2: Define and Explain Regular expressions and Properties of Regular sets.	Cognitive	Remembering Understanding
CO3: Define and Explain Context Free grammars	Cognitive	Remembering Understanding
CO4: Define and Explain Pushdown Automata & properties of Context free languages	Cognitive	Remembering Understanding
CO5: Define and Explain Turning Machine and Chomski hierarchy.	Cognitive	Remembering Understanding

UNIT I	**12**
Strings,Alphabets and Languages (Section 1.1 of the Text)Finite Automata (Chapters 2, Sections 2.1 to 2.4)	
UNIT II	**12**
Regular expressions and Properties of Regular sets.(Sections 2.5 to 2.8 and 3.1 to 3.4)	
UNITIII	**12**
Context Free grammars (Section 4.1 to 4.5)	
UNIT IV	**12**
Pushdown Automata & properties of Context free languages Theorem 5.3, 5.4 (without proof), (Section is 5.1 to 5.3 and 6.1 to 6.3)	
UNIT V	**12**
Turning Machine and Chomski hierarchy, (Sections 7.1 to 7.3 and 9.2 to 9.4)	

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

1. J.E. Hopocroft and J.D. Ulman, Introduction to Automata Theory Languages and Computation, Narosa, 1999

REFERENCES

1. G.ERevesz,Introduction to Formal Languages
2. P.Linz,Introduction to Forma Languages and Automata,Narosa2000
3. G.Lallment, Semigroups and Applications

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1		1	2		1		1
CO2	2	1		1	2		1		1
CO3	2	1		1	2		1		1
CO4	2	1		1	2		1		1
CO5	2	1		1	2		1		1
Total	10	5		5	10		5		5
Scaled Value	2	1		1	2		1		1

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA304			MATHEMATICAL STATISTICS	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Estimation Theory.	Cognitive	Remembering Understanding
CO2: Explain and solve Tests based on normal, t and f distributions for testing of means, variance and proportions – Analysis of r × c tables – Goodness of fit	Cognitive	Understanding Applying
CO3: Explain and solve Correlation And Regression.	Cognitive	Understanding Applying
CO4: Explain and solve Design of Experiments	Cognitive	Understanding Applying
CO5: Explain and solve Statistical Quality Control by X , R charts, p, c and np charts.	Cognitive	Understanding Applying

UNIT I Estimation Theory **12**

Estimators: Un biasedness, Consistency, Efficiency and Sufficiency – Maximum likelihood estimation – Method of moments.

UNIT II Testing Of Hypothesis **12**

Tests based on normal, t and f distributions for testing of means, variance and proportions – Analysis of r × c tables – Goodness of fit.

UNIT III Correlation And Regression **12**

Multiple and Partial correlation – Method of least squares – Plane of Regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation - Multiple correlation with total and partial correlation – Regression and Partial correlations in terms of lower order co-efficient.

UNIT IV Design of Experiments **12**

Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT V Statistical Quality Control **12**

Analysis of variance: Control charts for measurements (X and R charts) – control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling, Introduction to SPSS.

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

1. Gupta. S.C., and Kapoor. V.K., "Fundamentals of Mathematical Statistics", Sultan Chand andsons,
   Thirteenth Edition, 2014.

REFERENCES

1. J.E. Freund, "Mathematical Statistical", 5th Edition, Prentice Hall of India,2001.
2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences",5th Edition, Thomas and Duxbury, Singapore,2002.

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3			1			1	1
CO2	3	2			1			1	1
CO3	3	3			1			1	2
CO4	3	3			1		1	1	1
CO5	3	3			1		1	1	1
Total	15	15			5		2	5	6
Scaled Value	3	3			1		1	1	2

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			COURSE NAME	L	T	P	C
YMA3E1			DATA ANALYSIS USING SPSS	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE: Probability and Statistics

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1:Define and Explain Starting SPSS, SPSS Main Menus, Working with the Data Editor, Importing and Exporting data, Plotting of Charts using Bar and Pie diagram.	Cognitive	Remembering Understanding
CO2: Define and Explain measures of central tendencies and measures of dispersion using SPSS	Cognitive	Remembering Understanding
CO3:Define and Explain Type I and Type II error, Basics of one sample t-test, independent sample t-test and paired t-test using SPSS	Cognitive	Remembering Understanding
CO4:Define and Explain One way ANOVA, two way ANOVA and Chi-square test using SPSS	Cognitive	Remembering Understanding
CO5: Define and Explain correlation and regression using SPSS	Cognitive	Remembering Understanding

