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 department.

DEPARTMENT OF MATHEMATICS

SYLLABUS COPY OF THE COURSES HIGHLIGHTING THE 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 **Purple 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			
Communication Skills in English	XGL101	2018-19	Employability: Assignment & Seminar. To acquire basic Learning skills
Fundamental Physics	XPG103	2018-19	Employability: Assignment, Seminar and Group discussions
Foundation Course in Mathematics	XMT104	2018-19	Employability: Assignment, Seminar and Quiz
Differential Calculus & Integral Calculus	XMT105	2018-19	Employability: Assignment, Seminar and Quiz
Human Ethics, Values, Rights and Gender Equality	XUM106	2018-19	Employability: Assignment, Seminar and Quiz
Fundamental Physics Lab	XPG107	2018-19	Employability: Assignment, Seminar and Group discussions
English for Effective Communication	XGL201	2018-19	Employability: Assignment & Seminar. To acquire basic Lear ning skills
Environmental Studies	XES202	2018-19	Employability: Assignment, Seminar and Group discussions
Modern Physics	XPG 203	2018-19	Employability: Assignment, Seminar and Group discussions
Differential Equations & Laplace Transforms	XMT204	2018-19	Employability: Assignment, Seminar and Quiz
Sequences and Series	XMT205	2018-19	Employability: Assignment & Seminar. To acquire basic knowledge about Numbers.
Modern Physics Lab	XPG206	2018-19	Employability: Assignment, Seminar and Group discussions
Logic and Sets	XMT301	2018-19	Skill Enhancement: Seminar: To learn some application about logic and sets
Programming in C	XMT302	2018-19	Employability: Miniproject, Seminar and Group discussions
Real Analysis	XMT303	2018-19	Employability: Assignment, Seminar and Quiz
Analytical Geometry 3D	XMT304	2018-19	Employability: Assignment, Seminar and Quiz
Programming in C – Practical	XMT305	2018-19	Employability: Miniproject, Seminar and Group discussions

Disaster Management	XUM306	2018-19	Employability: Miniproject, Seminar and Group discussions
Theory of Equations	XMT401	2018-19	Skill Enhancement Seminar: To learn how to find roots of algebraic equations
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 Group discussions
Introduction to Matlab – Practical	XMT405	2018-19	Employability: Miniproject, Seminar and Group discussions
Probability and Statistics	XMT501	2018-19	Skill Enhancement: Seminar: To learn how to apply hypothesis tests
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
Graph Theory	XMT601	2018-19	Skill Enhancement Seminar: To learn how to apply different types of graphs in various fields
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	Skill Enhancement: To learn about formation of equation with some real world problems
Stochastic Processes	XMT603B	2018-19	Employability: Assignment, Seminar and Quiz
Project	XMT604	2018-19	Employability: Miniproject, Seminar and Group discussions

M.Sc. Mathematics			
Groups and Rings	YMA 101	2014-15	Employability: Assignment, test and case study.
Analysis-I	YMA 102	2014-15	Employability: Assignment, test and case study.
Differential Equations	YMA 103	2014-15	Employability: Assignment, test and case study.
Discrete Mathematics	YMA 104	2014-15	Employability: Assignment, test and case study.
Graph Theory	YMA1E1	2014-15	Skill Enhancement : Seminar: To learn types of Graphs and their properties/ To learn about application of coding theory/To learn about application of set theory in Logic
Coding Theory	YMA1E2	2014-15	Employability: Assignment, test and case study.
Mathematical Logic	YMA1E3	2014-15	Employability: Assignment, test and case study.
Linear Algebra	YMA 201	2014-15	Employability: Assignment, test and case study.
Analysis-II	YMA 202	2014-15	Employability: Assignment, test and case study.
Integral Equations, Calculus of Variations and Transforms	YMA 203	2019-20	Employability: Assignment, test and case study.
Operations Research	YMA 204	2014-15	Skill Enhancement :Seminar: To learn how to apply optimization techniques in real world problems
Algebraic Number Theory	YMA2E1	2014-15	Skill Enhancement : Seminar: To learn algebraic number theory/ To learn about algorithms in data structures/To learn about application of Fuzzy sets and Fuzzy Logic
Data structures and Algorithms	YMA2E2	2014-15	Employability: Assignment, test and case study.
Fuzzy sets and fuzzy logic	YMA2E3	2014-15	Employability: Assignment, test and case study
Field Theory	YMA 301	2014-15	Employability: Assignment, test and case study
Topology	YMA 302	2014-15	Employability: Assignment, test and case study.
Automata Theory	YMA303	2020-21	Employability: Assignment, test and case study
Mathematical Statistics	YMA 304	2014-15	Skill Enhancement: Seminar: To learn how to apply various methods of mathematical statistics
Data Analysis using SPSS	YMA3E1	2020-21	Employability: Assignment, test and case study

Numerical Methods	YMA3E2	2014-15	Employability: Assignment, test and case study
Commutative Algebra	YMA3E3	2014-15	Employability: Assignment, test and case study
Complex Analysis	YMA 401	2014-15	Employability: Assignment, test and case study
Functional Analysis	YMA 402	2014-15	Employability: Assignment, test and case study
Mathematical Modeling	YMA403	2020-21	Employability: Assignment, test and case study
Project work	YMA404	2014-15	Employability: Assignment, test and case study

2. **Syllabus of the courses**

B. Sc (MATHEMATICS)

<table>
<tr><td colspan="2">COURSE CODE</td><td colspan="2">XGL101</td><td>L</td><td>T</td><td>P</td><td>SS</td><td>H</td><td>C</td></tr>
<tr><td colspan="2">COURSE NAME</td><td colspan="2">Basic English Communication Skills</td><td>2</td><td>0</td><td>0</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td colspan="2">C:P:A - 3:0:0</td><td colspan="8"></td></tr>
<tr><td colspan="4">COURSE OUTCOMES:</td><td colspan="3">Domain</td><td colspan="3">Level</td></tr>
<tr><td>CO1</td><td colspan="3">Recall the basic grammar and using it in proper context</td><td colspan="3">Cognitive</td><td colspan="3">Remembering</td></tr>
<tr><td>CO2</td><td colspan="3">Explain the process of listening and speaking</td><td colspan="3">Cognitive</td><td colspan="3">Understanding</td></tr>
<tr><td>CO3</td><td colspan="3">Adapt important methods of reading</td><td colspan="3">Cognitive</td><td colspan="3">Creating</td></tr>
<tr><td>CO4</td><td colspan="3">Demonstrate the basic writing skills</td><td colspan="3">Cognitive</td><td colspan="3">Understanding</td></tr>
<tr><td colspan="2">UNIT I</td><td colspan="6">Grammar</td><td colspan="2"></td></tr>
<tr><td colspan="8">i. Major basic grammatical categories ii. Notion of correctness and attitude to error correction</td><td colspan="2">9</td></tr>
<tr><td colspan="2">UNIT II</td><td colspan="6">Listening and Speaking</td><td colspan="2"></td></tr>
<tr><td colspan="8">iii. Importance of listening skills iv. Problems of listening to unfamiliar dialects v. Aspects of pronunciation and fluency in speaking vi. Intelligibility in speaking</td><td colspan="2">9</td></tr>
<tr><td colspan="2">UNIT III</td><td colspan="6">Basics of Reading</td><td colspan="2"></td></tr>
<tr><td colspan="8">vii. Introduction to reading skills viii. Introducing different types of texts – narrative, descriptive, extrapolative</td><td colspan="2">9</td></tr>
<tr><td colspan="2">UNIT IV</td><td colspan="6">Basics of Writing</td><td colspan="2"></td></tr>
<tr><td colspan="8">ix. 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.)</td><td colspan="2">9</td></tr>
<tr><td colspan="8">Total Hours</td><td colspan="2">36</td></tr>
<tr><td colspan="8">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: Students' 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</td><td colspan="2"></td></tr>
</table>

Table 1: Mapping of Cos with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scaled Value	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-No Relation, 1- Low Relation, 2 – Medium Relation, 3- High Relation

Table 2: Mapping of COs with GAs:

	GA 1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA1 0	GA1 1	GA1 2
CO1	0	0	0	0	0	0	0	1	1	2	0	0
CO2	0	0	0	0	0	0	0	0	0	2	0	0
CO3	0	0	0	0	0	0	0	0	0	1	0	0
CO4	0	0	0	0	0	0	0	0	0	0	1	0
CO5	0	0	0	0	0	0	0	1	1	1	1	0
Tota l	0	0	0	0	0	0	0	2	2	6	2	0
Scal e	0	0	0	0	0	0	0	1	1	2	1	0

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

COURSE CODE	**XGL102A**	**L**	**T**	**P**	**C**
COURSE NAME	mwptpay; jkpo;	**3**	**0**	**0**	**3**
PREREQUISITE		**L**	**T**	**P**	**H**
C:P:A	3:0:0	**3**	**0**	**0**	**3**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recognize* (milahsk; fhZjy;)** gy;NtW mwptpay; Jiw rhu;e;j El;gq;fs;> fiyr; nrhy;yhf;f cj;jpfs; Nghd;wtw;iwj; jkpo;nkhop %yk; mwpe;J nfhs;sy;.	Cognitive	Remembering
CO2	***Choose* (njupT nra;jy;)** tlnkhop Ntu;r;nrhw;fs;> Gtpapay;> epytpay; gw;wpg; goe;jkpo; ,yf;fpaq;fs; %yk; mwpe;J nfhs;sy;.	Cognitive	Remembering
CO3	***Describe* (tpsf;Fjy;)** njhy;fhg;gpak; %yk; mwptpay; nra;jpfis czu;jy;.	Cognitive	Understanding
CO4	***Apply* (gad;gLj;Jjy;)** gy;NtW fy;tpj;Jiw rhu;e;jgupTfs;>gy;NtW fy;tpj;Jiw rhu;e;j gpupTfs; Fwpj;J njspT ngwy;.	Cognitive	Applying
CO5	***Analyze*(gFj;jy;)** mwptpay; rpWfijfspd; Njhw;wk; kw;Wk; tsu;r;rp epiy ehlfq;fspd; gq;F Fwpj;J njspT ngWjy;.	Cognitive	Analyzing

myF– 1	**mwptpay; jkpo; mwpKfk;**	**9**
mwptpay;jkpo; - nghwpapay;> njhopy;El;gk;> kUj;Jtk;> cotpay;. jkpopy; mwptpay; - jkpopy; El;gk;. gilg;Gg; gzp – nrhy;yhf;f cj;jpfs; - El;gkhd NtWghLfis czu;e;J nrhy;yhf;fk; nra;jy; - fiyr;nrhw;fs; - ,e;jpa nkhopfSf;Fg; nghJthd fiyr; nrhw;fis cUthf;Fjy; - tlnkhop Ntu;r;nrhw;fis kpFjpahff; nfhz;bUj;jiyg; gad;gLj;Jjy;.		

myF– 2	**Gpw mwptpay; Jiwfs;**	**9**
Gtpapay;> epytpay; gw;wp goe;jkpo; ,yf;fpak; Fwpg;gpLk; jfty;fs; - njhy;fhg;gpak; Fwpg;gpLk; capupay;> kz;zpay; gw;wpa mbg;gilr; nra;jpfs; - jkpo; kUj;Jtf; fy;tp - mwptpay; jkpOf;F ,jopay; cj;jpfs; - tsu; jkpo;.		

myF– 3	**gy;NtW fiyfspy; mwptpay;**	**9**
nkhopapay; fy;tp– fl;llf; fiyf;fy;tp– rKjhaf;fy;tp–Nra;ikf;fy;tp– kz;zpay;> Gtpapay;> fzf;fpay; Mfpait ,ize;j fy;tp - ,f;fhyf; fy;tpg; nghJepiy– fiy>mwptpay; - vd;gtw;wpd; tpsf;fq;fs;.		

myF– 4	**mwptpay; jkpopy; rpWfijfspd; gq;F**	**9**
rpWfij - ,yf;fzk; cUthf;Fk; cj;jpfs; - rpwe;j rpWfijfs; - rpWfij tiffs; - ey;y rpWfij cUthf;fk; - tuyhW– r%fk; - nkhopngau;g;G kw;Wk; mwptpay; rpWfijfs;.		

myF– 5	**mwptpay; jkpopy; ehlfq;fspd; gq;F**	**9**
ehlfk; - ehlf ,yf;fzk;> ,Utif ehlfq;fs; - gbg;gjw;Fupa ehlfk; - ebg;gjw;Fupa ehlfk; - rupj;jpuehlfk;> r%fehlfk; - eifr;Rit ehlfq;fs; - mnkr;#u; ehlfq;fs; - njhopy;Kiw ehlfq;fs;.		