UNIT I	**9**
Introduction to SPSS – Starting SPSS – SPSS Main Menus – Working with the Data Editor – SPSS Viewer – Importing and Exporting data. Plotting of Charts: Simple Bar diagram, Multiple Bar Diagram and Pie Diagram.	
UNIT II	**9**
Descriptive Statistics and Frequencies using SPSS. Measures of central tendencies: Arithmetic mean, Median, Mode, Geometric mean and Harmonic Mean. Measures of Dispersion: Range, inter quartile range, Mean Deviation and Standard deviation. Measures of Skewness and Kurtosis	
UNIT III	**9**
Testing of Hypothesis: Type I error and Type II Errors – Concept of p values – Basic Concepts of One Sample t-test, Independent Samples t-test, Paired samples t-test using SPSS with interpretation.	
UNIT IV	**9**
Analysis of Variance: Basic concepts of ANOVA – One Way and Two Way ANOVA using SPSS with interpretation. Chi-square Test for Independence of attributes using SPSS.	
UNIT V	**9**
Correlation: Karl Pearson's coefficient of Correlation – Spearman's Rank correlation – Simple linear Regression using SPSS with interpretation.	

LECTURE		**TOTAL**
45		**45**

TEXTBOOK

1. Ajai J Gaur and Sanjaya S. Gaur (2008): Statistical Methods for Practice and Research A guide to data analysis using SPSS, First Edition, Sage Publications.

REFERENCES:

1. Andy Field.(2011); Discovering Statistics Using SPSS, Sage Publications.
2. Hinton P R, Brownlow C, McMurray,I. and Cozens, B. (2004) SPSS Explained, Routledge

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3			1			1	1
CO2	3	2			1			1	1
CO3	3	3			1			1	2
CO4	3	3			1		1	1	1
CO5	3	3			1		1	1	1
Total	15	15			5		2	5	6
Scaled Value	3	3			1		1	1	2

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA3E2			NUMERICAL METHODS	3	0	0	3
C	P	A					
3	0	0		L	T	P	H
				3	0	0	3

PREREQUISITE: Algebra

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Find the solution by using Bisection method-Newton-Raphson Method-Curve fitting straight line and parabola.	Cognitive	Remembering
CO2: Solve Simultaneous Linear Equations.	Cognitive	Remembering Understanding
CO3: Find the value of y = f(x) using interpolation formula.	Cognitive	Remembering Understanding
CO4: Find the first and second derivative of f(x) and to find the value of integrals using numerical methods.	Cognitive	Remembering Understanding
CO5: Solve ordinary differential equations by using various methods.	Cognitive	Remembering Understanding

UNIT I	**9**
Solution of Numerical Algebraic Equations & Curve fitting Bisection method-Newton-Raphson method-Curve fitting straight line and parabola.	
UNIT II	**9**
Solutionof SimultaneousLinear Equations-Gauss-Eliminationmethod-Methodoffactorization-Gauss Jacobi and Gauss-Seidel methods	
UNITIII	**9**
Interpolation - Gregory-Newton forward and backward interpolation formulae Sterling's formula-Lagrange's formula.	
UNIT IV	**9**
Numerical Differentiation and Integration, Numerical differentiation, Trapezoidal rule-Simpson'sone-third rule –Simpson's three-eighth rule.	
UNIT V	**9**
Numerical Solution of Ordinary Differential Equations, Euler's method – fourth order Runge-Kutta method-Milne's predictor corrector method.	

LECTURE		TOTAL
45		45

TEXTBOOK

1. Sastry.S.S, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 2000.

REFERENCES

1. Gerald, Curtis and Wheatley, Patrick.O,"Applied Numerical Analysis", (Fifth Edition) Addison-Wesley,1989.
2. Kandasamy.P, Thilakavathy.K, Gunavathy.K-Numerical Methods, S.Chand & Co. Ltd,New Delhi, Reprint 2001.

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	1	1		2			1
CO2	2	1	1	1		2			1
CO3	2	1	1	1		2			1
CO4	2	1	1	1		2			1
CO5	2	1	1	1		2			1
Total	10	5	5	5		10			5
Scaled Value	2	1	1	1		2			1

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			COURSE NAME	L	T	P	C
YMA3E3			COMMUTATIVE ALGEBRA	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain special algebraic structures and their properties.	Cognitive	Remembering Understanding
CO2: Define and Explain proficient in the theory of Modules	Cognitive	Remembering Understanding
CO3: Define and Explain the methods of decomposition ofrings.	Cognitive	Remembering Understanding
CO 4: Define and Explain Chain conditions – Primary decomposition in Noetheria n rings.	Cognitive	Remembering Understanding
CO 5: Define and Explain Artin rings – Discrete valuationrings – Dedekind domains – Fractional ideals	Cognitive	Remembering Understanding

UNIT-I	**9**
Rings and ring homomorphism's – ideals – Extension and Contraction, modules and module homomorphism – exact sequences.	
UNIT-II	**9**
Tensor product of modules – Tensor product of algebra – Local properties – extended and contracted ideals in rings of fractions.	
UNIT-III	**9**
Primary Decomposition – Integral dependence – The going-up theorem – The going down theorem – Valuation rings.	
UNIT-IV	**9**
Chain conditions – Primary decomposition in Noetherian rings.	
UNIT-V	**9**
Artin rings – Discrete valuation rings – Dedekind domains – Fractional ideals.	

LECTURE		TOTAL
45		45

TEXT BOOKS:

1. Atiyah, M., MacDonald, I.G., Introduction to Commutative Algebra, AddisonWesley, Massachusetts 1969.Unit 1 : Chapter 1, Chapter 2 (up to page 23)Unit 2 : Chapter 2 (pages 24 – 31), Chapter 3.
   Unit 3 : Chapters 4,5.Unit 4 : Chapters 6,7.Unit 5 : Chapters 8,9.

REFERENCES:

1. H.Matsumura, Commutative ring theory, Cambridge University Press,1986
N.S. Gopalakrishnan, Commutative Algebra, Oxonian Press Pvt. Ltd, New Delhi, 1988.
R.Y.Sharp, Steps in Commutative Algebra, Cambridge University Press,1990

COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
Total	15	10	0	5	3	0	5	5	5
Scaled value	3	2		1	1		1	1	

1-5→1, 6-10→2, 11-15→3
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA401			COMPLEX ANALYSIS	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Analysis

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauchy's Theorem for rectangle- Cauchy's Theorem for disc	Cognitive	Remembering Understanding
CO2: Define and Explain Integral Formula – Higher derivatives – Removable singularities – Taylor's theorem – Zeros and Poles – The Local Mapping – The Maximum Principle.	Cognitive	Remembering Understanding
CO3: Define and Explain The General Statement of Cauchy's Theorem – Proof of Cauchy's Theorem – Locally Exact Differentials – Multiply Connected Regions.	Cognitive	Remembering Understanding
CO4: Define and Explain The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals – The Mean – value property – Poisson's formula- Schwarz's Theorem – The Reflection Principle.	Cognitive	Remembering Understanding
CO5: Define and Explain Weierstrass's Theorem – The Taylor Series– The Laurent Series – Partial Fractions- Jensen's Formula Hadamard's Theorem	Cognitive	Remembering Understanding

UNIT I	**15**
Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauchy's Theorem for rectangle- Cauchy's Theorem for disc.	
UNIT II	**15**
The Index of a point - Integral Formula – Higher derivatives – Removable singularities – Taylor's theorem – Zeros and Poles – The Local Mapping – The Maximum Principle.	
UNITIII	**15**
Chains and Cycles – Simple Connectivity – Homology – The General Statement of Cauchy's Theorem – Proof of Cauchy's Theorem – Locally Exact Differentials – Multiply Connected Regions.	
UNIT IV	**15**
The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals – The Mean – value property – Poisson's formula- Schwarz's Theorem – The Reflection Principle.	
UNIT V	**15**
Weierstrass's Theorem – The Taylor Series – The Laurent Series – Partial Fractions- Jensen's Formula – Hadamard's Theorem.	

	LECTURE	TUTORIAL	TOTAL
	60	15	75

TEXTBOOK

1.Lars V.Ahlfors, "Complex Analysis", 3rd Edition McGraw Hill Education (India) Private Ltd.2013.

Chapter 4 - Section 1.1 to 1.5, Section 2.1 to 2.3, Section 3.1 to 3.4, Section 4.1 to 4.7, Section 5.1

to 5.3 , Section 6.1 to 6.5.Chapter 5 - Section 1.1 to 1.3, Section 2.1, Section 3.1 & 3.2.
REFERENCES:
1. S. Poonusamy, "Complex Analysis", Alpha Science International Ltd; 2nd Revised edition, 2005.