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

Nkw;ghu;it Ehy;fs;:

1. mwptpay; jkpo; - lhf;lu; th.nr. Foe;ijr;rhkp
2. tsu;jkpo; - ,jo;fs;
3. ,yf;fpa tuyhW– rpWfij gw;wpaJ
4. ,yf;fpa tuyhW– Gjpdk; gw;wpaJ

Table 1: CO Versus PO mapping.

	PO							PSO	
	1	2	3	4	5	6	7	1	2
CO1		1							
CO2		1							
CO3		1					1		
CO4	1	2	2	1		1	2		
CO5	2	2	2	2		1	2		
Total	3	7	4	3		2	5		
Scaled Value	1	2	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	**XPG103**	**L**	**T**	**P**	**C**
COURSE NAME	**FUNDAMENTAL PHYSICS**	**3**	**1**	**0**	**4**
C:P:A	**4:0:0**	**L**	**T**	**P**	**H**
PREREQUISITE:		**3**	**1**	**0**	**4**

CO1	***Recall*** and ***Explain*** the basic principle simple harmonic motion and circular motion	Cognitive	Remembering , Understanding, Analyzing
CO2	***Understand*** the properties of sound, reverberation time and methods of production of ultrasonic waves.	Cognitive	Remembering , Analyzing
CO3	***Understand and determine*** Young's modulus, rigidity modulus, viscosity and explain surface tension and excess pressure inside a drop.	Cognitive	Analyzing , Understanding, Applying
CO4	***Recall*** the basic concepts and basic laws of thermal physics and ***determine*** the thermal conductivity of a bad conductor and solar constant.	Cognitive	Remembering , Analyzing, Applying
CO5	***Acquire knowledge*** on interference, diffraction; be able to determine wavelength of mercury source; understand LASER action and production; propagation of fibre optics.	Cognitive	Understanding, Evaluating

UNIT I Simple Harmonic Motion and Circular Motion	**9+3**
Time period - Amplitude - Phase - Spring mass system - Simple pendulum - Composition of two simple harmonic motions along a straight line and at right angles - Lissajous figures - Damping force - Damped harmonic oscillator - Uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks - Motion of a bicycle and a car around a circle.	
UNIT II Sound Uniform circular motion	**9+3**
Classification of sound - Characteristics of musical sound - Loudness - Weber Fechner law - Decibel - Absorption co-efficient - Reverberation - Reverberation time - Ultrasonic waves - Properties - Production : Magnetostriction and Piezo-electric method and uses.	
UNIT III Properties of Matter	**9+3**
Elasticity - Elastic constants - Bending of beams - Young's modulus by non-uniform bending - Torsion in a wire - Determination of rigidity modulus of torsional pendulum - Viscosity -	

Coefficient of viscosity by Poiseuelle's method - Stoke's law - Terminal velocity - Surface Tension - Molecular theory of surface tension - Excess pressure inside a drop and bubble - Surface tension by drop weight method.			
UNIT IV Thermal Physics			**9+3**
Kinetic theory of gases - Basic postulates - Ideal gas equation - Vanderwaal's equation of states - Laws of thermodynamics - Entropy - Change of entropy in reversible and irreversible processes - Lee's disc method for conductivity of bad conductor - Stefan's law of radiation - Solar Constant - temperature of the sun.			
UNIT V Optics			**9+3**
Interference in thin films - Air wedge - Diffraction - Theory of plane transmission grating (normal incidence only) - LASER - Population inversion - Pumping - Laser action - Nd-YAG laser - CO_2 laser - Fibre optics - Principle and propagation of light in optic fibres - Numerical aperture and acceptance angle.			
	LECTURE	**TUTORIAL**	**TOTAL**
	45	**15**	**60**
TEXT BOOKS			
1. A Sundaravelusamy, “Allied Physics I”, Priya Publications, 2009. 2. R. Murugesan, I B.Sc. “Ancillary Physics”, S. Chand & Co., 2010.			
REFERENCES			
1. Saigal. S, “Sound”, Chand & Co., Delhi,1990 2. Brijlal and Subramanian, “Elements of properties of matter”, S. Chand Limited, 1974. 3. Brijlal and Subramanian, “Heat and Thermodynamics”, S. Chand Limited,2008 4. Brijlal and Subramanian, “Optics”, S. Chand Limited,2012.			

Table 1: Mapping of Cos with Pos

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9
CO_1	1	1	1		2	1	1	1	
CO_2	2	3	2	1	2	2	1	2	
CO_3	1	3	2		1	2	2	2	
CO_4	1	1	2		1	2	1	1	
CO5	2	3	1		2	2	2	1	
Total	6	11	8	1	8	9	7	7	
Scaled	2	3	2	1	2	2	2	2	

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

<table>
<tr><td colspan="3">COURSE CODE</td><td>COURSE NAME</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="3">XMT104</td><td>FOUNDATION COURSE IN MATHEMATICS</td><td>4</td><td>1</td><td>0</td><td>5</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td></td><td>L</td><td>T</td><td>P</td><td>H</td></tr>
<tr><td>5</td><td>0</td><td>0</td><td></td><td>4</td><td>1</td><td>0</td><td>5</td></tr>
</table>

PREREQUISITE: Basic concept of Algebra and Trigonometry

Course outcomes:	**Domain**	**Level**
CO1:Define and **Apply** fundamental theorem of algebra to find the relation between roots and coefficients.	Cognitive	Remembering Applying
CO2: Explain the transformation of equation and to **solve** the reciprocal equation using Newton's method.	Cognitive	Understanding Applying
CO3: Expand the trigonometric functions and to find the series of trigonometric functions by **apply** the related properties to **Solve** the problems.	Cognitive	Understanding Applying
CO4: Explain hyperbolic and inverse hyperbolic functions and to find the logarithm of the complex numbers.	Cognitive	Remembering Applying
CO5: Explain Summations of trigonometric series and apply properties to find their related problems.	Cognitive	Remembering Applying

UNIT I **15**

Theory of Equations: Fundamental Theorem of Algebra - Relations between roots and coefficients - Symmetric functions of roots.

UNIT II **15**

Transformation of Equations - Reciprocal Equations - Newton's Method of Divisors - Descartes' rule of signs – Horner's Method.

UNIT III **15**

Trigonometry: Expansion of functions, sinnx, cosnx, tannx- Expansion of $\sin^n x$ and $\cos^n x$ interms of sinx and cosx - Properties and their -related problems.

UNIT IV **15**

Hyperbolic functions -Inverse hyperbolic functions- Logarithm of Complex Numbers.

UNIT V **15**

Summations of trigonometric series- Properties and their related problems.

LECTURE	**TUTORIAL**	**TOTAL**
60	**15**	**75**

TEXT BOOKS

1. S. Narayanan & T. K. ManickavasagamPillai, "Algebra", Vol. 2, S. Viswanathan Pvt. Ltd., Chennai, 2004.
   Unit 1: Chapter 6, Secs 6.1-6.14
   Unit 2 : Chapter 6, Secs 6.15-6.30.
2. S. Narayanan & T. K. ManickavasagamPillai, "Trigonometry", S. Viswanathan Pvt. Ltd., Chennai, 2001.
   Unit 3: Chapter 3
   Unit 4: Chapter 4, 5
   Unit 5: Chapter 6.

Reference

1. Arumugam & Issac, "Theory of Equations, Theory of Numbers and Trigonometry", New gamma Publishing house, Tirunelveli, 2011.

Table 1: Mapping of COs with POs

	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
Total	15	10	5	5	5	5	5		5
Scaled Value	3	2	1	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**
XMT105			**DIFFERENTIAL CALCULUS & INTEGRAL CALCULUS**	**4**	**1**	**0**	**5**
C	**P**	**A**		**L**	**T**	**P**	**H**
5	**0**	**0**		**4**	**1**	**0**	**5**

PREREQUISITE: Differentiation and Integration

Course outcomes:	**Domain**	**Level**
CO1: Apply the basics of differentiation.	Cognitive	Remembering Applying
CO2: Find Evolutes in Cartesian Coordinates.	Cognitive	Understanding Applying
CO3: State Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series and to find Maxima and Minima.	Cognitive	Understanding Applying
CO4: Find the definite integrals using integration by parts and reduction formula.	Cognitive	Remembering Applying
CO5: Find integration by changing order of integration using double integrals.	Cognitive	Remembering Applying

UNIT I	**15**
Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.	
UNIT II	**15**
Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates.	
UNIT III	**15**
Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series(Statement only) Maclaurin's series of sin x, cos x, e^x, log(l+x), $(l+x)^m$, Maxima and Minima, Indeterminate forms.	
UNIT IV	**15**
Definite integrals - Integration by parts & reduction formula	

UNIT V			**15**
Double integrals – changing the order of Integration – Triple Integrals.			
LECTURE	**TUTORIAL**	**TOTAL**	
60	**15**	**75**	

TEXT BOOKS

1. S.Narayanan and T.K.Manicavachagom Pillai, "Calculus Volume I", S.Viswanathan (Printers & Publishers) Pvt Limited, Chennai -2011.
2. S.Narayanan and T.K.Manicavachagom Pillai, "Calculus Volume II", S.Viswanathan (Printers & Publishers) Pvt Limited, Chennai – 2011.
   UNIT IV: Chapter 1 section 11, 12 & 13
   UNIT V: Chapter 5 section 2.1, 2.2 & 4

REFERENCES

1. S. Arumugam and Isaac, "Calculus, Volume1", New Gamma Publishing House, 1991.

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	**XUM 106**	**L**	**T**	**P**		**C**
COURSE NAME	**Human Ethics, Values, Rights and Gender Equality**	**3**	**0**	**0**		**0**
PREREQUISITES	**Not Required**	**L**	**T**	**P**	**SS**	**H**
C:P:A	**3:0:0.0**	**3**	**0**	**0**	**0**	**3**

COURSE OUTCOMES		**Domain**	**Level**
CO1	***Relate*** and ***Interpret***the human ethics and human relationships	Cognitive	Remember,Understand
CO2	***Explain*** and ***Apply*** gender issues, equality and violence against women	Cognitive	Understand, Apply
CO3	***Classify*** and ***Develop*** the identify of women issues and challenges	Cognitive& Affective	Analyze Receive
CO4	***Classify*** and ***Dissect*** human rights and report on violations.	Cognitive	Understand,Analyze
CO5	***List*** and **respond** to family values, universal brotherhood, fight against corruption by common man and good governance.	Cognitive & Affective	Remember, Respond

UNIT I HUMAN ETHICS AND VALUES	**7**
Human Ethics and values - Understanding of oneself and others- motives and needs- Social service, Social Justice, Dignity and worth, Harmony in human relationship: Family and Society, Integrity and Competence, Caring and Sharing, Honesty and Courage, WHO's holistic development - Valuing Time, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence, character building and Personality.	
UNIT IIGENDER EQUALITY	**9**
Gender Equality - Gender Vs Sex, Concepts, definition, Gender equity, equality, and empowerment. Status of Women in India Social, Economical, Education, Health, Employment, HDI, GDI, GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.	
UNIT IIIWOMEN ISSUES AND CHALLENGES	**9**
Women Issues and Challenges- Female Infanticide, Female feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Access to education, Marriage. Remedial Measures – Acts related to women: Political Right, Property Rights, and Rights to Education, Medical Termination of Pregnancy Act, and Dowry Prohibition Act.	
UNIT IV HUMAN RIGHTS	**9**
Human Rights Movement in India – The preamble to the Constitution of India, Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Discrimination and forced Labour, Rights and protection of children and elderly. National Human Rights Commission and other statutory Commissions, Creation of Human Rights Literacy and Awareness. - Intellectual Property Rights (IPR). National Policy on occupational safety, occupational health and working environment.	
UNIT V GOOD GOVERNANCE AND ADDRESSING SOCIAL ISSUES	**11**
Good Governance - Democracy, People's Participation, Transparency in governance and audit, Corruption, Impact of corruption on society, whom to make corruption complaints, fight against corruption and related issues, Fairness in criminal justice administration, Government system of Redressal. Creation of People friendly environment and universal brotherhood.	

	LECTURE	**SELF STUDY**	**TOTAL**
	15	**30**	**45**

References

1. Aftab A, (Ed.), “Human Rights in India: Issues and Challenges”, (New Delhi: Raj Publications, 2012).
2. Bajwa, G.S. and Bajwa, D.K. “Human Rights in India: Implementation and Violations” (New Delhi: D.K. Publications, 1996).
3. Chatrath, K. J. S., (ed.), “Education for Human Rights and Democracy” (Shimala: Indian Institute of Advanced Studies, 1998).
4. Jagadeesan. P., “Marriage and Social legislations in Tamil Nadu”, Chennai: Elachiapen Publications, 1990).
5. Kaushal, Rachna, “Women and Human Rights in India” (New Delhi: Kaveri Books, 2000)
6. Mani. V. S., “Human Rights in India: An Overview” (New Delhi: Institute for the World Congress on Human Rights, 1998).
7. Singh, B. P. Sehgal, (ed) “Human Rights in India: Problems and Perspectives” (New Delhi: Deep and Deep, 1999).
8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996)
9. Veeramani, K. (ed) Periyar Feminism, (Periyar Maniammai University, Vallam, Thanjavur: 2010).
10. Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p
11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
12. Weblink of Transparency International: https://www.transparency.org/
13. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india

Mapping of COs with Pos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1								2				
CO2								3	1			
CO3								2				
CO4								3		2		
CO5								3	2	2		2
Total		2						13	3	4		2
Scaled Value		1						3	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	**XPG107**	**L**	**T**	**P**	**C**
COURSE NAME	**FUNDAMENTAL PHYSICS LAB**	**0**	**0**	**4**	**2**
C:P:A	**0.4:1:0.6**	**L**	**T**	**P**	**H**
PREREQUISITE: Nil		**0**	**0**	**4**	**4**

COURSE OUTCOMES		**Domain**	**Level**
CO1:	***Recall*** the ***usage*** of laboratory instruments and ***measure*** the Young's modulus of Non – uniform pending	Cognitive Psychomotor	Understand Mechanism
CO2:	***Explain*** and ***demonstrate*** the behavior of rigidity modulus of a wire	Psychomotor Affective	Set Valuing
CO3:	***Manipulate*** and ***measure*** the thickness of a thin wire using Air wedge	Cognitive Psychomotor	Apply Mechanism
CO4:	***Compare*** and ***explain*** the Calibration of voltmeter	Affective Psychomotor	Organization Set
CO5	***Describe*** the Band gap of the semiconductor	Psychomotor Affective	Perception Organization

List of Experiments		**Hours**
1	Non-uniform Bending - Pin and Microscope Method	**4**
2	Torsional pendulum - Determination of rigidity modulus of a wire	**4**
3	Co-efficient of viscosity of Liquid using graduated burette	**4**
4	Spectrometer - Refractive index of solid prism (A, D and μ)	**4**
5	Post Office Box - Determination of Band gap of a semi-conductor	**4**
6	Air wedge - determination of thickness of thin wire	**4**
7	Potentiometer - Calibration of voltmeter	**4**
8	LASER grating - Determination of wavelength of LASER and size of the micro-particle	**4**

Text Books:

1. C. L. Arora, "BSc Practical Physics", S. Chand and Company Ltd, 2007.
2. D. Chattopadhyay and P. C. Rakshit, "An Advanced Course in Practical Physics", (New Central Book Agency), 2011.
3. S. Ghosh. A, "Text Book of Advanced Practical Physics", (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper, 2008.
4. Shukla R. K. and Anchal Srivastava, "Practical Physics", New Age International (P) Ltd, Publishers, 2006.

Reference books :

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Mapping of COs with Pos

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1								2						
CO2								3	1					
CO3								2						
CO4								3		2				
CO5								3	2	2		2		
Total		2						13	3	4		2		
Scaled Value		1						3	1	1		1		

1 – 5 → 1, 6-10 → 2, 11 – 15→ 3

0 – No relation, 1 – Low relation, 2 – Medium relation, 3 – High relation

II SEMESTER

		L	T	P	SS	H	C
COURSE CODE	**XGL201**	**L**	**T**	**P**	**SS**	**H**	**C**
COURSE NAME	**ADVANCED ENGLISH COMMUNICATION SKILLS**	**2**	**0**	**0**	**0**	**2**	**2**
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	**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.)		9
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. Summarise a piece of prose or poetry ix. Using phrases, idioms and punctuation appropriately		9
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		9
UNIT IV	**Cross Cultural Communication**	
xiv. Cross-cultural communication		9
	Total Hours	**36**

Text books

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, Meenakshi and Sangeeta Sharma (2011). Technical Communication: Principles and Practice. New Delhi, OUP

Table 1: Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scaled Value	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-No Relation, 1- Low Relation, 2 – Medium Relation, 3- High Relation

Table 2: Mapping of COs with GAs

	GA 1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA1 0	GA1 1	GA1 2
CO1	0	0	0	0	0	0	0	1	1	2	0	0
CO2	0	0	0	0	0	0	0	0	0	2	0	0
CO3	0	0	0	0	0	0	0	0	0	1	0	0
CO4	0	0	0	0	0	0	0	0	0	0	1	0
CO5	0	0	0	0	0	0	0	1	1	1	1	0
Tota l	0	0	0	0	0	0	0	2	2	6	2	0
Scal e	0	0	0	0	0	0	0	1	1	2	1	0

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

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

COURSE CODE	XES202	L	T	SS	P	C
COURSE NAME	ENVIRONMENTAL STUDIES	2	0	1	0	2
C:P:A	1.4: 0.3 : 0.3	L	T	SS	P	H
		2	0	1	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Describe*** the significance of natural resources and ***explain*** anthropogenic impacts.	Cognitive	Remembering Understanding
CO2	***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understanding
CO3	***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon	Cognitive Affective	Remembering Receiving
CO4	***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development.	Cognitive	Understanding Applying
CO5	***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** the modern technology towards environmental protection.	Cognitive	Understanding Analysing

UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY	12
Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Water resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: renewable and non-renewable energy sources – Land resources: Land as a resource, land degradation, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.	
UNIT – II ECOSYSTEMS AND BIODIVERSITY	**7**
Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	
UNIT – III ENVIRONMENTAL POLLUTION	**10**
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.	
UNIT –IV SOCIAL ISSUES AND THE ENVIRONMENT	**10**
Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.	

UNIT –V HUMAN POPULATION AND THE ENVIRONMENT					6
Population growth, variation among nations – Population explosion– Environment and human health – HIV / AIDS– Role of Information Technology in Environment and human health. Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education - HIV / AIDS – Women and Child welfare programme– Role of Information Technology in Environment and human health – Case studies.					
	LECTURE	**TUTORIAL**	**PRACTICAL**	**SELF STUDY**	**TOTAL**
	30	**0**	**0**	**15**	**45**

TEXT BOOKS

1. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co, USA, 2000.
1. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell Science, UK, 2003
2. Trivedi R.K and P.K.Goel, "Introduction to Air pollution", Techno Science Publications, India, 2003.
3. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
4. Butterworth Heinemann, "Introduction to International disaster management", 2006.
5. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCES BOOKS

1. Trivedi R.K., "Handbook of Environmental Laws, Rules", Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
2. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. S.K.Dhameja, "Environmental Engineering and Management", S.K.Kataria and Sons, New Delhi, 2012.
4. Sahni, "Disaster Risk Reduction in South Asia", PHI Learning, New Delhi, 2003.
5. Sundar, "Disaster Management", Sarup & Sons, New Delhi, 2007.
6. G.K.Ghosh, "Disaster Management", A.P.H.Publishers, New Delhi, 2006.

E RESOURCES

1. http://www.e-booksdirectory.com/details.php?ebook=10526
2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. http://bookboon.com/en/pollution-prevention-and-control-ebook
6. http://www.e-booksdirectory.com/details.php?ebook=8557
7. http://www.e-booksdirectory.com/details.php?ebook=6804
8. http://bookboon.com/en/atmospheric-pollution-ebook
9. http://www.e-booksdirectory.com/details.php?ebook=3749
10. http://www.e-booksdirectory.com/details.php?ebook=2604
11. http://www.e-booksdirectory.com/details.php?ebook=2116
12. http://www.e-booksdirectory.com/details.php?ebook=1026
13. http://www.faadooengineers.com/threads/7894-Environmental-Science

Table 1 : Mapping of CO's with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1							2	3	3
CO2							1	2	2
CO3							2	3	3
CO4							3	3	3
CO5							2	2	3
Total							10	13	14
Scaled Value							2	3	3

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

COURSE CODE	**XPG203**	**L**	**T**	**P**	**C**
COURSE NAME	**MODERN PHYSICS**	**3**	**1**	**0**	**4**
C:P:A	**2.8:0.4:0.8**	**L**	**T**	**P**	**H**
PREREQUISITE:	**Basic Physics at School level**	**3**	**1**	**0**	**4**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Define, explain and demonstrate*** and ***Relate*** knowledge of the basics of digital computer.	Cognitive Psychomotor	Remembering Understand Mechanism
CO2	Acquire the knowledge of INTEL 8085; ***Analyze*** Immediate and implicit addressing and Instruction set	Cognitive	Analyzing, Applying
CO3	***Understand*** Fundamentals of assembly language programming	Cognitive Affective	Understanding Receiving
CO4	***Identify*** Structure of 'C', ***explain*** I/O function.	Cognitive	Remembering
CO5	***Understand*** the Data input and output and ***describe*** Basic functions and ***Compare*** automatic variables, External Variables, Static Variables.	Cognitive Affective	Understanding Receiving

UNIT - I	**7+3**
Planck's quantum, Planck's constant and light as a collection of photons; Photoelectric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability.	
UNIT –II	**8 + 3**
Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle.	
UNIT – III	**10 + 3**
One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier.	
UNIT –IV	**10 + 3**
Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy	

UNIT –V	10 + 3
Radioactivity: stability of nucleus; Law of radioactive decay; Mean life and half-life; -rayγ decay - energy released, spectrum and Pauli's prediction of neutrino; β decay; α emission.	
TEXT BOOKS	
1. J.R. Taylor, C.D.Zafiratos, M.A.Dubson, "Concepts of Modern Physics", Arthur Beiser, 2009, McGraw-Hill Modern Physics, 2009, PHI Learning	
REFERENCESBOOKS	
1. Thomas A. Moore,Six," Ideas that Shaped Physics: Particle Behave like Waves", 2003, 2. E.H. Wichman, " Quantum Physics, Berkeley Physics",Vol.4. 2008, Tata McGraw- Hill Co. 3. R.A. Serway, C.J. Moses, and C.A.Moyer,"Modern Physics", 2005, Cengage Learning	
E RESOURCES	
NPTEL, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.	

	LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
	45	**15**	**-**	**60**

Table 1: Mapping of Cos with POs

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9
CO_1	1	1	1		2	1	1	1	
CO_2	2	3	2	1	2	2	1	2	
CO_3	1	3	2		1	2	2	2	
CO_4	1	1	2		1	2	1	1	
CO5	2	3	1		2	2	2	1	
Total	6	11	8	1	8	9	7	7	
Scaled	2	3	2	1	2	2	2	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
XMT204			**Differential Equations & Laplace Transforms**	**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: Solve simple problems related to first order, higher degree Differential equations solvable for x, solvable for y, solvable for dy/dx, Clairaut's form – Conditions of integrability of M dx + N dy = 0.	Cognitive	Applying
CO2: Solve second order linear differential equations with constant coefficients, variable coefficients, and solving the equation using method of Variation of Parameters.	Cognitive	Applying
CO3: Formation of Partial Differential Equation, **Solve** PDE of the standard forms using Lagrange's method, Charpit's method and a few standard forms.	Cognitive	Applying
CO4: Solve PDE of second order homogeneous equation with constant coefficients, particular integrals of the forms e^{ax+by}, sin (ax+by), cos(ax+by), $x^r y^s$ and e^{ax+by}. f(x,y).	Cognitive	Applying

CO5: Find Laplace Transforms and inverse Laplace transform of function using standard formulae , Basic theorems & simple applications **Use** Laplace Transforms in solving ODE with constant coefficients.	Cognitive	Remembering Applying

UNIT I	**15**
First order, higher degree differential equations solvable for x, solvable for y, solvable for dy/dx, Clairaut's form – Conditions of integrability of M dx + N dy = 0 – simple problems.	
UNIT II	**15**
Particular integrals of second order differential equations with constant coefficients - Linear equations with variable coefficients – Method of Variation of Parameters (Second Order only)	
UNIT III	**15**
Formation of Partial Differential Equation – General, Particular & Complete integrals – Solution of PDE of the standard forms - Lagrange's method - Solving of Charpit's method and a few standard forms.	
UNIT IV	**15**
PDE of second order homogeneous equation with Constant coefficients – Particular integrals of the forms e^{ax+by}, Sin(ax+by), Cos(ax+by), $x^r y^s$ and e^{ax+by}. f(x,y).	
UNIT V	**15**
Laplace Transforms – Standard formulae – Basic theorems & simple applications – Inverse Laplace Transforms – Use of Laplace Transforms in solving ODE with constant coefficients.	

	LECTURE	TUTORIAL	TOTAL
	60	**15**	**75**

TEXT BOOKS

1. T.K.Manicavachagom Pillay & S.Narayanan, "Differential Equations", S.Viswanathan Publishers Pvt. Ltd., 1996.
2. Arumugam & Isaac, "Differential Equations", New Gamma Publishing House, Palayamkottai, 2003.

   Unit : 1 Chapter IV – Sections 1,2 & 3, Chapter II – Section 6 [1]
   Unit : 2 Chapter V – Sections 1,2,3,4 & 5, Chapter VIII – Section 4 [1]
   Unit : 3 Chapter XII – Sections 1 – 6 [1]
   Unit : 4 Chapter V [2]
   Unit : 5 Chapter IX – Sections 1 – 8 [1]

REFERENCES

1. M.D.Raisinghania , "Ordinary and Partial Differential Equations", S.Chand & Co, 2016.
2. M.K. Venkatraman, "Engineering Mathematics", S.V. Publications, Revised Edition. 1985.

Table 1: COs 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
Scale 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

COURSE CODE			COURSE NAME	L	T	P	C
XMT205			SEQUENCES AND SERIES	4	1	0	5
C	P	A		L	T	P	H
4	0.5	0.5		4	1	0	5

PREREQUISITE: Nil

Course outcomes:	Domain	Level
CO1: Explain Bounded Sequences, Monotonic sequences , Convergent Sequence , Divergent sequences , Oscillating sequences.	Cognitive	Understanding
CO2: Explain Behaviour of Monotonic functions.	Cognitive Psychomotor	Understanding Guided Response
CO3: Explain subsequences, limit points and Cauchy sequences.	Cognitive	Understanding
CO4: Apply comparison test **to** infinite series to test the convergence and to **Explain** Cauchy's general principal of convergence.	Cognitive	Understanding Applying
CO5: Apply D Alembert's ratio test, Cauchy's root test to test convergence and to test the Alternating Series and Absolute Convergence of the series	Cognitive Affective	Applying Receiving

UNIT I SEQUENCES — **15**

Bounded Sequences – Monotonic Sequences – Convergent Sequence – Divergent Sequences – Oscillating sequences

UNIT II ALGEBRA OF LIMITS — **15**

Behaviour of Monotonic functions.

UNIT III SOME THEOREMS ON LIMITS — **15**

Subsequences – limit points : Cauchy sequences

UNIT IV SERIES — **15**

Infinite series – Cauchy's general principal of convergence –Comparison test theorem and test of convergence using comparison test (comparison test statement only, no proof).

UNIT V TEST OF CONVERGENCE USING D ALEMBERT'S RATIO TEST — **15**

Cauchy's root test – Alternating Series – Absolute Convergence (Statement only for all tests).

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXT BOOKS:

1.Dr. S.Arumugam & Mr.A.Thangapandi Isaac, "Sequences and Series", New Gamma Publishing House – 2002 Edition.

Unit I : Chapter 3 : Sec. 3.0 – 3.5 Page No : 39-55
Unit II : Chapter 3 : Sec. 3.6, 3.7 Page No:56 – 82
Unit III : Chapter 3 : Sec. 3.8-3.11, Page No:82-102
Unit IV : Chapter 4 : Sec. (4.1 & 4.2) Page No : 112-128.
Unit V : Relevant part of Chapter 4 and Chapter 5: Sec. 5.1 & 5.2
Page No:157-167.

REFERENCES:

1. Prof. S.Surya Narayan Iyer, "Algebra",Margham publications, Chennai, 2002.
2. Prof. M.I.Francis Raj, "Algebra", Margham publications, Chennai, 2004.

Table 1: Mapping of COs with Pos

	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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

COURSE CODE		**XPG206**	**L**	**T**	**P**	**C**
COURSE NAME		**MODERN PHYSICS LAB**	**0**	**1**	**2**	**2**
C:P:A		**0.4:1:0.6**	**L**	**T**	**P**	**H**
PREREQUISITE: Nil			**0**	**1**	**2**	**2**
COURSE OUTCOMES			**Domain**	**Level**		
CO1	***Recall*** the ***usage*** of laboratory instruments and ***measure*** the Young's modulus of uniform pending		Cognitive Psychomotor	Understanding Mechanism		
CO2	***Explain*** and ***demonstrate*** the behaviour of thermal conductivity of bad conductor		Psychomotor Affective	Set Valuing		
CO3	***Manipulate*** and ***measure*** the normal incidence of grating		Cognitive Psychomotor	Applying Mechanism		
CO4	***Compare*** and ***explain*** the Calibration of ammeter		Affective Psychomotor	Organization Set		
CO5	***Describe*** the resistance and specific resistance of a wire		Psychomotor Affective	Perception Organization		
List of Experiments				**Hours**		
1	Uniform Bending - Pin and Microscope Method.			**3**		
2	Lee's Disc - Thermal Conductivity of Bad Conductor.			**3**		
3	Spectrometer - Grating- Normal incidence method.			**3**		
4	Spectrometer - id curve.			**3**		
5	AND, OR and NOT logic gates - verification of truth table.			**3**		
6	Potentiometer - Calibration of ammeter.			**3**		
7	Semiconductor Diode - Forward and Reverse bias characteristics.			**3**		
8	Metre Bridge - Determination of resistance and specific resistance of a wire.			**3**		

TEXTBOOKS:

1. C. L. Arora, "BSc Practical Physics", B.Sc Practical Physics, S. Chand and Company Ltd, 2007.
2. D. Chattopadhyay and P. C. Rakshit, "An Advanced Course in Practical Physics", New Central Book Agency, 2011.
3. S. Ghosh, "A Text Book of Advanced Practical Physics", New Central Book Agency, 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, "Practical Physics",New Age International (P) Ltd,

Publishers, 2006.
REFERENCESBOOKS :
1. Squires G. L., "Practical Physics", 4th Edition, Cambridge University Press, 2001. 2. Halliday D., Resnick R. and Walker J., "Fundamentals of Physics", 6th Edition, John Wiley and Sons, 2001. 3. Jenkins F.A. and White H.E., "Fundamentals of Optics", 4th Edition, Mc Graw Hill Book Company,2007. 4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007. 5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

Table 1: Mapping of COs with Pos

	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

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

<table>
<tr><td colspan="3">COURSE CODE</td><td>COURSE NAME</td><td>L</td><td>T</td><td colspan="2">P</td><td>C</td></tr>
<tr><td colspan="3">XMT301</td><td>LOGIC AND SETS</td><td>2</td><td>0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td></td><td>L</td><td>T</td><td>P</td><td>SS</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td></td><td>2</td><td>0</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td colspan="9">PREREQUISITE: Foundation course in Mathematics</td></tr>
<tr><td colspan="4">Course outcomes:</td><td colspan="2">Domain</td><td colspan="3">Level</td></tr>
<tr><td colspan="4">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.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Understanding</td></tr>
<tr><td colspan="4">CO2: Define and Explain Theory of inference for a statement calculus, rules of inference, related problems and Indirect method of proof.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Understanding</td></tr>
<tr><td colspan="4">CO3: Define and Explain Predicate Calculus, The statement functions, variables and quantifiers predicate formulae, free and bounded variables and the universe of discourse.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Understanding</td></tr>
<tr><td colspan="4">CO4: Define and Explain The rule of sum and product – permutation – combination of binomial theorem – Multinomial theorem.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Understanding</td></tr>
<tr><td colspan="4">CO5: Define and Explain Mathematical Induction, The pigeon hole principle and The principle of inclusive and exclusive Derangements.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Understanding</td></tr>
</table>

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 Explain 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.	Cognitive	Remembering Understanding

UNIT I Real numbers	**15**
The field axioms- Field properties-Order in R- Absolute value- Completeness – Representation of 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, Pre processors 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 about creating 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

<table>
<tr><td colspan="3">COURSE CODE</td><td>COURSE NAME</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="3">XMT404</td><td>ALGEBRA</td><td>4</td><td>1</td><td>0</td><td>5</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td></td><td>L</td><td>T</td><td>P</td><td>H</td></tr>
<tr><td>5</td><td>0</td><td>0</td><td></td><td>4</td><td>1</td><td>0</td><td>5</td></tr>
<tr><td colspan="8">PREREQUISITE: Nil</td></tr>
<tr><td colspan="4">Course outcomes:</td><td colspan="2">Domain</td><td colspan="2">Level</td></tr>
<tr><td colspan="4">CO1: Define groups, abelian and non-abelian groups with examples and to explain integer under addition and multiplication modulo n.</td><td colspan="2">Cognitive
Psychomotor</td><td colspan="2">Remembering
Guided Response</td></tr>
<tr><td colspan="4">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.</td><td colspan="2">Cognitive</td><td colspan="2">Understanding</td></tr>
<tr><td colspan="4">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.</td><td colspan="2">Cognitive</td><td colspan="2">Understanding</td></tr>
<tr><td colspan="4">CO4: State and Explain Cosets, Index of subgroup, Lagrange’s theorem, order of an element, Normal subgroups, Quotient groups.</td><td colspan="2">Cognitive</td><td colspan="2">Remembering
Understanding</td></tr>
<tr><td colspan="4">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.</td><td colspan="2">Cognitive

Affective</td><td colspan="2">Remembering
Understanding
Receiving</td></tr>
<tr><td colspan="7">UNIT I</td><td>15</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="7">UNIT II</td><td>15</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="8">UNIT III</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="7">UNIT IV</td><td>15</td></tr>
<tr><td colspan="8">Cosets, Index of subgroup, Lagrange’s theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.</td></tr>
<tr><td colspan="7">UNIT V</td><td>15</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td></td><td colspan="4">LECTURE</td><td colspan="2">TUTORIAL</td><td>TOTAL</td></tr>
<tr><td></td><td colspan="4">60</td><td colspan="2">15</td><td>75</td></tr>
<tr><td colspan="8">TEXT BOOKS</td></tr>
</table>

1. S. Narayanan & T. K. Manickavasagam Pillai, “Algebra”, Vol. 1, S. Viswanathan Pvt. Ltd., Chennai, 2004. 2. S. Narayanan & T. K. Manickavasagam Pillai, “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 about creating 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) Lab Experiment: 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

<table>
<tr><td colspan="3">COURSE CODE</td><td colspan="2">COURSE NAME</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="3">XMT502B</td><td colspan="2">Discrete Mathematics</td><td>4</td><td>2</td><td>0</td><td>6</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td colspan="2"></td><td>L</td><td>T</td><td>P</td><td>H</td></tr>
<tr><td>6</td><td>0</td><td>0</td><td colspan="2"></td><td>4</td><td>2</td><td>0</td><td>6</td></tr>
<tr><td colspan="5">PREREQUISITE: Logic and Sets</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Course Outcomes:</td><td colspan="2">Domain</td><td colspan="3">Level</td></tr>
<tr><td colspan="4">CO1: Define and Apply truth tables and the rules of propositional and predicate calculus.</td><td colspan="2">Cognitive</td><td colspan="3">Remembering
Applying</td></tr>
<tr><td colspan="4">CO2: Apply the following methods direct proof, indirect proof, and proof by contradiction, and case analysis to formulate short proofs.</td><td colspan="2">Cognitive</td><td colspan="3">Applying</td></tr>
<tr><td colspan="4">CO3: Solve linear recurrence relation with constant coefficients, non homogeneous recurrence relations and non homogeneous recurrence relations using methods of generating functions.</td><td colspan="2">Cognitive</td><td colspan="3">Applying</td></tr>
<tr><td colspan="4">CO4: Explain Basic theorems on Boolean Algebra, Duality Principle, Boolean functions.</td><td colspan="2">Cognitive</td><td colspan="3">Understanding</td></tr>
<tr><td colspan="4">CO5: Apply Boolean algebra, Logic gates and circuits combinatorial circuits, Boolean expression and karnaugh map.</td><td colspan="2">Cognitive</td><td colspan="3">Applying</td></tr>
<tr><td colspan="7">UNIT I</td><td colspan="2">18</td></tr>
<tr><td colspan="9">Mathematical Logic- Propositional calculus- Basic Logical operators- conditional statements- Bi conditional statement- tautologies- contradictions- equivalence implications.</td></tr>
<tr><td colspan="7">UNIT II</td><td colspan="2">18</td></tr>
<tr><td colspan="9">Norms forms- Theory of inference for the statement calculus- The predicate calculus inference theory and predicate calculus.</td></tr>
<tr><td colspan="7">UNIT III</td><td colspan="2">18</td></tr>
<tr><td colspan="9">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.</td></tr>
<tr><td colspan="7">UNIT IV</td><td colspan="2">18</td></tr>
<tr><td colspan="9">Basic theorems on Boolean Algebra- Duality principle Boolean functions.</td></tr>
<tr><td colspan="7">UNIT V</td><td colspan="2">18</td></tr>
<tr><td colspan="9">Boolean functions- Applications of Boolean algebra- Logic gates and circuits -combinatorial circuits- Boolean expression – karnaugh map.</td></tr>
<tr><td rowspan="2"></td><td colspan="4">LECTURE</td><td colspan="2">TUTORIAL</td><td colspan="2">TOTAL</td></tr>
<tr><td colspan="4">60</td><td colspan="2">30</td><td colspan="2">90</td></tr>
<tr><td colspan="9">TEXT BOOK</td></tr>
<tr><td colspan="9">1. J.B.Tremblay, R. Manohar, “Discrete Mathematical structures with applications to Computer Science”, Tata McGraw Hill, International edition New Delhi, 1997, Reprint 2007.</td></tr>
<tr><td colspan="9">REFERENCE</td></tr>
<tr><td colspan="9">1.M.K. Venkatraman, N.Sridharan & N.Chandrasekaran, “Discrete Mathematics”, The National Publishing company India, 2000.</td></tr>
</table>

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 examples orthogonality, 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 and Explain 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 construct Bilinear 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 → 1, 6 – 10 → 2, 11 – 15 → 3

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

M.SC (MATHEMATICS)
I SEMESTER

COURSE CODE			COURSE NAME	L	T	P	C
YMA101			GROUPS AND RINGS	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4

PREREQUISITE: Basic concepts of sets, groups and rings

Course outcomes:	Domain	Level
CO1: Define and Explain Subgroups, Normal subgroups and Quotient Groups, Lagrange's Theorem.	Cognitive	Remembering Understanding
CO2: Define and Explain Homomorphism Theorems, Isomorphism Theorems, Automorphisms Theorems, Cayley's theorem. Permutation groups, Another Counting principle.	Cognitive	Remembering Understanding
CO3: Define and Explain Sylow's Theorems and their simple applications, Direct Products: External and Internal, Finite Abelian Groups.	Cognitive	Remembering Understanding
CO4: Define and Explain Rings, Subrings, Ideals, Factor Rings, Homomorphism and Integral Domains. Maximal and prime ideals. The field of Quotients of an integral domain.	Cognitive	Remembering Understanding
CO5: Define and Explain Euclidean Ring, A Particular Euclidean Ring, Polynomial Ring, and Polynomial over the Rational Field, Polynomial Rings over Commutative Rings.	Cognitive	Remembering Understanding

UNIT I	**12**
Definition & examples: Groups, Subgroups, Normal subgroups and Quotient Groups, Lagrange's Theorem.	
UNIT II	**12**
Homomorphism Theorems, Isomorphism Theorems, Automorphisms Theorems, Cayley's theorem. Permutation groups, Another Counting principle.	
UNIT III	**12**
Sylow's Theorems and their simple applications, Direct Products: External and Internal, Finite Abelian Groups.	
UNIT IV	**12**
Rings, Subrings, Ideals, Factor Rings, Homomorphism, Integral Domains. Maximal and prime ideals. The field of Quotients of an integral domain.	
UNIT V	**12**
Euclidean Ring, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rational Field, Polynomial Rings over Commutative Rings.	

	LECTURE		TOTAL
	60		**60**

TEXTBOOK

1. Herstein, I.N., "Topics in Algebra", Willey Eastern 1975.
   Unit I - Chapter 2 (Section 2.1 - 2.6)
   Unit II - Chapter 2 (Section 2.7 – 2.11)
   Unit III - Chapter 2 (Section 2.12 – 2.14)
   Unit IV - Chapter 3 (Section 3.1 - 3.6)
   Unit V - Chapter 3 (Section 3.7 – 3.11)

REFERENCES

1. John B. Fraleigh, "A First Course in Abstract Algebra", Narosa Publication, Third Edition, 2003. 2. Cohn P. M., "Basic Algebra", Springer's Publications, Second Edition, 2005.

TABLE 1: 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
Scaled Value	15	10			5	5	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
YMA102			ANALYSIS - I	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4
PREREQUISITE: Basic concepts of real numbers							
Course outcomes:				**Domain**	**Level**		
CO1: Define and Explain the Real and Complex Number Systems.				Cognitive	Remembering Understanding		
CO2: Define and Explain Basic Topology.				Cognitive	Remembering Understanding		
CO3:Define and Explain convergence of sequences and series				Cognitive	Remembering Understanding		
CO4:Define and Explain Continuity of functions				Cognitive	Remembering Understanding		
CO5: Define and Explain the derivative of a real function, the Continuity of Derivatives, Derivatives of Higher Order, and Taylor's Theorem.				Cognitive	Remembering Understanding		
UNIT I The Real and Complex Number Systems							**12**
Ordered sets, The real field, The complex field, Euclidean spaces.							
UNIT II Basic Topology							**12**
Finite, Countable and Uncountable sets, Metric space, Compact sets, Perfect Sets, Connected Sets.							
UNIT III Numerical Sequences and Series							**12**
Convergent sequences (in Metric Spaces), subsequences, Cauchy sequences, Upper and Lower Limits, Some Special Sequences, Series, Series of Negative terms, The root and ratio tests.							
UNIT IV Continuity							**12**

Limits of functions (in metric spaces) Continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotonic functions, Uniform Continuity, Infinite Limits and Limits at Infinity.	
UNIT V Differentiation	**12**
The Derivative of a Real Function, Mean Value Theorems, The Continuity of Derivatives, L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.	

		LECTURE	**TOTAL**
		60	**60**

TEXTBOOK
1. Walter Rudin,"Principles of Mathematical Analysis", (3rd Edition) McGraw-Hill, 2016. Unit I - Chapter 1 (Pages: 3-5, 8-11, 12-16) Unit II - Chapter 2 (Pages: 24 - 42) Unit III - Chapter 3 (Pages: 47-63, 65-69) Unit IV - Chapter 4 (Pages: 83-97) Unit V - Chapter 5 (Section 103-111)
REFERENCES
1. Shanti Narayan,"A Course of Mathematical Analysis", S.Chand & Co, 2005. 2. Apostol, T.M,"Mathematical Analysis", 2nd Edition,1996. 3. Malik, S.C,"Mathematical Analysis", Wiley Eastern Ltd, 2017.

TABLE 1: 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
Scaled Value	15	10			5	5	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**
YMA103			**DIFFERENTIAL EQUATIONS**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**
PREREQUISITE: Differentiation and Integration							
Course outcomes:				**Domain**		**Level**	
CO1: Find The general solution of the homogeneous equations using various methods.				Cognitive		Remembering Understanding	
CO2: Solve the homogeneous linear system with constant coefficients and special functions.				Cognitive		Applying	
CO3: Find the critical points and stability for linear systems by Liapounov's direct method.				Cognitive		Remembering Understanding	
CO4: Solve First order linear partial differential				Cognitive		Applying	

equations using various methods.		
CO5: Solve initial and boundary value problems.	Cognitive	Applying

UNIT I **12**

The general solution of the homogeneous equation – The use of one known solution to find another – The method of variation of parameter – Power series solutions – Series solutions of first order equations – Second order linear equations – ordinary points – Regular singular points – Gauss hyper geometric equations – the point 0 at infinity.

UNIT II **12**

Legendre polynomials – Properties of Legendre polynomials – Bessel functions – The gamma function – Properties of Bessel function – linear systems – Homogeneous linear system with constant coefficients.

UNIT III **12**

The existence and uniqueness of solutions – The method of Successive approximation – Picard's theorem – Types of critical points – Critical points and stability for linear systems – Stability by Liapunov's direct method.

UNIT IV **12**

First order partial differential equations – Linear equations of the first order – Partial differential equations – Compatible systems – Charpit's method – Jacobi's method – Integral surface through a given circle.

UNIT V **12**

Solution of initial and boundary value problems – Characteristics – D'Alembert's solution – Significance of characteristic curves – Laplace transforms solutions for displacement in a string – a long string under its weight – Longitudinal vibration of a elastic bar with prescribed force on one end – free vibrations of string.

	LECTURE	TOTAL
	60	60

TEXTBOOK

1. Simmons, G.F.,"Differential Equations with Applications and Historical Notes", TMH, New Delhi, 2003
2. T. Amarnath, "An Elementary Course in Partial Differential Equations", Narosa, New Delhi, 1997.
   Unit I- Chapter 3: Sections – 15,16,19, Chapter 5: Sections – 26 to 31
   Unit II- Chapter 8: Sections – 44 to 47, Chapter 10: Sections – 54 to 56
   Unit III- Chapter 13: Sections – 68, 69, Chapter 11: Sections – 60, 61
   Unit IV – Chapter 1: Sections – 1.4 to 1.9
   Unit V - Chapter 2: Sections – 2.1, 2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.5.1, 2.5.2

REFERENCES

1. W.T.Reid, "Ordinary Differential Equations", John Wiley, New York, 1971.
2. E.A.Coddington and E.Levinson, "Theory of ODE", Mc Graw Hill Publishing Company, Newyork, 1955.
3. J.N. Sneddon, "Elements of Partial Differential Equations", Mc Graw Hill Publishing Company, Newyork, 1957.

TABLE 1: 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
Scaled Value	10	5	5	5		10			5
Total	2	1	1	1		2			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
YMA104			DISCRETE MATHEMATICS	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4

PREREQUISITE: Algebra

Course outcomes:	Domain	Level
CO1: Define and Explain Basic logical operations.	Cognitive	Remembering Understanding
CO2: Define and Explain the theory of inference for the statement Calculus.	Cognitive	Remembering Understanding
CO3: Solve Recurrence Relations using Generating Functions**.**	Cognitive	Applying
CO4: Define and Explain Lattices and Boolean Algebra.	Cognitive	Remembering Understanding
CO5: Define and Explain Grammar and Languages.	Cognitive	Remembering Understanding

UNIT	Hours
UNIT I Mathematical Logic	**12**
Basic logical operations, conditional and biconditional statements, tautologies, contradiction, Normal forms.	
UNIT II The theory of inference for the statement Calculus	**12**
Rules of inference, Consistency, Automatic Theorem proving, Predicate Calculus, quantifiers, Inference Theory of the Predicate Calculus.	
UNIT III Recurrence Relations and Generating Functions	**12**
Polynomial expressions, telescopic form, recursion theorem, closed form expression, generating function, solution of recurrence relation using generating function.	
UNIT IV Lattices and Boolean Algebra	**12**
Partial ordered sets, Properties of Lattices, Lattices as Algebraic Systems, Boolean Algebra.	
UNIT V Grammar and Languages	**12**
Phrase structure grammars, rewriting rules, derivation sentential forms, language generated by grammar, regular, context free and context sensitive grammar and languages.	
LECTURE	**TOTAL**

		60	**60**

TEXTBOOK

1. P. Tremblay, R. Manohar,"Discrete Mathematical Structure with Applications to Computer Science", Mc Graw- Hill International Edition, 1997.
   Unit I - Chapter 1 (Section 1.1,1.2 & 1.3)
   Unit II - Chapter 1 (Section 1.4 ,1.5 & 1.6)
   Unit IV - Chapter 4 (Section 4.1& 4.2)
   Unit V – Chapter 4 (Section 4.6)
2. Alan Doerr, "Applied Discrete Structure for Computer Science", Pearson Education, 2013
   Unit III – Chapter 8 (Section 8.1,8.2,8.3 &8.5)

REFERENCE

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Mc Graw- Hill International Edition, 2002.

TABLE 1: 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**
Scaled Value	**10**	**5**	**5**	**5**		**10**			**5**
Total	**2**	**1**	**1**	**1**		**2**			**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

<table>
<tr><td colspan="3">COURSE CODE</td><td>COURSE NAME</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="3">YMA1E1</td><td>GRAPH THEORY</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td></td><td>L</td><td>T</td><td>P</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td colspan="8">PREREQUISITE: Basic concepts of Graph Theory</td></tr>
</table>

Course outcomes:	Domain	Level
CO1: Define and Explain Graphs, subgraphs and trees.	Cognitive	Remembering Understanding
CO2: Define and Explain Connectivity - Blocks - Euler tours - Hamilton Cycles.	Cognitive	Remembering Understanding
CO3: Define and Explain Matchings and Coverings in Bipartite Graphs , Edge Chromatic Number and Vizing's Theorem.	Cognitive	Applying
CO4: Define and Explain independent sets and cliques, vertex colorings.	Cognitive	Remembering Understanding
CO5: Define and Explain Plane and planar Graphs, Dual graphs, Euler's Formula , The Five-Color Theorem and the Four- Color Conjecture- Applications.	Cognitive	Remembering Understanding

UNIT I GRAPHS, SUBGRAPHS AND TREES	9
Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency Matrices - Subgraphs - Vertex Degrees - Paths and Connection - Cycles - Trees - Cut Edges and Bonds - Cut Vertices.	
UNIT II CONNECTIVITY, EULER TOURS AND HAMILTON CYCLES	**9**
Connectivity - Blocks - Euler tours - Hamilton Cycles – Applications.	
UNIT III MATCHINGS, EDGE COLOURINGS	**9**
Matchings - Matchings and Coverings in Bipartite Graphs - Edge Chromatic Number - Vizing's Theorem- Applications.	
UNIT IV INDEPENDENT SETS AND CLIQUES, VERTEX COLOURINGS	**9**
Independent sets - Ramsey's Theorem - Chromatic Number - Brooks' Theorem - Chromatic Polynomials- Applications.	
UNIT V PLANAR GRAPHS	**9**
Plane and planar Graphs - Dual graphs - Euler's Formula - The Five - Colour Theorem and the Four-Colour Conjecture- Applications.	

	LECTURE	TOTAL
	45	45

TEXTBOOK

1. J.A.Bondy and U.S.R. Murthy, "Graph Theory and Applications", Macmillan, London, 1976.
   Unit I - Chapter 1 (Section 1.1 - 1.7); Chapter 2 (Section 2.1 - 2.3)
   Unit II - Chapter 3 (Section 3.1 - 3.2); Chapter 4 (Section 4.1 - 4.2)
   Unit III - Chapter 5 (Section 5.1 - 5.2); Chapter 6 (Section 6.1 - 6.2)
   Unit IV - Chapter 7 (Section 7.1 – 7.2); Chapter 8 (Section 8.1 – 8.2, 8.4)
   Unit V - Chapter 9 (Section 9.1 - 9.3, 9.6)

REFERENCES

1. Harary , "Graph Theory" Narosa Publishing House., 2001.
2. A.Gibbons, "Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.
3. R.J.Wilson and J.J.Watkins, "Graphs: An Introductory Approach", John Wiley and Sons, New York, 1989.
4. V.K. Balakrishnan, Schaum's Outlines of "Theory and problems of Graph Theory", Tata McGraw Hill Education Private Limited Delhi, 2004.
5. S.A.Choudum, "A First Course in Graph Theory", MacMillan India Ltd. 1987.

TABLE 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	1	1	1	2	1	1	1
CO2	2	1	1	1	1	2	1	1	1
CO3	2	1	1	1	1	2	1	1	1
CO4	2	1	1	1	1	2	1	1	1
CO5	2	1	1	1	1	2	1	1	1
Scaled Value	10	5	5	5	5	10	5	5	5
Total	2	1	1	1	1	2	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
YMA1E2			CODING THEORY	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

Course outcomes:	Domain	Level
CO1: Define and Explain Error detection, Correction and decoding	Cognitive	Remembering Understanding
CO2: Define and Explain Linear codes	Cognitive	Remembering Understanding
CO3: Define and Explain Linear codes Bounds in coding theory	Cognitive	Remembering Understanding
CO 4: Define and Explain Cyclic codes: Definitions – Generator polynomials – Generator matrix and parity check matrix – Decoding of Cyclic codes	Cognitive	Remembering Understanding
CO 5: Define and Special cyclic codes	Cognitive	Remembering Understanding

UNIT-I	9
Error detection, Correction and decoding: Communication channels – Maximum likelihood decoding – Hamming distance – Nearest neighbourhood minimum distance decoding – Distance of a code	
UNIT-II	**9**
Linear codes: Linear codes – Self orthogonal codes – Self dual codes – Bases for linear codes – Generator matrix and parity check matrix – Encoding with a linear code – Decoding of linear codes – Syndrome decoding.	
UNIT-III	**9**
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-IV	**9**
Cyclic codes: Definitions – Generator polynomials – Generator matrix and parity check matrix – Decoding of Cyclic codes.	
UNIT-V	**9**
Special cyclic codes: BCH codes – Parameters of BCH codes – Decoding of BCH codes – Reed Solomon codes.	

		LECTURE	TOTAL
		45	45

TEXT BOOKS:

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, 7.4 UNIT 5 : Sections 8.1, 8.2

REFERENCES:

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

<table>
<tr><td colspan="3">COURSE CODE</td><td>COURSE NAME</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="3">YMA1E3</td><td>Mathematical Logic</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>C</td><td>P</td><td>A</td><td></td><td>L</td><td>T</td><td>P</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td colspan="8">PREREQUISITE: Discrete Mathematics</td></tr>
</table>

Course outcomes:	**Domain**	**Level**
CO1: Define and Explain Syntax of First-Order Logic, Semantics of First-Order Languages, Structures of First-Order Languages.	Cognitive	Remembering Understanding
CO2: Define and Explain Propositional Logic and Tautology	Cognitive	Remembering Understanding
CO3: Define and Explain Consistency and Completeness and Extensions by definition of first order theories	Cognitive	Remembering Understanding
CO 4: Define and Explain Embeddings and Isomorphisms Compactness theorem, Categoricity and Complete theories	Cognitive	Remembering Understanding
CO 5: Define and Explain Recursive functions, Arithmatization of first order theories and Godel's first Incompleteness theorem.	Cognitive	Remembering Understanding

UNIT-I	**9**
Syntax of First-Order Logic: First Order Languages, Terms and Formulas of a First Order language, First Order Theories. Semantics of First-Order Languages: Structures of First-Order Languages, Truth in a Structure, Model of a Theory	
UNIT-II	**9**
Propositional Logic: Tautologies and Theorems of propositional Logic, Tautology Theorem. Proof in First Order Logic, Meta theorems of a first order theory, e.g. , theorems on constants.	
Equivalence theorem, deduction and variant theorems etc.,	
UNIT-III	**9**
Consistency and Completeness, Lindenbaum Theorem. Henkin Extension, Completeness theorem, Extensions by definition of first order theories, Interpretation theorem.	
UNIT-IV	**9**
Model Theory: Embeddings and Isomorphisms, Lowenheim-Skolem Theorem, Compactness theorem, Categoricity, Complete Theories.	
UNIT-V	**9**
Recursive functions, Arithmatization of first order theories, Decidable Theory, Representability, Godel's first Incompleteness theorem.	

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

TEXT BOOKS:

1. Shoenfield J. R. Mathematical logic, Addison-Wesley Publishing Co.
2. Srivastava S. M. A Course on Mathematical Logic, Universitext, Springe

REFERENCES:

1. Mendelson E. Introduction to Mathematical Logic, Chapman & Hall.

II SEMESTER

COURSE CODE			COURSE NAME	L	T	P	C
YMA201			LINEAR ALGEBRA	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4

PREREQUISITE: Group theory and Ring theory

Course outcomes:	Domain	Level
CO1:Define and Explain Elementary Basic Concepts- Linear Independence and Bases.	Cognitive	Remembering Understanding
CO2: Define and Explain Dual Spaces- Inner Product Space- Modules.	Cognitive	Remembering Understanding
CO3: Solve the Algebra of Linear Transformations to find characteristics roots.	Cognitive	Applying
CO4: Define and Explain Canonical Forms, Triangular form, Nilpotent Transformations, Jordan Form and Rational Canonical form.	Cognitive	Remembering Understanding
CO5: Define and Explain Trace and Transpose, Determinants, Hermitian, Unitary and Normal Transformations, Real Quadratic forms.	Cognitive	Remembering Understanding

UNIT I	**12**
Elementary Basic Concepts- Linear Independence and Bases.	
UNIT II	**12**
Dual Spaces- Inner Product Space- Modules.	
UNIT III	**12**
The Algebra of Linear Transformations- Characteristics Roots- Matrices.	
UNIT IV	**12**
Canonical Forms: Triangular form- Nilpotent Transformations- Jordan Form - Rational Canonical form.	
UNIT V	**12**
Trace and Transpose – Determinants- Hermitian, Unitary and Normal Transformations- Real Quadratic forms.	

	LECTURE	TOTAL
	60	**60**

TEXTBOOK

1. Herstein, I.N.,”Topics in Algebra”, Willey Eastern 1975.
   Unit I - Chapter 4 (Section 4.1 & 4.2)
   Unit II - Chapter 4 (Section 4.4 – 4.5) Unit III - Chapter 6 (Section 6.1 – 6.3)
   Unit IV - Chapter 6 (Section 6.4 – 6.7) Unit V - Chapter 6 (Section 6.8 – 6.11)

REFERENCES

1. John B. Fraleigh, “A First Course in Abstract Algebra”, Narosa Publication, Third Edition, 2013.
2. P. M. Cohn, “Basic Algebra”, Springer’s Publications, Second Edition, 2003.

Table 1: COs vs POs Mapping

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

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
YMA202			**ANALYSIS - II**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**
PREREQUISITE: Basic concepts of convergence and uniform convergence							
Course outcomes:				**Domain**	**Level**		
CO1: Define and Explain Existence, Properties of the Integral, Integration and Differentiation.				Cognitive	Remembering Understanding		
CO2: Define and Explain Uniform convergence and Continuity.				Cognitive	Remembering Understanding		
CO3: Define and Explain Uniform convergence and Integration and Differentiation.				Cognitive	Remembering Understanding		
CO4: Define and Explain Set functions, Construction of Lebesgue Measures, Measurable function, Simple functions in measure.				Cognitive	Remembering Understanding		
CO5: Define and Explain Integration Comparison with the Riemann Integral, Integration of Complex functions, Functions of class J^2.				Cognitive	Remembering Understanding		
UNIT I							**12**
Definition and Existence of the Integral, Properties of the Integral, Integration and Differentiation.							
UNIT II							**12**
Uniform Convergence, Uniform convergence and Continuity.							
UNIT III							**12**
Uniform convergence and Integration, Uniform convergence and Differentiation.							
UNIT IV							**12**
Set functions, Construction of Lebesgue Measures, Measurable function, Simple functions in measure.							
UNIT V							**12**

Integration Comparison with the Riemann Integral, Integration of Complex functions, Functions of class J^2.

	LECTURE	TOTAL
	60	60

TEXTBOOK

1.Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition), McGraw-Hill, 2016
Unit I - Chapter 6 (Pages: 120-135)
Unit II - Chapter 7 (Pages: 143-151)
Unit III - Chapter 7 (Pages: 151-154)
Unit IV - Chapter 11 (Pages: 300-314)
Unit V - Chapter 5 (Section 314-325)

REFERENCES:

1.Shanti Narayan, "A course of Mathematical Analysis", S. Chand & Company Ltd New Delhi, 2005.
2. Apostol, T.M, "Mathematical Analysis", Narosa Book Distributors Pvt Ltd, 2nd Edition, New Delhi, 1996.
3. Malik, S.C, "Mathematical Analysis", Wiley Eastern Ltd. 2017.

Table 1: 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
Scaled Value	15	10			5	5	5	5	5
Total	3	2			1	1	1	1	1

COURSECODE			COURSENAME	L	T	P	C
YMA203			INTEGRAL EQUATIONS, CALCULUS OF VARIATIONS AND TRANSFORMS	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE: Multivariable calculus and vector calculus

Course outcomes:	Domain	Level
CO1: Define and Explain Calculus of variations, Maxima and Minima, the simplest case, Natural boundary and transition conditions , variational notation	Cognitive	Remembering Understanding
CO2: Define and Explain Fourier sine and cosine transforms - Properties Convolution -Solving integral equations - Finite Fourier transform	Cognitive	Remembering Understanding
CO3: Define and Explain Hankel Transform : Definition – Inverse formula – Some important results for Bessel function – Linearity property	Cognitive	Remembering Understanding

CO4: Define and Explain Linear Integral Equations - Definition, Regularity conditions – special kind of kernels –eigen values and eigen functions – convolution Integral	Cognitive	Remembering Understanding
CO5: Define and Explain Volterra Integral equation – examples – some results about the resolvent kernel. Classical FredholmTheory.	Cognitive	Remembering Understanding

UNIT I **12**

Calculus of variations – Maxima and Minima – the simplest case – Natural boundary and transition conditions - variational notation – more general case – constraints and Lagrange's multipliers – variable end points – Sturm - Liouville problems.

UNIT II **12**

Fourier transform - Fourier sine and cosine transforms - Properties Convolution -Solving integral equations - Finite Fourier transform - Finite Fourier sine and cosine transforms - Fourier integral theorem - Parseval's identity.

UNIT III **12**

Hankel Transform **:** Definition – Inverse formula – Some important results for Bessel function – Linearity property – Hankel Transform of the derivatives of the function –Hankel Transform of differential operators – Parseval's Theorem

UNIT IV **12**

Linear Integral Equations - Definition, Regularity conditions – special kind of kernels –Eigen values and eigen functions – convolution Integral – the inner and scalar productof two functions – Notation – reduction to a system of Algebraic equations – examples–Fredholm alternative - examples – an approximate method.

UNIT V **12**

Method of successive approximations: Iterative scheme – examples – Volterra Integral equation – examples – some results about the resolvent kernel. Classical FredholmTheory: the method of solution of Fredholm – Fredholm's first theorem.

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

[1] Ram.P.Kanwal – Linear Integral Equations Theory and Practice, Academic Press 1971.
[2] F.B. Hildebrand, Methods of Applied Mathematics II ed. PHI, ND 1972.
[3] A.R. Vasishtha, R.K. Gupta, Integral Transforms, Krishna Prakashan Media Pvt Ltd, India, 2002.

UNIT – I Chapter 2: Sections 2.1 to 2.9 of [2]
UNIT – II Chapter 7 of [3]
UNIT – III Chapter 9 of [3]; UNIT – IV -Chapters 1 and 2 of [1]
UNIT – V Chapters 3 and 4 of [1]

REFERENCES

[1] S.J. Mikhlin, Linear Integral Equations (translated from Russian), Hindustan Book Agency, 1960.
[2] I.N. Snedden, Mixed Boundary Value Problems in Potential Theory, North Holland, 1966.

Table 1: COs vs POs Mapping

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

COURSE CODE			COURSE NAME	L	T	P	C
YMA204			**OPERATIONS RESEARCH**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**
PREREQUISITE: Nil							

Course outcomes:	Domain	Level
CO1: Define and Explain Decision theory in detail.	Cognitive	Remembering Understanding
CO2: Explain and solve problems in PERT and CPM	Cognitive	Understanding Applying
CO3: Explain deterministic inventory control models and probabilistic Inventory Control Models and **solve** problems by using the methods:	Cognitive	Understanding Applying
CO4: Explain Essential Features of Queueing System, Classification of Queueing Models and find solution of Queueing Models.	Cognitive	Understanding Remembering
CO5: Explain replacement and maintenance models and **solve** problems by using these methods.	Cognitive	Understanding Applying

UNIT I DECISION THEORY	12
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 II PROJECT MANAGEMENT : PERT AND CPM	**12**
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 III DETERMINISTIC INVENTORY CONTROL MODELS	**12**
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 Shortages Probabilistic Inventory Control Models: Single Period Probabilistic Models without Setup cost - Single Period Probabilities Model with Setup cost.	
UNIT IV QUEUEING THEORY	**12**
Essential Features of Queueing System - Operating Characteristic of Queueing System -	

Probabilistic Distribution in Queueing Systems - Classification of Queueing Models - Solution of Queueing Models - Probability Distribution of Arrivals and Departures - Erlangian Service times Distribution with k-Phases.

UNIT V REPLACEMENT AND MAINTENANCE MODELS	12

Failure Mechanism of items - Replacement of Items Deteriorates with Time - Replacement of items that fail completely - other Replacement Problems.

	LECTURE	TOTAL
	60	60

TEXTBOOK

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)
   Unit IV - Chapter-16 (Section 16.1 - 16.9);Appendix 16. A (PP 774-781)
   Unit V - Chapter-17 (Section 17.1 - 17.5)

REFERENCES

1.F.S. Hillier and J.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 and Sons,
New York, 1998.
5. Hamdy A. Taha , "Operations Research" (sixth edition), Prentice - Hall of India Private Limited,
New Delhi. 2007

Table 1: 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
Scaled Value	10	5		5	10		5		5
Total	2	1		1	2		1		1

LIST OF ELECTIVES

COURSE CODE			COURSE NAME	L	T	P	C
YMA2E1			ALGEBRAIC NUMBER THEORY	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE: Nil

Course outcomes:	Domain	Level
CO1: Define and Explain Primes, Congruences, Fermat's, Euler's and Wilson's Theorems	Cognitive	Remembering Understanding
CO2: Define and Explain Techniques of numerical calculations – Public key cryptography – Prime power Moduli – Primitive roots and Power Residues	Cognitive	Remembering Understanding
CO3: Define and Explain Number theory from an Algebraic Viewpoint, The Legendre symbol (a/r) where r is an odd prime – Quadratic Reciprocity– The Jacobi Symbol (P/q) where q is an odd positive integer.	Cognitive	Remembering Understanding
CO4: Define and Explain Equivalence and Reduction of Binary Quadratic Forms, Sums of three squares, Arithmetic Functions – The Mobius Inversion Formula – Recurrence Functions – Combinatorial number theory	Cognitive	Remembering Understanding
CO5: Define and Explain Diophantine Equations – The equation ax+by=c – Simultaneous Linear Diophantine Equations – Pythagorean Triangles	Cognitive	Remembering Understanding

UNIT-I **9**

Introduction – Divisibility – Primes – The Binomial Theorem – Congruences – Euler's totient - Fermat's, Euler's and Wilson's Theorems – Solutions of congruences – The Chinese Remainder theorem.

UNIT-II **9**

Techniques of numerical calculations – Public key cryptography – Prime power Moduli – Primitive roots and Power Residues –Congruences of degree two.

UNIT-III **9**

Number theory from an Algebraic Viewpoint – Groups, rings and fields – Quadratic Residues- The Legendre symbol (a/r) where r is an odd prime – Quadratic Reciprocity – The Jacobi Symbol (P/q) where q is an odd positive integer.

UNIT-IV **9**

Binary Quadratic Forms – Equivalence and Reduction of Binary Quadratic Forms – Sums of three squares – Positive Definite Binary Quadratic forms – Greatest integer Function – Arithmetic Functions – The Mobius Inversion Formula – Recurrence Functions – Combinatorial number theory .

UNIT-V **9**

Diophantine Equations – The equation ax+by=c – Simultaneous Linear Diophantine Equations – Pythagorean Triangles – Assorted examples.

		LECTURE	TOTAL
		45	**45**

TEXT BOOKS:
1. Ivan Niven, Herbert S, Zuckerman and Hugh L, Montgomery, An Introduction to the Theory of Numbers, Fifth edn., John Wiley & Sons Inc, 2004. UNIT I Chapter 1 and Chapter 2 : Sections 2.1 to 2.3 UNIT II Chapter 2 : Sections 2.4 to 2.9 UNIT III Chapter 2 : Sections 2.10, 2.11 and Chapter 3: Sections 3.1 to 3.3 UNIT IV Chapter 3 : Sections 3.4 to 3.7 and Chapter 4 UNIT V Chapter 5: Sections 5.1 to 5.4.
REFERENCES:
1. Elementary Number Theory, David M. Burton W.M.C. Brown Publishers, Dubuque, Lawa, 1989 2. Number Theory, George Andrews, Courier Dover Publications,1994. 3. Fundamentals of Number Theory, William J. Leveque Addison-Wesley Publishing Company, Phillipines, 1977.

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

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**
YMA2E2			**DATA STRUCTURE AND ALGORITHMS**	**3**	**0**	**0**	**3**
C	**P**	**A**		**L**	**T**	**P**	**H**
3	**0**	**0**		**3**	**0**	**0**	**3**

PREREQUISITE: Discrete Mathematics

Course outcomes:	**Domain**	**Level**
CO1: Understand and apply linear data structures	Cognitive	Understanding Applying
CO2: Understand and apply nonlinear data structures	Cognitive	Understanding Applying
CO3: Understand and apply sorting techniques	Cognitive	Understanding Applying
CO 4: Understand and apply graph algorithms	Cognitive	Understanding Applying
CO 5: Design different algorithm techniques.	Cognitive	Understanding Applying

UNIT-I	**9**
ADT – List ADT – Stack ADT – Queue ADT.	

UNIT-II	9
Trees – Binary Trees – Binary Search Trees – AVL Trees – Splay Trees – Tree Traversal – B Trees- B+ Tree	
UNIT-III	**9**
Insertion sort – Shell sort – Heap sort – Merge sort – Quick sort – Bucket sort – External Sorting.	
UNIT-IV	**9**
Topological sort – Shortest path algorithms – Network Flow problems – Minimum Spanning Tree – Applications of Depth First search – NP completeness.	
UNIT-V	**9**
Greedy Algorithms – Divide and Conquer – Dynamic Programming - Randomized Algorithms – Backtracking algorithms.	

		LECTURE	TOTAL
		45	45

TEXT BOOKS /REFERENCE BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education Reprint 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002
3. ReemaThareja, "Data Structures Using C", Oxford University Press, 2011
4. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
5. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education

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
CO 3	3	2	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
Total	15	10	5	5	3	0	5	5	5
Scaled value	3	2	1	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
YMA2E3			FUZZY SETS AND FUZZY LOGIC	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE: Discrete Mathematics

Course outcomes:	Domain	Level
CO1: Define and Explain basic definitions of Crisp sets, the notion of fuzzy sets and basic concepts of fuzzy sets.	Cognitive	Remembering Understanding
CO2: Define and Explain operation on Fuzzy Sets.	Cognitive	Remembering Understanding
CO3: Define and Explain Fuzzy Relations	Cognitive	Remembering Understanding
CO4: Define and Explain Classical Logic.	Cognitive	Remembering
		Understanding
CO5: Define and Explain Fuzzy logic, fuzzy tautologies - contradictions - equivalence and logical proofs.	Cognitive	Remembering Understanding

UNIT I Crisp Sets and Fuzzy Sets	**9**
Crisp sets basic definitions - the notion of fuzzy sets - basic concepts of fuzzy sets.	
UNIT II Operation on Fuzzy Sets	**9**
Fuzzy complement - fuzzy union - fuzzy intersection - combination and general aggregation operations.	
UNIT III Fuzzy Relations	**9**
Crisp and fuzzy relations - binary relation - equivalence and similarity relations - tolerance relations - orderings.	
UNIT IV Classical Logic	**9**
Tautologies - contradictions - equivalence - exclusive OR and exclusive NOR - logical proofs.	
UNIT V Fuzzy Logic	**9**
Fuzzy logic - approximate reasoning - fuzzy tautologies - contradictions - equivalence and logical proofs.	

	LECTURE	TOTAL
	45	45

TEXTBOOKS

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.

Table 1: COs vs POs Mapping

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

COURSE CODE			**COURSE TITLE**	**L**	**T**	**P**	**C**
YMA301			**FIELD THEORY**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**
PREREQUISITE: Algebra							

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.	
UNIT III	**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		TOTAL
60		**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.

TABLE 1: 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
Scaled Value	15	10			5	5	5	5	5
Total	3	2			1	1	1	1	1

COURSE CODE			**COURSE TITLE**	**L**	**T**	**P**	**C**
YMA302			**TOPOLOGY**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**
PREREQUISITE:							

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	**12**
Topological spaces - Basis for a topology - The order topology - The product topology on X x Y - The subspace topology.	
UNIT II Continuous Functions	**12**
Closed sets and limit points-Continuous functions - the product topology - The metric topology. - The metric topology (continued) - Uniform limit theorem.	
UNIT III Connectedness	**12**
Connected spaces - connected subspaces of the Real line - Components and local connectedness.	
UNIT IV Compactness	**12**
Compact spaces - compact subspaces of the Real line - Limit Point Compactness - Local Compactness.	
UNIT V Countability and Separation Axiom	**12**
The Countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization Theorem - The Tietz extension theorem.	

		LECTURE	TOTAL
		60	60

TEXTBOOK
1. James R. Munkres, "Topology", (2nd Edition) PHI Learning Pvt. Ltd., (Third Indian Reprint) New Delhi, 2014 Unit I - Chapter 2: Sections 12 to 17 Unit II - Chapter 2: Sections 18 to 21 (Omit Section 22) Unit III - Chapter 3: Sections 23 to 25 Unit IV - Chapter 3: Sections 26 to 29 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., New York.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.

TABLE 1: 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

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

PREREQUISITE: Analysis		
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)	
UNIT III	**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

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

TABLE 1: 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
Scaled Value	10	5		5	10		5		5
Total	2	1		1	2		1		1

COURSE CODE			COURSE NAME	L	T	P	C
YMA304			**MATHEMATICAL STATISTICS**	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4

PREREQUISITE:

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		TOTAL
60		60

TEXTBOOK

1. Gupta. S.C., and Kapoor. V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and sons, 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.

TABLE 1: 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

LIST OF ELECTIVES

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
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

COURSE CODE			COURSE TITLE	L	T	P	C
YMA3E2			NUMERICAL METHODS	3	0	0	3
C	P	A		L	T	P	H
3	0	0		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**
Solution of Simultaneous Linear Equations-Gauss-Elimination method-Method of factorization-Gauss Jacobi and Gauss-Seidel methods	
UNIT III	**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's one-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.

TABLE 1: 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

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 roperties.	Cognitive	Remembering Understanding
CO2: Define and Explain proficient in the theory of Modules	Cognitive	Remembering Understanding
CO3: Define and Explain the methods of decomposition of rings.	Cognitive	Remembering Understanding
CO 4: Define and Explain Chain conditions – Primary decomposition in Noetherian rings.	Cognitive	Remembering Understanding
CO 5: Define and Explain Artin rings – Discrete valuation rings – 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.
2. N.S. Gopalakrishnan, Commutative Algebra, Oxonian Press Pvt. Ltd, New Delhi, 1988. R.Y.Sharp, Steps in Commutative Algebra, Cambridge University Press, 1990.

COURSE CODE			COURSE NAME	L	T	P	C
YMA401			COMPLEX ANALYSIS	4	0	0	4
C	P	A		L	T	P	H
4	0	0		4	0	0	4

PREREQUISITE:

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	**12**
Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauchy's Theorem for rectangle- Cauchy's Theorem for disc.	
UNIT II	**12**
The Index of a point - Integral Formula – Higher derivatives – Removable singularities – Taylor's theorem – Zeros and Poles – The Local Mapping – The Maximum Principle.	
UNIT III	**12**
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	**12**
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	**12**
Weierstrass's Theorem – The Taylor Series – The Laurent Series – Partial Fractions- Jensen's Formula – Hadamard's Theorem.	

	LECTURE		TOTAL
	60		**60**

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.

TABLE 1: 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

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
YMA402			**FUNCTIONAL ANALYSIS**	**4**	**0**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**4**	**0**	**0**	**4**

PREREQUISITE:

COURSE OUTCOMES:

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	**12**
Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems.	
UNIT II	**12**
Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.	
UNIT III	**12**
Bounded Inverse Theorem – Spectrum of a Bounded Operator.	
UNIT IV	**12**
Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.	
UNIT V	**12**
Bounded Operators and adjoint, Normal , Unitary and Self-adjoint Operators.	

	LECTURE		**TOTAL**
	60		**60**

TEXTBOOK

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

REFERENCES

1. G.F. Simmons, "Introduction to Topology and Modern Analysis", 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.

TABLE 1: 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

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

PREREQUISITE: Probability and Statistics

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

UNIT I: Mathematical Modeling through Ordinary Differential Equations of First order	**9+3**
Linear Growth and Decay Models – Non-Linear Growth and Decay Models –Compartment Models – Dynamics problems – Geometrical problems.	
UNIT II: Mathematical Modeling 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 Modeling through Ordinary Differential Equations of Second Order	**9+3**
Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modeling through Linear Differential Equations of Second Order –Miscellaneous Mathematical Models.	
UNIT IV : Mathematical Modeling 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 Modeling through Graphs	**9+3**
Solutions that can be Modeled through Graphs – Mathematical Modeling interims of Directed Graphs, Signed Graphs, Weighted Digraphs and Un oriented Graphs.	

		LECTURE	TUTORIAL	TOTAL
		45	**15**	**60**

TEXTBOOKS

1 .J.N. Kapur, Mathematical Modeling, 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, 1988.