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	**2**	**1**	**1**	**1**		**2**			**1**
CO2	**2**	**1**	**1**	**1**		**2**			**1**
CO3	**2**	**1**	**1**	**1**		**2**			**1**
CO4	**2**	**1**	**1**	**1**		**2**			**1**
CO5	**2**	**1**	**1**	**1**		**2**			**1**
Total	**10**	**5**	**5**	**5**		**10**			**5**
Scaled Value	**2**	**1**	**1**	**1**		**2**			**1**

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSECODE			COURSENAME	L	T	P	C
YMA402			FUNCTIONAL ANALYSIS	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Analysis

Course outcomes:	Domain	Level
CO1: Define and Explain Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems.	Cognitive	Remembering Understanding
CO2: Define and Explain Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.	Cognitive	Remembering Understanding
CO3: Define and Explain Bounded Inverse Theorem – Spectrum of a Bounded Operator.	Cognitive	Remembering Understanding
CO4: Define and Explain Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.	Cognitive	Remembering Understanding
CO5: Define and Explain Bounded Operators and adjoint, Normal , Unitary and Self-adjoint Operators.	Cognitive	Remembering Understanding

UNIT I	**15**
Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems.	
UNIT II	**15**
Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.	
UNITIII	**15**
Bounded Inverse Theorem – Spectrum of a Bounded Operator.	
UNIT IV	**15**
Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.	
UNIT V	**15**
Bounded Operators and adjoint, Normal , Unitary and Self-adjoint Operators.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

1.Balmohan V Limaye, "Functional Analysis", 3rd Edition, New Age International (P) Limited Publishers, New Delhi, 2017.

REFERENCES

1.G.F.Simmons,"IntroductiontoTopology and ModernAnalysis", McGraw Hill International Book Company, New York, 1963.

2.W. Rudin, "Functional Analysis", Tata McGraw-Hill Publishing Company, New Delhi, 1973.

3.E. Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, New York, 1978.

4.H. C. Goffman and G.Fedrick, "First Course in Functional Analysis", Prentice Hall of India, New Delhi, 1987.

COs vs POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	1	1		2			1
CO2	2	1	1	1		2			1
CO3	2	1	1	1		2			1

CO4	**2**	**1**	**1**	**1**		**2**			**1**
CO5	**2**	**1**	**1**	**1**		**2**			**1**
Total	**10**	**5**	**5**	**5**		**10**			**5**
Scaled Value	**2**	**1**	**1**	**1**		**2**			**1**

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
YMA403			**MATHEMATICAL MODELING**	**3**	**1**	**0**	**4**
C	**P**	**A**					
3	**0**	**1**		**L**	**T**	**P**	**H**
				3	**1**	**0**	**4**

PREREQUISITE: Probability and Statistics

COURSE OUTCOMES:

Course outcomes:	**Domain**	**Level**
CO1:Define and explain Mathematical Modelling through Ordinary Differential Equations of First order	Cognitive Affective	Remembering Understanding Receiving
CO2:Define and explain Mathematical Modelling through Systems of Ordinary Differential Equations of First Order	Cognitive Affective	Remembering Understanding Receiving
CO3:Define and explain Mathematical Modelling through Ordinary Differential Equations of Second Order	Cognitive	Remembering Understanding
CO4:Define and explain Mathematical Modelling through Difference Equations	Cognitive	Remembering Understanding
CO5: Define and explain Mathematical Modelling through Graphs	Cognitive	Remembering Understanding

UNIT I: Mathematical Modelling through Ordinary Differential Equationsof First order	**9+3**
Linear Growth and Decay Models – Non-Linear Growth and Decay Models –Compartment Models – Dynamics problems – Geometrical problems.	
UNIT II: Mathematica Modelling through Systems of Ordinary Differential Equations of First Order	**9+3**
Population Dynamics – Epidemics – Compartment Models – Economics –Medicine, Arms Race, Battles and International Trade – Dynamics.	
UNIT III: Mathematical Modelling through Ordinary Differential Equationsof Second Order	**9+3**
Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order –Miscellaneous Mathematical Models.	
UNIT IV : Mathematical Modelling through Difference Equations	**9+3**
Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics –Probability Theory.	
UNIT V: Mathematical Modelling through Graphs	**9+3**
Solutions that can be Modelled through Graphs – Mathematical Modelling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.	

	LECTURE	**TUTORIAL**	**TOTAL**

	45	**15**	**60**
TEXTBOOKS			
1.J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.			
REFERENCES			
1. J. N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East –West Press Pvt Limited, New Delhi, 19			

COs vs POs Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**3**	**2**			**1**	**1**	**1**	**1**	**1**
CO2	**3**	**2**			**1**	**1**	**1**	**1**	**1**
CO3	**3**	**2**			**1**	**1**	**1**	**1**	**1**
CO4	**3**	**2**			**1**	**1**	**1**	**1**	**1**
CO5	**3**	**2**			**1**	**1**	**1**	**1**	**1**
Total	**15**	**10**			**5**	**5**	**5**	**5**	**5**
Scaled Value	**3**	**2**			**1**	**1**	**1**	**1**	**1**

1-5→1, 6-10→2, 11-15→3

0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation