Criterion 1 – Curricular Aspects

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.2	Percentage of Programmes where syllabus revision was carried out during academic year 2022-23

DEPARTMENT OF MATHEMATICS

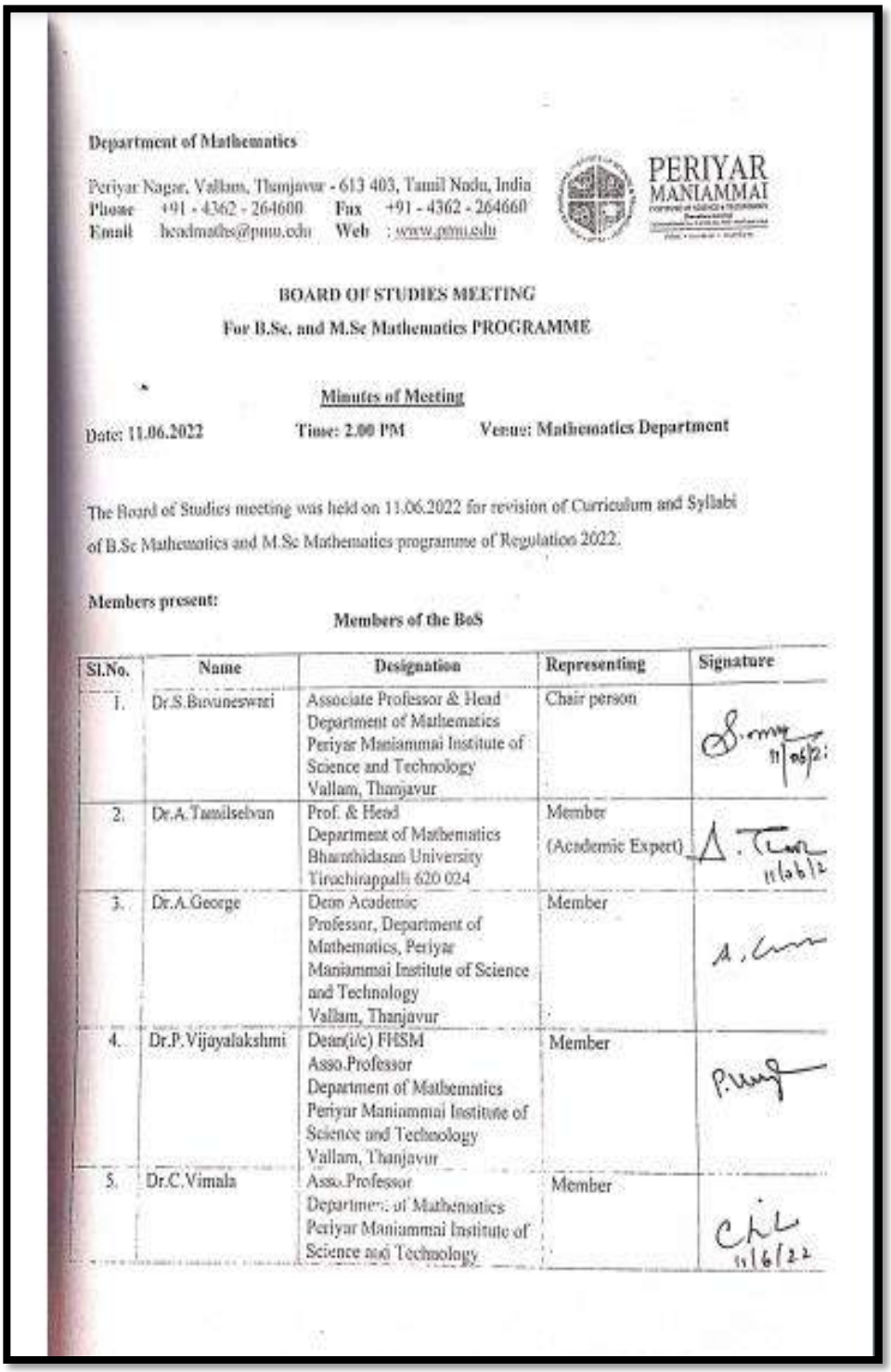
Sl. No.	Programme Code	Programmename	Year of Introduction	Year of revision	Percentage of Syllabus content added or replaced
01.	164	B.Sc. Mathematics (Full Time)	2017-18	2022	39.39%
02.	359	M.Sc.–Mathematics (Full Time)	2014-15	2022	45.83%

S.No	Contents
1.	Minutes of Board of Studies
2.	Extracts of minutes of the Academic Council Meeting
3.	Curriculum and Syllabus of the programme – Before Revision
4.	Curriculum and Syllabus of the programme – After Revision

Legend : Highlighted Color - Red – Indicates courses which are removed from syllabus before revision

Highlighted Color - Green – Indicates courses which are removed from syllabus after revision

1. a. Minutes of the Board of Studies for B.SC AND M.SC- MATHEMATICS (Full Time) held on 11.06.2022



Department of Mathematics

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PERIYAR MANIAMMAI

BOARD OF STUDIES MEETING

For B.Sc. and M.Sc Mathematics PROGRAMME

Minutes of Meeting

Date: 11.06.2022 **Time: 2.00 PM** **Venue: Mathematics Department**

The Board of Studies meeting was held on 11.06.2022 for revision of Curriculum and Syllabi of B.Sc Mathematics and M.Sc Mathematics programme of Regulation 2022.

Members present:

Members of the BoS

Sl.No.	Name	Designation	Representing	Signature
1.	Dr.S.Buvaneswari	Associate Professor & Head Department of Mathematics Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Chair person	11/06/22
2.	Dr.A.Tamilselvan	Prof. & Head Department of Mathematics Bharathidasan University Tiruchirappalli 620 024	Member (Academic Expert)	11/6/22
3.	Dr.A.George	Dean Academic Professor, Department of Mathematics, Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Member	
4.	Dr.P.Vijayalakshmi	Dean(i/c) FHSM Asso.Professor Department of Mathematics Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Member	
5.	Dr.C.Vimala	Asso.Professor Department of Mathematics Periyar Maniammai Institute of Science and Technology	Member	11/6/22

6.	Dr A Sasikala	Vallam, Thanjavur Asso Professor Department of Mathematics Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Member	11/6/22
7.	Dr P N Sudha	Assistant Professor Department of Mathematics Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Member	9/6/22
8.	Ms K Rajeswari	Assistant Professor Department of Mathematics Periyar Maniammai Institute of Science and Technology Vallam, Thanjavur	Member	11/6/22

- **A. FEEDBACK ON CURRICULAR ASPECTS**

The feedback were collected and analyzed during 2018-19, 2019-20 and 2020-21 from the following stake holders

- Teachers
- Employers
- Alumni
- Students
- Industrialist

In addition, the feedback from Academic Expert, Teachers, Alumni and Students who participated in Department Advisory Committee (DAC) Meeting were presented. The action taken for the feedbacks are given as "Remarks" in Table II.

- **B. CURRICULUM INTERVENTION BASED ON CO ATTAINMENT**

The CO attainment and PO attainment for the courses of B.Sc Programme were presented to the members. The courses whose CO attainment was consistently below the target values were discussed. This has been considered as one of the point for syllabus modification for some courses and documented in the Table II.

- **C. PRESENTATION OF CURRICULUM AND SYLLABUS**

All the courses which are framed by the department of Mathematics are presented individually. The deletion, addition and introduction of new courses related details are tabulated for all courses in the following table.

Table II: Discussions on courses with actions as remarks - **B.Sc Mathematics**

S.No	Sem	New Course Name	Course content Deletion/ Addition/New	Percentage of change	Remarks
1	I	Tamil – I/ Foundational Tamil- I	-	100%	Language
2	I	English – I	-	100%	Language
3	I	Differential Calculus and Trigonometry	-	60%	3 units changed
4	I	Analytical geometry 3-D and Integral Calculus	-	60%	3 units changed
5	I	Physics – I	-	60%	3 units changed
6	I	Physics Practical - I	-	70%	Introduced 7 new experiments
7	I	Human Ethics, Values, Rights and Gender Equality	cutting edge	40%	University Mandatory Course
8	II	Tamil – II/	Added as New	100%	Language

		Foundational Tamil – II	Course		
9	II	English – II	-	100%	Language
10	II	Classical Algebra	Added as New Course	100%	Based on requirements
11	II	Sequence and Series	-	50%	2.5 units changed
12	II	Physics – II	-	60%	3 units changed
13	II	Physics Practical - II	-	80%	Introduced 8 new experiments
14	II	Quantitative Aptitude – I	Added as New Course	100%	Feedback received from stakeholders
15	II	Environmental Studies	cutting edge	40%	University Mandatory Course
16	III	Differential Equations and Laplace Transforms	-	-	-
17	III	Vector Calculus, Fourier Series and Fourier Transforms	-	20%	1 unit changed
18	III	Mathematical Statistics – I	-	40%	-
19	III	Mathematical Statistics Practical – I	Added as New Course	100%	Feedback received from stakeholders
20	III	Quantitative Aptitude – II	Added as New Course	100%	Feedback received from stakeholders
21	III	Disaster Management	cutting edge	-	University Mandatory Course
22	IV	Abstract Algebra	Added as New Course	100%	-
23	IV	Mechanics	-	-	-
24	IV	Mathematical Statistics – 2	Added as New Course	100%	Feedback received from stakeholders
25	IV	Mathematical Statistics Practical – 2	Added as New Course	100%	Feedback received from stakeholders
26	IV	Quantitative Aptitude – III	Added as New Course	100%	Feedback received from stakeholders
27	IV	Introduction to Entrepreneurship Development	cutting edge	100%	University Mandatory Course
28	V	Real Analysis	-	-	-
29	V	Discrete Mathematics	-	20%	-

30	V	Numerical Methods	-	-	-
31	V	Number Theory	-	20%	-
32	V	Graph Theory	-	40%	-
33	V	Mathematical Modeling	Added as New Course	100%	Feedback received from stakeholders
34	V	Fundamentals of Data Science & R Progamming	Added as New Course	100%	Feedback received from stakeholders
35	V	Quantitative Aptitude – IV	Added as New Course	100%	Feedback received from stakeholders
36	VI	Complex Analysis	-	-	-
37	VI	Operations Research	-	20%	-
38	VI	Fuzzy sets and its applications	Added as New Course	100%	Feedback received from stakeholders
39	VI	Recent Trends in Industrial Mathematics	Inter disciplinary Added as New Course	100%	Feedback received from stakeholders
40	VI	Astronomy	-	20%	-
41	VI	Stochastic Processes	-	40%	-
42	VI	Project	-	-	-
43	VI	Cyber Security	cutting edge	100%	University Mandatory Course

- **LIST OF NEWLY INTRODUCED COURSES IN REGULATION 2022**

B.Sc Mathematics (39.39%)

S.No	Name of the course
1.	Classical algebra
2.	Quantitative Aptitude – I
3.	Mathematical Statistics Practical – 1
4.	Quantitative Aptitude – II
5.	Abstract Algebra
6.	Mathematical Statistics – 2
7.	Mathematical Statistics Practical – 2
8.	Quantitative Aptitude – III
9.	Mathematical Modeling
10.	Fundamentals of Data Science & R Programming
11.	Quantitative Aptitude – IV
12.	Fuzzy sets and its applications
13.	Recent Trends in Industrial Mathematics

Table II b: Discussions on courses with actions as remarks **M.Sc Mathematics**

S.No	Sem	New Course Name	Course content Deletion/ Addition/New	Percentage of change	Remarks	Category
1	I	Algebra - I	Few topics added	100%	Feedback received from stakeholders Already existed in the name of Groups and Rings in First Semester	Employability
2	I	Real Analysis - I		No change	Already existed in the name of Analysis I in First Semester	Employability
3	I	Graph Theory		No change		Employability
4	I	Ordinary Differential Equations		40 %	Feedback received from stakeholders Already existed in the name of Differential Equations in First Semester	Employability
5	I	Optimization Techniques		40%	Feedback from stakeholders Already Existed in the name of Operation Research in Second Semester	Employability
6	I	Fuzzy sets and Fuzzy logic		No Change	Shifted from Second Semester	Employability
7	I	Coding Theory		No Change		Skill Enhancement
8	I	Neural Networks	New Course	100 %	Feedback received from stakeholders	Skill Enhancement
9	II	Algebra -II	New Course	100 %	Feedback received from stakeholders	Employability
10	II	Real Analysis -II	New Course	100 %	Feedback received from stakeholders	Employability
11	II	Partial Differential Equations	New Course	100 %	Feedback received from stakeholders	Employability
12	II	Classical Dynamics	New Course	100 %	Feedback received from stakeholders	Employability

13	II	Fluid Dynamics	New Course	100 %	Feedback received from stakeholders	Employa bility
14	II	Combinatorics	New Course	100 %	Feedback received from stakeholders	Employa bility
15	II	Cryptography	New Course	100 %	Feedback received from stakeholders	Skill Enhance ment
16	II	Computer Programming (C++ Theory and Lab)	New Course	100 %	Feedback received from stakeholders	Skill Enhance ment
17	III	Topology		No Change		Employa bility
18	III	Integral Equations, Calculus of Variations and Transforms		No Change	Shifted from Second Semester	Employa bility
19	III	Functional Analysis		No Change	Shifted from Fourth Semester	Employa bility
20	III	Differential Geometry	New course	100%	Feedback from stakeholders	Employa bility
21	III	Complex Analysis		No Change	Shifted from Fourth Semester	Employa bility
22	III	Elements of Stochastic Processes	New course	100 %	Feedback from stakeholders	Employa bility
23	III	Mathematical Modeling		No Change	Shifted from Fourth Semester	Employa bility
24	III	Data Analysis using SPSS		No Change		Skill Enhance ment
25	IV	Project Work				Skill Enhance ment

- **LIST OF NEWLY INTRODUCED COURSES IN REGULATION 2022**
  M.Sc Mathematics (45.83%)

S.No	Name of the course
1	Neural Networks
2	Algebra II
3	Real Analysis II
4	Partial Differential Equations
5	Classical Dynamics
6	Fluid Dynamics
7	Combinatorics
8	Cryptography
9	Computer Programming (C++ Theory and Lab)
10	Elements of Stochastic Processes
11	Differential Geometry

Table III b: Table of courses removed with remarks **M.Sc Mathematics**

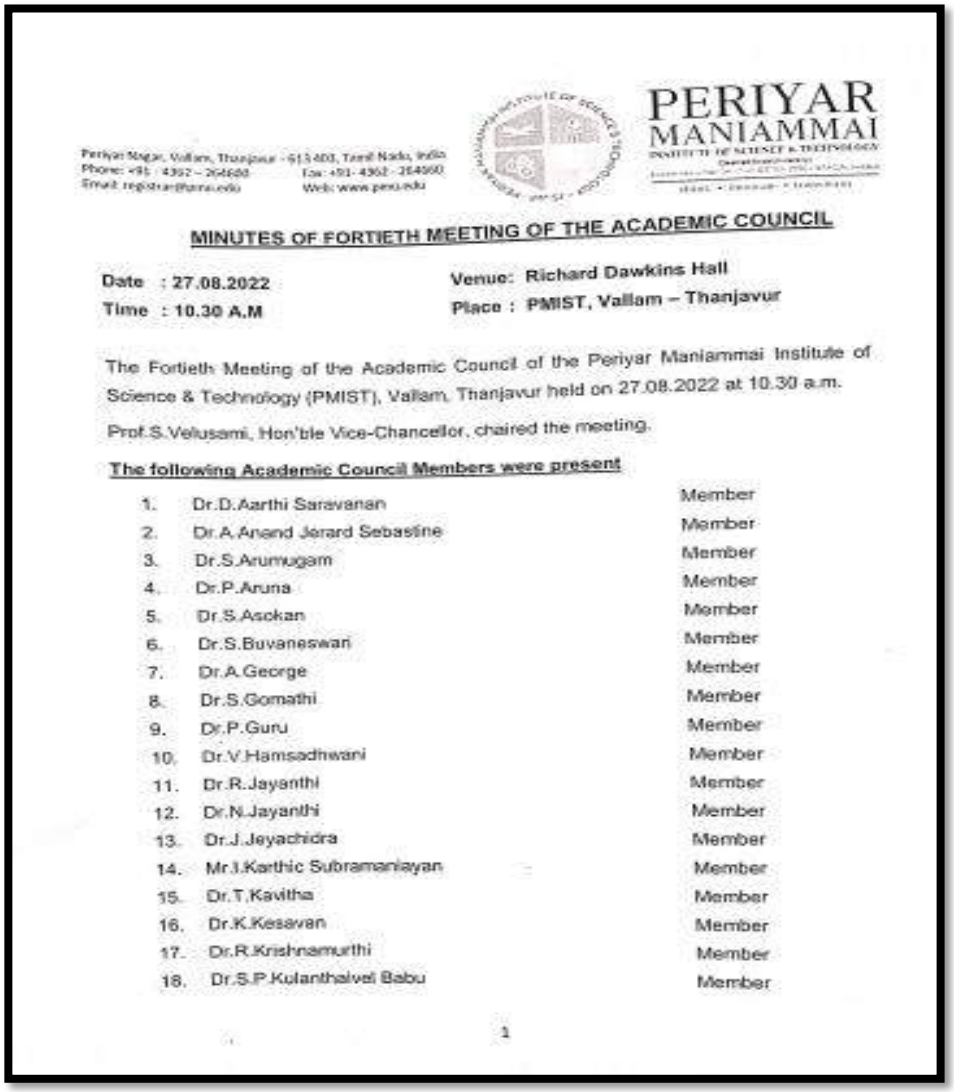
S.No	Course Code and Name	Remarks
1	Discrete Mathematics	Already Studied in UG
2	Mathematical Logic	Feedback received from stakeholders
3	Linear Algebra	Already Studied in UG
4	Analysis II	Feedback received from stakeholders
5	Data structures and Algorithms	Feedback received from stakeholders
6	Field Theory	Feedback received from stakeholders
7	Mathematical Statistics	Feedback received from stakeholders
8	Numerical Methods	Already Studied in UG
9	Commutative Algebra	Syllabus included in Algebra II
10	Automata Theory	Feedback received from stakeholders
11	Algebraic Number Theory	Feedback received from stakeholders

- **PERCENTAGE CHANGE IN THE SYLLABUS**

b. M.Sc Mathematics

Number of new courses added = 11 = 45 credits
Number of old courses removed = 11 = 41 credits
% change = (45/92) x 100 = 48.91%

2. Extracts of minutes of the Academic Council Meeting



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PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

MINUTES OF FORTIETH MEETING OF THE ACADEMIC COUNCIL

Date : 27.08.2022
Time : 10.30 A.M

Venue: Richard Dawkins Hall
Place : PMIST, Vallam – Thanjavur

The Fortieth Meeting of the Academic Council of the Periyar Maniammai Institute of Science & Technology (PMIST), Vallam, Thanjavur held on 27.08.2022 at 10.30 a.m.

Prof.S.Velusami, Hon'ble Vice-Chancellor, chaired the meeting.

The following Academic Council Members were present

1.	Dr.D.Aarthi Saravanan	Member
2.	Dr.A.Anand Jerard Sebastine	Member
3.	Dr.S.Arumugam	Member
4.	Dr.P.Aruna	Member
5.	Dr.S.Asokan	Member
6.	Dr.S.Buvaneswari	Member
7.	Dr.A.George	Member
8.	Dr.S.Gomathi	Member
9.	Dr.P.Guru	Member
10.	Dr.V.Hamsadhwani	Member
11.	Dr.R.Jayanthi	Member
12.	Dr.N.Jayanthi	Member
13.	Dr.J.Jeyachidra	Member
14.	Mr.I.Karthic Subramaniayan	Member
15.	Dr.T.Kavitha	Member
16.	Dr.K.Kesavan	Member
17.	Dr.R.Krishnamurthi	Member
18.	Dr.S.P.Kulanthaivel Babu	Member

But, as per the recommendations of the Board of Studies the new course BBA.-(Hospitality Management) is offered.

The matter is placed before the Academic Council for approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabi of I to VI Semester of BBA.-(Hospitality Management) under Full-Time (Regulation 2022).

DEPARTMENT OF MATHEMATICS

FHSM M.Sc.-Maths 40.5.4

TO CONSIDER AND APPROVE the Curriculum and Syllabi for I to IV Semester for M.Sc Mathematics programme (Regulation 2022) for the candidates admitted from 2022–23 onwards.

Notes:

The Board of Studies of Department of Mathematics recommended the Curriculum and Syllabi for I to IV Semester for M.Sc. Mathematics programme under full time(Regulation 2022) for the candidates admitted from 2022 –23 onwards.

The matter is placed before the Academic Council for Approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabi for I to IV Semester for M.Sc Mathematics programme (Regulation 2022) for the candidates admitted from 2022–23 onwards.

FHSM B.Sc.-Maths 40.5.5

TO CONSIDER AND APPROVE the Curriculum and Syllabi for I to VI Semester for B.Sc.-Mathematics programme (Regulation 2022) for the candidates admitted from 2022–23.

Notes:

The Board of Studies of Department of Mathematics recommended the Curriculum and Syllabi for I to VI semester for B.Sc.-Mathematics programme under full time (Regulation 2022) for the candidates admitted from 2022-23.

The matter is placed before the Academic Council for Approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabi for I to VI Semester for B.Sc -Mathematics programme (Regulation 2022) for the candidates admitted from 2022-23.

FHSM Maths 40.5.6

TO CONSIDER AND APPROVE the list of Value Added Courses to be offered by the department in the academic year 2022-23.

1. Quicker Mathematics
2. C++
3. LaTeX
4. Python Programming
5. Matlab
6. SAP

Notes:

The Board of Studies of Department of Mathematics recommended the above list of Value Added Courses (Regulation 2022).

The matter is placed before the Academic Council for Approval.

Resolution

RESOLVED TO APPROVE the above list of Value Added Courses.

DEPARTMENT OF COMMERCE

FHSM B.Com.-Hons 40.5.7

TO CONSIDER AND APPROVE the Curriculum and Syllabi for B.Com (Hons.) under Full-Time (Regulation 2022).

Notes:

The Board of Studies of Department of Commerce recommended the Curriculum and Syllabi for I to VI Semester B.Com (Hons.) under Full-Time (Regulation 2022).

The matter is placed before the Academic Council for approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabi for B.Com (Hons.) under Full-Time (Regulation 2022).

3.a. Curicullum and Syllabus of the programme – Before Revision

B.Sc. (Mathematics) Syllabus Before Revision
REGULATION – 2018

SEMESTER I								
Type	**ɔurse Code**	**Course Name**	**L**			**S**		
AECC 1	XGL101	Communication Skills in English	2					
LAN	XGL102A/ XGL102B	AriviyalTamil /ComprehensiveEnglish	3					
CC 1	XPG103	Fundamental Physics	3					
C 2 (DSC 2A)	XMT104	Foundation Course in Mathematics	4					
C 3 (DSC 3A)	XMT105	Differential Calculus & Integral Calculus	4					
UMAN 1	XUM106	Human Ethics, Values, Rights and Gender Equality	3					
CC 1 lab	XPG107	Fundamental Physics Lab	0					
		Total	**19**			**3**		

SEMESTER II								
Type	**Course Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
AECC 2	XGL201	English for Effective Communication	2	0	0	0	2	2
AECC 3	XES202	Environmental Studies	2	0	0	1	3	2
CC 4	XPG 203	Modern Physics	3	1	0	0	4	4
CC 5 (DSC 2B)	XMT204	Differential Equations & Laplace Transforms	4	1	0	0	5	5
CC 6 (DSC 3B)	XMT205	Sequences and Series	4	1	0	0	5	5
CC 4 Lab	XPG206	Modern Physics Lab	0	1	2	0	3	2
		Total	**15**	**4**	**2**	**1**	**22**	**20**

SEMESTER III								
Type	**Course Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 1	XMT301	Logic and Sets	2	0	0	2*	2	2
CC 7	XMT302	Programming in C	3	1	0	0	4	4
CC 8 (DSC 2C)	XMT303	Real Analysis	4	1	0	0	5	5
CC 9 (DSC 3C)	XMT304	Analytical Geometry 3D	4	1	0	0	5	5
GE 1		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC 7 lab	XMT305	Programming in C – Practical	0	1	2	0	3	2
UMAN 2	XUM306	Disaster Management	0	0	0	3*	0	0
Minor Course * Extra Credit		Office Automation (15 hours)	0	0	0	0	0	1*
		Total	**16**	**4**	**2**	**5***	**22**	**21+1***

SEMESTER IV								
Type	**Course Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 2	XMT401	Theory of Equations	2	0	0	2*	2	2
CC 10	XMT402	Introduction to Matlab	3	1	0	0	4	4
CC 11 (DSC 2D)	XMT403	Vector Calculus and Fourier Series	4	1	0	0	5	5
CC 12 (DSC 3D)	XMT404	Algebra	4	1	0	0	5	5
GE 2		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC 10 Lab	XMT405	Introduction to Matlab - Practical	0	1	2	0	3	2
Minor Course * Extra Credit		Animation Software I (15 hours)	0	0	0	0	0	1*
		Total	**16**	**4**	**2**	**2***	**22**	**21+1***

SEMESTER V								
Type	**Course Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 3	XMT501	Probability and Statistics	2	0	0	2*	2	2
DSE 1A	XMT502A	Matrices	4	2	0	0	6	6
	XMT502B	Discrete Mathematics						
DSE 2A	XMT503A	Numerical Methods	4	2	0	0	6	6
	XMT503B	Mechanics						
DSE 3A	XMT504A	Linear Algebra	4	2	0	0	6	6
	XMT504B	Astronomy						
GE 3		*Open Elective - To be chosen by	3	0	0	0	3	3
Minor Course * Extra Credit		Animation Software II (15 hours)	0	0	0	0	0	1*
		Total	**17**	**6**	**0**	**2***	**23**	**23+1***

SEMESTER VI								
Type	**Course Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 4	XMT601	Graph Theory	2	0	0	2*	2	2
DSE 1B	XMT602A	Complex Analysis	4	2	0	0	6	6
	XMT602B	Number Theory						
DSE 2B	XMT603A	Linear Programming	4	2	0	0	6	6
	XMT603B	Stochastic Processes						
DSE 3B	XMT604	Project	0	0	0	0	8	6
	–	NSS/NCC/NSO....	0	0	0	0	0	1*

Total	10	4	0	2*	22	20+1*

L - Lecture **T- Tutorial** **P – Practical** **C-Credit**

COURSE CODE	**XGL101**	**L**	**T**	**P**	**SS**	**H**	**C**
COURSE NAME	**COMMUNICATION SKILLS IN ENGLISH**	**2**	**0**	**0**	**0**	**2**	**2**
C:P:A - 3:0:0							

COURSE OUTCOMES:		**Domain**	**Level**
CO1	***Explain*** the process of communication and its types	Cognitive	Understanding
CO2	***Recall*** various sounds and use it in proper context	Cognitive	Remembering
CO3	***Organise*** meeting events and recording it constructively	Cognitive	Applying
CO4	***Adapt*** methods of framing questions and using punctuations	Cognitive	Creating
CO5	***Demonstrate*** the basic skills at the time of interview and presentations	Cognitive	Understanding

SYLLABUS		**HOURS**
UNIT I	**The Process of Communication**	
Communication- the process of communication - barriers of communication - different types of communication		9
UNIT II	**Phonetics**	
Pronunciation – Vowels – Consonants – Transcription of Words and Sentences		9
UNIT III	**Report Writing**	
Organizing successful meeting, One to one meeting, editing, criteria for successful meetings, memo, e mails		9
UNIT IV	**Grammar**	
Articles – Question Tag –Punctuation – Types of Sentences – Types of Questions, Cause and Effect.		9
UNIT V	**Presentation Skills**	
Presentation skills, Importance of body language in presentations, Verbal and Non Verbal communication		9
	Total Hours	**45**

TEXT BOOKS

Sanghita Sen. Communication and Language Skills.Cambridge Press, Chennai, 2015

Sumant. *Technical English.*Vijay Nicole Imprints, Chennai, 2011

Dorathy adams. Everyday English. Cengage Learning, New Delhi, 2009

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
After the completion of the course, students will be able to			
CO1	***Recognize(milahsk; fhZjy;)***gy;NtWmwptpay; Jiwrhu;e;jEl;gq;fs;>fiyr; nrhy;yhf;fcj;jpfs; Nghd;wtw;iwj; jkpo;nkhop %yk; mwpe;Jnfhs;sy;.	Cognitive	Remember
CO2	***Choose(njupTnra;jy;)***tlnkhopNtu;r;nrhw;fs;>Gtpapay;>epytpay; gw;wpg; goe;jkpo; ,yf;fpaq;fs; %yk; mwpe;Jnfhs;sy;.	Cognitive	Remember
CO3	***Describe(tpsf;Fjy;)***njhy;fhg;gpak; %yk; mwptpay; nra;jpfisczu;jy;.	Cognitive	Understand
CO4	***Apply (gad;gLj;Jjy;)***gy;NtWfy;tpj;Jiwrhu;e;jgpupTfs;>gy;NtWfy;tpj;Jiwrhu;e;jgpupTfs; Fwpj;JnjspTngwy;.	Cognitive	Apply
CO5	***Analyze(gFj;jy;)***mwptpay; rpWfijfspd; Njhw;wk; kw;Wk; tsu;r;r pepiy ehlfq;fspd; gq;F Fwpj;J njspTngWjy;.	Cognitive	Analyze

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;fcj;jpfs; - El;gkhdNtWghLfisczu;e;Jnrhy;yhf;fk; nra;jy; - fiyr;nrhw;fs; - ,e;jpankhopfSf;Fg; nghJthdfiyr; nrhw;fiscUthf;Fjy; - tlnkhopNtu;r;nrhw;fiskpFjpahff; nfhz;bUj;jiyg; gad;gLj;Jjy;.		
myF– 2	**gpwmwptpay; Jiwfs;**	**9**
Gtpapay;>epytpay; gw;wpgoe;jkpo; ,yf;fpak; Fwpg;gpLk; jfty;fs; - njhy;fhg;gpak Fwpg;gpLk; capupay;>kz;zpay; gw;wpambg;gilr; nra;jpfs; - jkpo; kUj;Jtf; fy;tp - mwptpay jkpOf;F ,jopay; cj;jpfs; - tsu; jkpo;.		
myF– 3	**gy;NtWfiyfspy; mwptpay;**	**9**
nkhopapay; fy;tp– fl;llf; fiyf;fy;tp– rKjhaf;fy;tp–Nra;ikf;fy;tp– kz;zpay;>Gtpapay;>fzf;fpay; Mfpait ,ize;jfy;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;jrpWfijfs; - rpWfij tiffs; - ey;yrpWfijcUthf;fk; - tuyhW– r%fk; - nkhopngau;g;Gkw;Wk; mwptpay; rpWfijfs;.		
myF– 5	**mwptpay; jkpopy; ehlfq;fspd; gq;F**	**9**
ehlfk; - ehlf ,yf;fzk;> ,Utifehlfq;fs; - gbg;gjw;Fupaehlfk; - ebg;gjw;Fupaehlfk; - rupj;jpuehlfk;>r%fehlfk; - eifr;Ritehlfq;fs; - mnkr;#u; ehlfq;fs; - njhopy;Kiwehlfq;fs;.		

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

Nkw;ghu;itEhy;fs;:

1. mwptpay; jkpo; - lhf;lu; th.nr. Foe;ijr;rhkp
2. tsu; jkpo; - ,jo;fs;
3. ,yf;fpatuyhW– rpWfijgw;wpaJ

4. ,yf;fpatuyhW– Gjpdk; gw;wpaJ

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

Mapping of COs with GAs:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
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
Total	0	0	0	0	0	0	0	2	2	6	2	0
Scale	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

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	1	1	1			1		

1 – 5 -> 1 6 – 10 -> 2 -11 – 15 -> 3

3–Strong Correlation, 2–Medium Correlation, 1–Low Correlation, 0–No Correlation

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

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

A Sundaravelusamy, " Allied Physics I", Priya Publications, 2009. R. Murugesan, I B.Sc. "Ancillary Physics", S. Chand & Co., 2010.
References
Saigal. S, "Sound", Chand & Co., Delhi,1990 Brijlal and Subramanian, "Elements of properties of matter", S. Chand Limited, 1974. Brijlal and Subramanian, "Heat and Thermodynamics", S. Chand Limited,2008 Brijlal and Subramanian, "Optics", S. Chand Limited,2012.

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

3–Strong Correlation, 2–Medium Correlation, 1–Low Correlation, 0–No Correlation

COURSE CODE			**COURSE NAME**	**L**	**T**	**P**	**C**
XMT 104			**FOUNDATION COURSE IN MATHEMATICS**	**4**	**1**	**0**	**5**
C	**P**	**A**		**L**	**T**	**P**	**H**
5	**0**	**0**		**4**	**1**	**0**	**5**

PREREQUISITE: Basic concept of Algebra and Trigonometry

COURSE OUTCOMES:

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.

COs VS POs Mapping:

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

XMT 105			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:

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 integrationusing 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, $\log(1+x)$, $(1+x)^m$, 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

REFERENCE

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
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	**XUM 106**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**Human Ethics, Values, Rights and Gender Equality**	**3**	**0**	**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

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	SS	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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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

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
Text Books:			
		Psychomotor	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**

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**	**PO 10**	**PO 11**	**PO 12**	**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

COURSE CODE	XGL201	L	T	P	SS	H	C
COURSE NAME	ENGLILSH FOR EFFECTIVE COMMUNICATION	2	0	0	0	2	2
C:P:A - 2:0:0							

COURSE OUTCOMES:		Domain	Level
CO1	***Explain*** the process of listening and its characteristics	Cognitive	Understanding
CO2	***Practicing*** the types of speeches	Cognitive	Apply
CO3	***Recognize*** the basic expressions and using it effectively	Cognitive	Understanding
CO4	***Construct*** the means of writing contents to media	Cognitive	Create
CO5	***Employing*** varioustechniques in preparing communication letters	Cognitive	Apply

SYLLABUS		HOURS
UNIT I	**LISTENING SKILLS**	
Academic Listening, Barriers to Listening, Listening to Announcements – News on Radio and Televisions – Casual Conversations		9
UNIT II	**TYPES OF SPEECH**	
Manuscript, Impromptu, Rememorized and Extemporaneous speeches		9
UNIT III	**COMMON EXPRESSIONS**	
Greeting and Introduction – Making Requests – Asking and Giving Permission – Offering Help – Giving Instructions		9
UNIT IV	**COMMUNICATION AND MEDIA**	
English for News Paper, Radio, TV, Film, Writing Stories, Drama		9
UNIT V	**CAREER SKILLS**	
Curriculum Vitae and Covering letters – facing an interview – Note taking and Note making		9
	Total Hours	**45**

Textbooks

Kiranmai Dutt,"A Course in Communication Skills", Foundation Books, Chennai. 2013
John Sealy,"Writing and Speaking", Oxford University Press, New Delhi, Third Edition 2009.
Sanjay Kumar, Pushp Lata, "Communication Skills", Oxford University Press, New Delhi

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:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
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
Total	0	0	0	0	0	0	0	2	2	6	2	0
Scale	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	Remember Understand
CO2	***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understand
CO3	***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon	Cognitive Affective	Remember Receive
CO4	***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development.	Cognitive	Understand Apply
CO5	***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** the 0modern technology towards environmental protection.	Cognitive	Understand Analysis

UNIT - IINTRODUCTION 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
HOURS	**30**	**0**	**0**	**15**	**45**

TEXT BOOKS

1. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co, USA, 2000.

Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell Science, UK, 2003

Trivedi R.K and P.K.Goel, "Introduction to Air pollution", Techno Science Publications, India, 2003.

Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.

Butterworth Heinemann, "Introduction to International disaster management", 2006.

Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCE BOOKS

Trivedi R.K., "Handbook of Environmental Laws, Rules", Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.

Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.

S.K.Dhameja, "Environmental Engineering and Management", S.K.Kataria and Sons, New Delhi, 2012.

Sahni, "Disaster Risk Reduction in South Asia", PHI Learning, New Delhi, 2003.

Sundar, "Disaster Management", Sarup & Sons, New Delhi, 2007.

G.K.Ghosh, "Disaster Management", A.P.H.Publishers, New Delhi, 2006.

E RESOURCES

http://www.e-booksdirectory.com/details.php?ebook=10526
https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
https://www.free-ebooks.net/ebook/What-is-Biodiversity
https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
http://bookboon.com/en/pollution-prevention-and-control-ebook
http://www.e-booksdirectory.com/details.php?ebook=8557
http://www.e-booksdirectory.com/details.php?ebook=6804
http://bookboon.com/en/atmospheric-pollution-ebook
http://www.e-booksdirectory.com/details.php?ebook=3749

http://www.e-booksdirectory.com/details.php?ebook=2604
http://www.e-booksdirectory.com/details.php?ebook=2116
http://www.e-booksdirectory.com/details.php?ebook=1026
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 *On the successful completion of the course, students will be able to*		**DOMAIN**	**LEVEL**
CO1	***Define, explain and demonstrate*** and ***Relate*** knowledge of the basics of digital computer.	Cognitive: Psychomotor:	Remember, Understand Mechanism
CO2	Acquire the knowledge of INTEL 8085; ***Analyze*** Immediate and implicit addressing and Instruction set	Cognitive:	Analyze, Apply
CO3	***Understand*** Fundamentals of assembly language programming	Cognitive: Affective:	Understand Receive
CO4	***Identify*** Structure of 'C', ***explain*** I/O function.	Cognitive:	Remember
CO5	***Understand*** the Data input and output and ***describe*** Basic functions and ***Compare*** automatic variables, External Variables, Static Variables.	Cognitive: Affective:	Understand Receive

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	
REFERENCE BOOKS	
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
Hours	**45**	**15**	**-**	**60**

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			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:

Course outcomes:	**Domain**	**Level**
CO1: Solvesimple problems related to first order, higher degree differential equations solvable for x, solvable for y, solvable for dy/dx, Clairauts 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** of 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, Clairauts 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:

Course outcomes:	**Domain**	**Level**
CO1:Explain Bounded Sequences, Monotonic Sequences, Convergent Sequence , Divergent Sequences , Oscillating sequences.	Cognitive	Understanding
CO2: Explain Behavior of Monotonic functions.	Cognitive Psychomotor	Understanding Guided Response
CO3:Explainsubsequences, 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 IIAlgebra of Limits	**15**
Behavior of Monotonic functions.	
UNIT IIISome 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 VTest 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 & 5.2Page 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: 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	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	Understand Mechanism
CO2	***Explain*** and ***demonstrate*** the behavior of thermal conductivity of bad conductor	Psychomotor Affective	Set Valuing
CO3	***Manipulate*** and ***measure*** the normal incidence of grating	Cognitive Psychomotor	Apply 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.

REFERENCE BOOKS :

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.

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

PREREQUISITE: Foundation course in Mathematics

COURSE OUTCOMES:

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

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

LECTURE		TOTAL
30		30

TEXTBOOK

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

REFERENCES

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

TABLE 1: COs VS POs Mapping

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

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

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

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**
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. 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
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
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:

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 consines 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.

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**
XMT 305	**PROGRAMMING IN C (PRACTICAL)**	**0**	**0**	**2**	**2**

C	**P**	**A**
2	**0**	**0**

L	**T**	**P**	**H**
0	**0**	**2**	**4**

PREREQUISITE: Nil

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

List of Programmes

1. Write a Program to convert temperature from degree Centigrade to Fahrenheit.
2. Write a Program to find whether given number is Even or Odd.
3. Write a Program to find greatest of three numbers.
4. Sorting given list of names in alphabetical order
5. Sorting given list of numbers in ascending order
6. Write a Program to using switch statement to display Monday to Sunday.
7. Write a Program to display first Ten Natural Numbers and their sum.

8. Write a Program to find Sum and Multiplication of Two Matrices.
9. Write a Program to find the maximum number in Array using pointer.
10. Write a Program to reverse a number using pointer.
11. Write a Program to solve Quadratic Equation using functions.
12. Write a Program to find factorial of a number using Recursion.
13. Write a program to calculate Mean, Variance and SD of N numbers
14. Write a Program to create a file containing Student Details.

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

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

COURSE CONTENT

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	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		
Total	5					15	10	5				5		
Scaled Value	1					3	2	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**
XMT401			**THEORY OF EQUATIONS**	**2**	**0**	**0**		**2**
C	**P**	**A**						
2	**0**	**0**		**L**	**T**	**P**	**SS**	**H**
				2	**0**	**0**	**2**	**4**

PREREQUISITE: Foundation Course in Mathematics

COURSE OUTCOMES:

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, Descartes'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
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**
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
Total	15	10	0	5	3	0	5	5	5
Scaled Value									

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 & irrotational 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	Cognitive	Remembering Applying

done by a force, Normal surface integral, Volume integral and to **solve** simple problems.		
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**

TEXTBOOKS

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", Emerald publishers 1986.
2. Dr. Arumugam and prof. A. Thangapandi Issac, "Fourier series", New Gamma publishing House 2012.

Table 1: COs VS POs Mapping

	PO1	**PO 2**	**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									

1 – 5 → 1, 6-10 → 2, 11 – 15→ 3

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

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

PREREQUISITE: Nil

COURSE OUTCOMES:

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

UNIT I **15**

Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n and the group U(n) of units under multiplication modulo n.

UNIT II **15**

Cyclic groups from number systems, complex roots of unity, circle group, the general linear group GLn (n,R), groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions.

UNIT III

Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group.

UNIT IV **15**

Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition,

examples, and characterizations, Quotient groups.	
UNIT V	**15**
Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, Zn the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields: Zp, Q, R,and C. Field of rational functions.	

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

TEXTBOOKS

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

REFERENCES

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

Table 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	2		1	1		1	1	1
CO 2	3	2		1			1	1	1
CO 3	3	2		1			1	1	1
CO 4	3	2		1	1		1	1	1
CO 5	3	2		1	1		1	1	1
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**
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 OUTCOMES:							
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: ApplyMATLAB Scripts, Input and Output, scripts				Cognitive		Applying	

with input and output, user defined functions in simple applications.		
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

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

PREREQUISITE: Algebra

COURSE OUTCOMES:

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

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 with Application", 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
Total	15	10	5	5	5	5	5	0	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**
XMT502A			**Matrices**	**4**	**2**	**0**	**6**
C	**P**	**A**					
6	**0**	**0**		**L**	**T**	**P**	**H**
				4	**2**	**0**	**6**

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	**Domain**	**Level**
CO1: Explain Concept of Linear Independence and examples of different bases. Subspaces of R2, R3.	Cognitive	Understanding
CO2: Explain Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.	Cognitive	Understanding
CO3: Solvelinear homogeneous and non-homogeneous equations with number of equations and unknowns up to four.	Cognitive	Applying
CO4: Explain Matrices in diagonal form up to matrices of order 3, the computation of matrix inverses using elementary row operations and to find rank of the matrix.	Cognitive	Understanding
CO5: Solve a system of linear equations using matrices.	Cognitive	Applying

UNIT I **18**

R, R2, R3 as vector spaces over R. Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of R2, R3.

UNIT II	18
Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.	
UNIT III	**18**
Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.	
UNIT IV	**18**
Matrices in diagonal form. Reduction to diagonal form upto matrices of order 3. Computation of matrix inverses using elementary row operations. Rank of matrix.	
UNIT V	**18**
Solutions of a system of linear equations using matrices. Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXTBOOKS

1. A.I. Kostrikin, "Introduction to Algebra", Springer Verlag, 1984.
2. S. H. Friedberg, A. L. Insel and L. E. Spence, "Linear Algebra", Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. Richard Bronson, "Theory and Problems of Matrix Operations", Tata McGraw Hill, 1989.

REFERENCE

1. S. Narayanan& T. K. ManickavasagamPillai, "Algebra", Vol. 2, S. Viswanathan Pvt. Ltd. Chennai, 2004.

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
Total	15	10	5	5	5	5	5	0	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
XMT502B			**Discrete Mathematics**	**4**	**2**	**0**	**6**
C	**P**	**A**					
6	**0**	**0**		**L**	**T**	**P**	**H**
				4	**2**	**0**	**6**

PREREQUISITE: Logic and Sets

COURSE OUTCOMES:

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

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

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

TEXTBOOK

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

REFERENCE

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

Table 1: COs VS POs Mapping

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

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					
6	0	0		L	T	P	H
				4	2	0	6

PREREQUISITE: Differential Calculus and Integral Calculus

COURSE OUTCOMES:

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-Siedel 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
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**
XMT503B			**Mechanics**	**4**	**2**	**0**	**6**
C	**P**	**A**					
6	**0**	**0**		**L**	**T**	**P**	**H**
				4	**2**	**0**	**6**

PREREQUISITE: Algebra

COURSE OUTCOMES:

Course outcomes:	**Domain**	**Level**
CO1: Definebasic Concepts and Principles, Forces acting at a Point to **Explain** Lami's Theorem and Applications, Parallel Forces, Like and Unlike Parallel Forces, Moment of a force, Couples related Problems.	Cognitive	Remembering Understanding
CO2: Explain Equilibrium of Three Forces acting on a rigid body, Friction, Laws of Friction, Angle of Friction, Cone of Friction, Properties and related problems.	Cognitive	Understanding
CO3: Explain Motion in a Straight line under uniform acceleration, Newton's Laws of motion. Projectiles: **Define and explain** Path of Projectile, Range on an inclined Plane, Properties and Problems.	Cognitive	Remembering Understanding
CO4: Explain Collision of Elastic Bodies, Direct and oblique Impact, Loss of Kinetic Energy related properties and problems.	Cognitive	Understanding
CO5: Explain ccentral Orbits Properties and related problems.	Cognitive	Understanding

UNIT I	**18**
Basic Concepts and Principles - Forces acting at a Point - Lami's Theorem and Applications - Parallel Forces - Like and Unlike Parallel Forces - Moment of a force – Couples – Related problems.	
UNIT II	**18**
Equilibrium of Three Forces acting on a rigid body - Friction - Laws of Friction - Angle of Friction - Cone of friction - Properties and related problems.	
UNIT III	**18**

Motion in a Straight line under uniform acceleration - Newton's Laws of motion. Projectiles: Definition - Path of Projectile - Range on an Inclined Plane - Properties and Problems.	
UNIT IV	**18**
Impulse and Impact: Collision of Elastic Bodies – Direct and Oblique Impact – Loss of Kinetic Energy – Related Properties and Simple Problems.	
UNIT V:	**18**
Central Orbits: Motion under the action of Central Forces - Properties and Related Problems - Differential Equation of Central Orbit - Pedal Equation of Central Orbit - Velocities in a Central Orbit - Law of Forces - Properties and Related Problems	

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

TEXTBOOKS

1. M. K. Venkataraman, "Statics", Agasthiar Publications, Trichy, 2004.
   Unit 1: Chapters 2, 3, 4 Unit 2: Chapters 5, 7
2. M. K. Venkataraman, "Dynamics", Agasthiar Publications, Trichy, 2004.
   Unit 3: Chapters 3: section 3.22, Chapter 4: Section 4.3, Chapter 6
   Unit 4: Chapter 8 Unit 5: Chapter 11

REFERENCES

1. T. K. ManickavasagamPillai, "Statics", S. Viswanathan & Co., Chennai, 1980.
2. S. Narayanan, "Dynamics", S. Chand & Co., New Delhi, 1980.

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
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
XMT504A			Linear algebra	4	2	0	6
C	P	A					
6	0	0		L	T	P	H
				4	2	0	6

PREREQUISITE: Matrices

COURSE OUTCOMES:

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 mmatrix of a linear transformation, Inner product space and to **Define** with examples orthogonality, Gram Schmidt orthogonalization 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 orthogonalization 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

TEXTBOOK

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
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**
XMT504B			**Astronomy**	**4**	**2**	**0**	**6**
C	**P**	**A**					
6	**0**	**0**		**L**	**T**	**P**	**H**
				4	**2**	**0**	**6**

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	**Domain**	**Level**
CO1: Explain Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) , Celestial sphere and diurnal motion ,Celestial coordinates and sidereal time.	Cognitive	Understanding
CO2: Define and Explain Morning and evening stars, circumpolar stars, diagram of the celestial sphere, zones of earth, perpetual day, dip of horizon and twilight.	Cognitive	Remembering Understanding
CO3: Define and Explain Refraction, laws of refraction, tangent formula, Cassini's formula, horizontal refraction, geocentric parallax and horizontal parallax.	Cognitive	Remembering Understanding
CO4: Define and Explain Kepler's laws, verification of 1st and 2nd laws in the case of earth, Anomalies, Kepler's equation, Seasons, causes and kinds of years.	Cognitive	Remembering Understanding
CO5: Define and Explain Moon, sidereal and synodic months, elongation, phase of moon, eclipses, umbra and penumbra, lunar and solar eclipses, ecliptic limits, maximum and minimum number of eclipses near a node and in a year and Saros.	Cognitive	Remembering Understanding

UNIT I	**18**
Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) -Celestial sphere and diurnal motion -Celestial coordinates-sidereal time.	
UNIT II	**18**
Morning and evening stars -circumpolar stars- diagram of the celestial sphere -zones of earth -perpetual day-dip of horizon-twilight.	

UNIT III	**18**
Refraction - laws of refraction -tangent formula-Cassini's formula - horizontal refraction- geocentric parallax -horizontal parallax.	
UNIT IV	**18**
Kepler's laws - verification of 1st and 2nd laws in the case of earth - Anomalies -Kepler's equation - Seasons -causes -kinds of years.	
UNIT V:	**18**
Moon-sidereal and synodic months - elongation - phase of moon - eclipses-umbra and penumbra - lunar and solar eclipses - ecliptic limits - maximum and minimum number of eclipses near a node and in a year - Saros.	

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

TEXTBOOK

Kumaravel, S. and Susheela Kumaravel, "Astronomy", 8th Edition, SKV Publications, 2004. Unit 1: Sec: 39-79
Unit 2: Sec: 80-90,106-116
Unit3: Sec: 117-144
Unit 4: Sec: 146-162,173-178
Unit 5: Sec: 229-241,256-275

REFERENCE

1. G V Ramachandran, "Textbook of Astronomy", Mission Press, Palayamkottai, 1965.

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

PREREQUISITE: Differential Calculus and Integral Calculus

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Use CR Equations in cartesian and polar co-ordinates to find an 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

TEXTBOOK

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.

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**
XMT603A			**Linear programming**	**4**	**2**	**0**	**6**
C	**P**	**A**					
5	**0.5**	**0.5**		**L**	**T**	**P**	**H**
				4	**2**	**0**	**6**

PREREQUISITE: NIL

COURSE OUTCOMES:

Course outcomes:	**Domain**	**Level**
CO1: Find Graphical Solution, **Solve** LPP using Simplex Method, Big M 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 feasiblesolution using North West Corner Rule and Vogel's approximation method, **Solve** unbalanced Transportation Problems, Assignment Problems and Routing Problems.	Cognitive	Applying
CO4: Solve ssequencing 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.

COs VS POs Mapping

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

1 – 5 → 1, 6-10 → 2, 11 – 15→ 3

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

COURSE CODE			COURSE NAME	L	T	P	C
XMT603B			Stochastic Processes	4	2	0	6
C	P	A					
6	0	0		L	T	P	H
				4	2	0	6

PREREQUISITE: Probability and Statistics

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Find and Solve Generating function, Laplace transforms, Laplace transforms of a probability distribution function, - Difference equations, Differential difference equations .	Cognitive	Remembering Understanding
CO2: Define and Explain with Examples Stochastic Process, Notion, Specification, Stationary Process, Markov Chains, and Higher transition probabilities.	Cognitive	Remembering Understanding
CO3: Define and Explain Classification of states and chains, Determination of higher transition probabilities, Stability of Markov system, and Limiting behavior.	Cognitive	Remembering Understanding
CO4: Define and Explain Poisson Process and related distributions, Generalization of Poisson Process, Birth and death process.	Cognitive	Remembering Understanding
CO5: Define and Explain Stochastic Process in queuing and reliability, queuing systems, M/M/1 models, Birth and death process in queuing theory, Multi-channel models and Bulk Queues.	Cognitive	Remembering Understanding

UNIT I	**18**
Generating function - Laplace transforms – Laplace transforms of a probability distribution function - Difference Equations Differential difference equations – Matrix analysis.	
UNIT II	**18**
Stochastic Process - Notion – Specification – Stationary Process - Markov Chains – Definition and examples – Higher transition probabilities.	
UNIT III	**18**
Classification of states and chains – Determination of higher transition probabilities – Stability of Markov system – Limiting behaviour.	
UNIT IV	**18**
Poisson Process and related distributions – Generalization of Poisson Process – Birth and death process.	
UNIT V:	**18**
Stochastic Process in queuing and reliability – queuing systems – M/M/1 models – Birth and death process in queuing theory – Multi channel models – Bulk Queues.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXTBOOK

J.Medhi, "Stochastic Processes", 3rd Ed. New age, International, 2009.

Chapters 1,2,3 (Omitting 3.6,3.7,3.8), Chapter (Omitting 4.5 and 4.6) and Chapter 10 (Omitting 10.6, 10.7). Unit 1: Chapter 1 – Sec 1.1, 1.2, 1.3, Appendix A 1, 2, 3, 4. Unit 2: Chapter 2 – Sec 2.1, 2.2, 2.3 &

Chapter 3 – Sec 3.1, 3.2. Unit 3: Chapter 3 – Sec 3.4, 3.5, 3.6. Unit 4: Chapter 4 – Sec 4.1, 4.2, 4.3, 4.4 Unit 5: Chapter 10 – Sec 10.1, 10.2, 10.3, 10.4, 10.5

REFERENCES

1. Samuel Karlin, "First Course in Stochastic Processes" 2nd Edition, Elsevier, 2012.
2. Srinivasan and Metha, "Stochastic Processes" TATA McGraw Hill, 1978.
3. U. Narayan, "Elements of Applied Stochastic Processes" A. John wiley & Sons, 2002.

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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

4. a.Curriculum and Syllabus of the programme – After Revision –B.Sc Maths

B.Sc. (Mathematics) Syllabus After Revision
REGULATION – 2022
SEMESTER – I

Category	Code	Course Name	L	T	P	S	H	C
Part – I	XGT101/XFT101	Tamil – I/ Foundational Tamil- I	3	0	0	0	3	3
Part – II	XGE102	English – I	3	0	0	0	3	3
Core -1	XMT103	Differential Calculus and Trigonometry	4	1	0	0	5	4
Core -2	XMT104	Analytical geometry 3-D and Integral Calculus	4	1	0	0	5	4
Allied -1	XPG105	Physics – I	3	1	0	0	4	4
	XPG106	Physics Practical - I	0	0	4	0	4	2
UMAN - 1	XUM001	Human Ethics,Values, Rights and Gender Equality	1	0	0	1	2	1
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO,RRC and YRC)	0	0	0	0	2	0
		Total	**16**	**3**	**4**	**1**	**30**	**21**

SEMESTER II								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Part – I	XGT201/ XFT201	Tamil – II/ Foundational Tamil – II	3	0	0	0	3	3
Part – II	XGE202	English – II	3	1	0	0	3	3
Core-3	XMT203	Classical Algebra	3	1	0	0	4	4
Core-4	XMT204	Sequence and Series	3	1	0	0	4	4
Allied -2	XPG205	Physics – II	3	1	0	0	4	4
	XPG206	Physics Practical - II	0	0	4	0	4	2
SEC -1	XMT207	Skill Based Elective Course - 1	2	0	0	0	2	2
UMAN - 2	XUM002	Environmental Studies	1	0	0	1	2	1
		Field Visit/Industrial Visit	0	0	0	0	0	2
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO, RRC and YRC)	0	0	0	0	2	0
		Total	**18**	**3**	**4**	**1**	**30**	**25**

SEMESTER III								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -5	XMT301	Differential Equations and Laplace Transforms	3	1	0	0	5	4
Core -6	XMT302	Vector Calculus, Fourier Series and Fourier Transforms	3	1	0	0	5	4
Allied -3	XMT303	Mathematical Statistics - 1	3	1	0	0	5	4
	XMT304	Mathematical Statistics Practical –1	0	0	4	0	4	2
GE - 1		Open Elective- I	3	0	0	0	3	3
SEC - 2	XMT305	Skill Based Elective Course –2- Quantitative Aptitude - II	2	0	0	0	2	2
UMAN -3	XUM003	Disaster Management	1	0	0	1	2	1
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO,RRC and YRC)	0	0	0	0	2	0
		Total	**15**	**3**	**4**	**1**	**30**	**20**

SEMESTER IV								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core –7	XMT401	Abstract Algebra	3	1	0	0	5	4
Core -8	XMT402	Mechanics	3	1	0	0	5	4
Allied - 4	XMT403	Mathematical Statistics – 2	3	1	0	0	5	4
	XMT404	Mathematical Statistics Practical – 2	0	0	4	0	4	2
GE- 2		Open Elective- 2	3	0	0	0	3	3
SEC – 3	XMT405	Skill Based Elective Course –3- Quantitative Aptitude - III	2	0	0	0	2	2
UMAN - 4	XUM004	Introduction to Entrepreneurship Development	1	0	0	1	2	1
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO,RRC and YRC)	0	0	0	0	2	0
		Total	**15**	**3**	**4**	**1**	**30**	**20**

SEMESTER V								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -9	XMT501	Real Analysis	3	1	0	0	5	4
Core-10	XMT502	Discrete Mathematics	3	1	0	0	4	4
DSE – 1	XMT503	Discipline Specific Course - 1	4	1	0	0	5	5
DSE–2	XMT504	Discipline Specific Course - 2	4	1	0	0	5	5
GE -3		Open Elective- 3	3	0	0	0	3	3
NME	XMT505	Fundamentals of Data Science & R Programming	1	1	0	0	2	2
SEC–4	XMT506	Skill Based Elective Course –4-Quantitative Aptitude -IV	2	0	0	0	2	2
IPT	XMT507	IPT	0	0	0	0	0	4
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO,RRC and YRC)	0	0	0	0	2	0
		Total	**20**	**5**	**0**	**0**	**30**	**29**

SEMESTER VI								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -11	XMT601	Complex Analysis	3	1	0	0	5	4
Core -12	XMT602	Operations Research	3	1	0	0	4	4
DSE - 3	XMT603	Discipline Specific Course - 3	4	1	0	0	5	5
DSE - 4	XMT604	Discipline Specific Course - 4	4	1	0	0	5	5
Project	XMT605	Project	1	4	0	0	5	6
UMAN - 5	XUM005	Cyber Security	1	0	0	1	2	1
		Mentoring	0	0	0	0	1	0
		Library/E-Library	0	0	0	0	1	0
		Extension Activities (NSS, NCC, NSO,RRC and YRC)	0	0	0	0	2	2
		Total	**16**	**8**	**0**	**1**	**30**	**27**

Note:

L – Lecture **T – Tutorial** **P – Practical**

SS – Self Study **H – Hours** **C – Credits**

LIST OF SKILL BASED ELECTIVE COURSES

Category	Semester	Code	Course Name	L	T	P	H	C
SEC -1	II	XMT207	Quantitative Aptitude – I	2	0	0	0	2
SEC -2	III	XMT305	Quantitative Aptitude - II	2	0	0	0	2
SEC -3	IV	XMT405	Quantitative Aptitude - III	2	0	0	0	2
SEC -4	V	XMT506	Quantitative Aptitude – IV	2	0	0	0	2

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSES

Semester – V

DSE – 1 (Any one of the following)

Category	Code	Course Name	L	T	P	H	C
DSE1A	XMT503A	Numerical Methods	4	1	0	5	5
DSE1B	XMT503B	Number Theory	4	1	0	5	5

DSE – 2 (Any one of the following)

Category	Code	Course Name	L	T	P	H	C
DSE2A	XMT504A	Graph Theory	4	1	0	5	5
DSE2B	XMT504B	Mathematical Modeling	4	1	0	5	5

Semester – VI

DSE – 3 (Any one of the following)

Category	Code	Course Name	L	T	P	H	C
DSE3A	XMT603A	Fuzzy sets and its applications	4	1	0	5	5
DSE3B	XMT603B	**Introduction to Industry 4.0**	4	1	0	5	5

DSE – 4 (Any one of the following)

Category	Code	Course Name	L	T	P	H	C
DSE4A	XMT604A	Astronomy	4	1	0	5	5
DSE4B	XMT604B	Stochastic Processes	4	1	0	5	5

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

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

SYLLABUS		HOUR
UNIT I	**Grammar**	
i. Major basic grammatical categories ii. Notion of correctness and attitude to error correction		9
UNIT II	**Listening and speaking**	
iii. Importance of listening skills iv. Problems of listening to unfamiliar dialects v. Aspects of pronunciation and fluency in speaking vi. Intelligibility in speaking		9
UNIT III	**Basics of Reading**	
vii. Introduction to reading skills viii. Introducing different types of texts – narrative, descriptive, extrapolative		9
UNIT IV	**Basics of Writing**	
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.)		9
	Total Hours	**36**

Text books

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

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

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

அலகு-1	**தமிழ் அறிஞர்களும் தமிழ்த்தொண்டும்**	9

பாரதியார், பாரதிதாசன், நாமக்கல் கவிஞர், சி.இலக்குவனார், உ.வே.சாமிநாத அய்யர், தெ.பொ.மீனாட்சி சுந்தரம், கவிமணி தேசியவிநாயகம் பிள்ளை தொடர்பான செய்திகள், சிறந்த தொடர்கள், சிறப்புப் பெயர்கள்.

அலகு-2	**கவிதைகள் (மரபுக்கவிதை, புதுக்கவிதை)**	9

மரபுக்கவிதை : முடியரசன், வாணிதாசன், சுரதா, கண்ணதாசன், உடுமலை நாராயண கவி, பட்டுக்கோட்டை கல்யாண சுந்தரம், மருதகாசி தொடர்பான செய்திகள்.
புதுக்கவிதை : ந.பிச்சமூர்த்தி, சி.சு.செல்லப்பா, மு.மேத்தா, ஈரோடு தமிழன்பன், அப்துல் ரகுமான ஞானக்கூத்தன், ஆலந்தூர் மோகனரங்கன் தொடர்பான செய்திகள்.

அலகு-3	**உரையாடல்கள், தமிழ் மகளிரின் சிறப்பு**	9

ஜி.யு.போப் மற்றும் வீரமாமுனிவரின் தமிழ்ப்பணி, பெரியார், அண்ணா, முத்துராமலிங்கத்தேவர், அம்பேத்கர், காமராசர், மா.பொ.சிவஞானம், காயிதே மில்லத் சமுதாயத் தொண்டு.
அன்னி பெசண்ட் அம்மையார், மூவாலூர் ராமாமிர்தம்மாள், டாக்டர் முத்துலட்சுமி ரெட்டி, வேலுநாச்சியார், வள்ளியம்மை, ராணி மங்கம்மாள் சிறப்பு.

அலகு-4	**நாட்டுப்புறப்பாடல்**	9

தாலாட்டுப்பாடல், தொழில் பாடல், ஒப்பாரிப் பாடல்.

அலகு-5	**இலக்கிய வரலாறு**	9

உரைநடை, சிறுகதை, நாடகம், கவிதைகள்.

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

பார்வை நூல்கள்:

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

Table 1: Assessment Template

S.No.	Task	Marks
1	CA 1 (Descriptive + MCQ)	15
2	CA 2 (Class Test- Descriptive + MCQ)	15
3	CA3 (Rubrics prepared by the Course Teacher)	20
4	CA 4- End Semester Pattern (MCQ – 20% + Descriptive 80%)	50
	Total	**100**

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

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

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

	functions and circular functions		
UNIT 1	**Successive Differentiation**		**12**
Successive Differentiation – The n^{th} derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product – Proof			
UNIT 2	**Partial Differentiation, Maxima and minima of functions of two variables**		**12**
Successive partial derivatives – Function of function rule – Total differential coefficient – Implicit functions – Homogeneous functions – Partial derivatives of a function of two functions – Taylor's expansion of $f(x, y)$ - Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.			
UNIT 3	**Envelopes, Curvature of Plane curve**		**12**
Envelopes – Method of finding envelope – Curvature – Cartesian formula for radius of curvature – The coordinates of centre of curvature – Evolute and involute – Radius of curvature when the curve is given in polar co-ordinates – p-r equation; pedal equation of a curve – Chord of curvature.			
UNIT 4	**Expansions**		**12**
Expansions of cos $n\theta$ and sin $n\theta$ - Expansion of tan $n\theta$ in powers of tan θ - Expansion of tan $A + B + C + \cdots$ - Examples on formation of equations – Expansions of $\cos^n\theta$ and $\sin^n\theta$ in terms of functions of multiples of θ - Expansion of cos θ and sin θ in a series of ascending powers of θ.			
UNIT 5	**Hyperbolic Functions and Logarithms of Complex quantities**		**12**
Hyperbolic functions – Relations between hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions – Separation into real and imaginary parts – Logarithms of complex quantities – logarithm of $x + iy$ - General value of logarithm of $x + iy$.			

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

Text Books

Calculus Volume I, S. Narayanan and T.K. ManicavachagomPillay, S. Viswanathanpvt. Ltd., 2014.

Unit I : Chapter III (All sections)

Unit II : Chapter VIII (Sections 1, 3, 4 & 5)

Unit III: Chapter X (All sections)

Trigonometry, Narayanan and T.K. ManicavachagomPillay, S. Viswanathanpvt. Ltd., 2014.

Unit IV: Chapter III

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

E-References

https://math.Korea. Edu/math_en/calculus/syllabus. Do [Korea University]

https://explore course. Stanford. edu/search?q=MATH21 [Stanford University]

COs VS POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

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

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

	Course Outcomes	Domain	Level
CO 1	**Identify** the given lines are coplanar lines and shortest distance between the skew lines	Cognitive	Applying
CO 2	**Identify** the equation of the tangent plane to a given sphere	Cognitive	Applying
CO 3	**Apply** reduction formulae to Integrate functions of a higher degree.	Cognitive	Applying
CO 4	**Apply** the concepts of Beta and Gamma functions and their properties to evaluate definite integral.	Cognitive	Applying
CO 5	**Apply** the concepts of multiple integral for finding the area and volume of the region bounded by curves	Cognitive	Applying

UNIT 1		**12**

Analytical Geometry 3-D – The plane – The straight line – Coplanar lines - skew lines S.D.

UNIT 2		**12**

Sphere- Tangent plane- intersection of two spheres – Equation of tangent plane to a sphere.

UNIT 3		**12**

Properties of definite integrals - Reduction formulae of the types:

$\int x^n e^{ax} dx, \int x^n \cos ax \ dx, \int \sin^n x \ dx, \int \cos^n x \, dx, \int \sin^m x \cos^n x \, dx, \int \tan^n x \, dx$

UNIT 4		**12**

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

UNIT 5		**12**

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

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

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

References

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

Course Name			**Physics –I**	**L**	**T**	**P**	**C**
Course Code			**XPG105**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**SS**	**H**
4	**0**	**0**		**3**	**1**	**0**	**4**

Prerequisite — Basic knowledge of physics concepts.

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

Course Outcomes		**Domain**	**Level**
CO 1	**Identify** the principles of elasticity, **derive** expression for twisting couple and **determine** rigidity modulus of a wire.	Cognitive	Remember, Understand and Apply
CO 2	**Describe** sound, propagation, perception **analysis** of acoustical wave and effect echoes in building.	Cognitive	Understand and apply

CO 3	**Recall** basic concepts of specific heat capacity **List** the laws of thermodynamics.	Cognitive	Remember and understand
CO 4	**Understand** Interference, diffraction and **identify** their applications.	Cognitive	Understand and Analyze
CO 5	**Recall** the general properties of atoms and nucleus, **Discuss** the various models and A**nalyze** various applications of X–ray.	Cognitive	Remember Understand, analyze
UNIT 1	**Elasticity**		**12**
Stress – Strain –Hooke' law-Different moduli of elasticity - Twisting couple on a cylinder – Determination of Rigidity modulus by Static Torsion method –Bending of beams–Experimental methods for the determination of Young's modulus by non-uniform bending.			
UNIT 2	**Sound**		**12**
Introduction – characteristic of musical sound - Loudness – unit of loudness – Noise - Acoustics of buildings – Reverberation – Reverberation time- requirements for good acoustics of buildings - Echo and Echelon effect.			
UNIT 3	**Thermal Physics**		**12**
Specific Heat – Specific Heat of a Liquid by Joule's Electrical Method – Newton's law of cooling – verification - specific heat capacity of a liquid by cooling– Conduction: Coefficient of thermal conductivity – Lee's disc method for bad conductors – Black body radiation- Stefan's law.			
UNIT 4	**Optics**		**12**
Interference – determination of thickness of a thin wire by air wedge method – Diffraction – Fresnel's and Fraunhofer diffraction – Diffraction grating–Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism.			
UNIT 5	**Atomic and Nuclear physics**		**12**
Atom Physics – Electron - spin quantum numbers – Pauli's exclusion principle – Excitation and ionization potentials – Photoelectric effect –X – rays: continuous and characteristic–applications. Nuclear Physics: Nuclear size –mass – charge – Mass defect – Binding energy – packing fraction –binding energy – nuclear fission – nuclear fusion– chain reaction –nuclear reactor.			

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

Text Books

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

References

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

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Biswanath Banerjee and Amit Shaw, Department of Civil Engineering IIT Kharagpur, " THEORY OF

ELASTICITY", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/105/105/105105177/

NPTEL , Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

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

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name			**Physics Practical - I**	**L**	**T**	**P**	**C**
Course Code			**XPG106**	**0**	**0**	**4**	**2**
C	**P**	**A**		**L**	**T**	**P**	**H**
0.5	**1**	**0.5**		**0**	**0**	**4**	**4**
Prerequisite			Basic knowledge of physics concepts.				

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

	Course Outcomes	**Domain**	**Level**
CO 1	**Describe** sound, propagation, perception **analysis** of acoustical wave.	Cognitive Psychomotor	Knowledge
CO 2	**Identify** the principles of elasticity, **derive** expression for twisting couple and **determine** rigidity modulus of a wire.	Psychomotor: Affective:	Analyze, Mechanism Respond
CO 3	**Define** heat capacity, **recall** the concepts of temperature and **explain** the specific heat capacity.	Cognitive Psychomotor	Evaluate
CO 4	**Explain** interference & diffraction and **analysis** various application of diffraction and interference.	Psychomotor:	Knowledge, Mechanism
CO 5	**Know** the determination of wavelength and size of the micro particle.	Cognitive Psychomotor	Comprehension, Evaluate
Ex. No	**Experiments (Any Eight Experiments)**		
1.	Torsional pendulum – Determination of the rigidity modulus of thin wire.		CO2
2.	Young's modulus – Non uniform bending –Pin and microscope.		CO2
3.	Lee's disc –Specific heat capacity of the bad conductor.		CO3

4.	Specific heat capacity of liquid – Newton's law of cooling	CO3
5.	Spectrometer – Refractive index of a prism	CO4
6.	Spectrometer grating – a wavelength of various spectral line by normal incidence	CO4
7.	Air wedge – Thickness of wire	CO4
8.	Sonometer – verification of laws	CO1
9.	Determination specific heat capacity using Spherical Calorimeter	CO3
10.	Laser grating – Determination of wave length and To find the size of the micro particle.	CO5

Lecture	**0**	**Tutorial**	**0**	**Practical**	**30**	**Total**	**30**

Text Books

C. L. Arora,"B.Sc. Practical Physics",S. Chand & Company Ltd. Ram Nagar, New Delhi, 2007.

R. K. Shukla &Anchal Srivastava. "Practical Physics," New Age International (P) Ltd, Publishers, New Delhi, 2006.

References

Indu Prakash and Ramakrishna, "A Text Book of Practical Physics," 11th Edition, KitabMahal, New Delhi, 2011.

C. Ouseph,K. Rangarajan, "A Text Book of Practical Physics", Volume I & II, S.Viswanathan Publishers,1997.

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Amal Kumar Das, Department of Physics, IIT Kharagpur ,"Experimental Physics – II", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/115/105/115105120/

S. Srinivasan, Department of Electrical Engineering, IIT Madras, " Digital Circuits and Systems", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	3	3	1	2	1	1
CO 2	3	3	3	3	3	1	2	1	1
CO 3	3	3	3	3	3	1	3	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	3	1	1
TOTAL	**15**	**15**	**15**	**15**	**15**	**5**	**12**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**1**

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

1-5 →1, 6-10 →2, 11-15 →3

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

Course Outcomes		Domain	Level
CO 1	**Utilize**Cayley Hamilton Theorem to find inverse and power of a given matrix	Cognitive	Applying
CO 2	**Utilize** Newton's method to find the sum of the roots of a given polynomial equation	Cognitive	Applying
CO 3	**Apply** Descartes' rule of signs technique to find the maximum number of positive real zeros of a polynomial function	Cognitive	Applying
CO 4	**Utilize** the binomial theorem to expand polynomials and to identify terms for a given polynomial	Cognitive	Applying
CO 5	**Utilize** logarithmic functions to solve equations involving exponential functions	Cognitive	Applying
UNIT 1	**MATRICES**		**12**
Characteristic roots and characteristic vectors - Linear transformation – the characteristic equation of transformation – Cayley-Hamilton theorem – Diagonalisation of a matrix – orthogonal matrices.			
UNIT 2	**THEORY OF EQUATIONS**		**12**
Relation between roots and coefficients- symmetric functions of the roots in terms of the coefficients- imaginary roots and irrational roots- sum of the powers of the roots of an equation.			
UNIT 3	**TRANSFORMATION OF EQUATIONS**		**12**
Transformation of equations – Reciprocal equations- standard forms to increase and decrease the roots of a given equation by a given quantity- Removal of terms- Descartes' rule of sign.			
UNIT 4	**BINOMIAL THEOREM**		**12**
Binomial theorem – positive integral index – the greatest coefficient in the expansion of $(1 + x)^n$ – Binomial theorem for a rational index – particular cases of the Binomial expansions – Numerically greatest terms – summation of a series			
UNIT 5	**EXPONENTIAL AND LOGARITHMIC SERIES**		**12**
Exponential limit – the exponential theorem – summation – Logarithmic series - modification of the logarithmic series – summation			

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

Text Books

References

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

E-References

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

COs vs POs

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

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

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

Semester II

Course Name			**Sequence and Series**	**L**	**T**	**P**	**C**
Course Code			**XMT204**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**SS**	**H**
4	**0**	**0**		**3**	**1**	**0**	**4**
Prerequisite			Basic knowledge of numbers .				

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

Course Outcomes		**Domain**	**Level**
CO 1	**Determine** if an infinite sequence is bounded, monotonic or oscillating	Cognitive	Evaluating
CO 2	**Determine** the series whether it is convergent or divergent by using the appropriate tests.	Cognitive	Understanding
CO 3	**Determine** the series whether it is convergent or divergent by using the appropriate tests.	Cognitive	Evaluating
CO 4	**Identify** the sequence of partial sum for a given infinite series	Cognitive	Applying

CO 5	**Demonstrate** the concepts about the Weirstrass inequalities and Cauchy's inequality	Cognitive	Understanding

UNIT 1	**12**

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

UNIT 2	**12**

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

UNIT 3	**12**

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

UNIT 4	**12**

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

UNIT 5	**12**

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

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

Text Books

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

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

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

COs vs POs

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

TOTAL	15	15	13	11	15	5	5	5	5
SCALED VALUE	3	3	3	3	3	1	1	1	1
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5 →1, 6-10 →2, 11-15 →3									

Course Name			**Physics –II**	**L**	**T**	**P**	**C**
Course Code			**XPG205**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**SS**	**H**
2.8	**0.8**	**0.4**		**3**	**1**	**0**	**4**
Prerequisite			**Basic knowledge of Physics.**				

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

Course Outcomes		**Domain**	**Level**
CO 1	**Recall** Ohms law,**learn** about resistors and capacitors and**apply** knowledge to calibrate low voltmeter using potentiometer.	Cognitive	Understand
CO 2	**Recall** Biot–Savart's law, **explain** current passing through straight conductor, coil and **distinguish** various properties of magnetic materials.	Cognitive	Remember, understand, analyze
CO 3	**Recall** basic of semiconductor **distinguish** different types of diodes and their applications.	Cognitive	Understand apply
CO 4	**Examine** the structure of number systems, **perform** the conversion among different number systems and **discuss** operation of all the gates.	Cognitive	Understand Apply
CO 5	**Illustrate** reduction of logical expressions **using** Boolean algebra and k-map.	Cognitive	Understand Apply
UNIT I	**ELECTRICITY**		**9+3**

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

Electromagnetic induction: Laws of electromagnetic induction – self-induction - Mutual induction of coil.

UNIT II	**MAGNETISM**	**9+3**

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

UNIT III	**SEMICONDUCTOR**	**9+3**

Properties of semiconductors – Types of semiconductors– PN junction diode –V I Characteristics– full wave

and Bridge rectifiers – Zener diode– characteristics of Zener diode –Zener diode as voltage regulator– Photo Diode and Uses.

UNIT IV	NUMBER SYSTEM AND LOGIC GATES	9+3

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

UNIT V	BOOLEAN ALGEBRA AND KARNAUGH MAPS	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

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

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

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

COs vs POs

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

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

Course Name			Physics Practical - II	L	T	P	C
Course Code			XPG206	0	0	4	2
C	P	A		L	T	P	H
0.5	1	0.5		0	0	4	4
Prerequisite			Basic knowledge of Physics.				

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

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

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

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

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

References

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

E – References

Amal Kumar Das, Department of Physics, IIT Kharagpur ,"Experimental Physics – II", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/115/105/115105120/

S. Srinivasan, Department of Electrical Engineering, IIT Madras, " Digital Circuits and Systems", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite Basic mathematical knowledge.

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

Course Outcomes		**Domain**	**Level**
CO1	**Explain** the basic concepts of Numbers, H.C.F. &L.C.M of Numbers and to solve the problems	Cognitive	Understanding
CO2	**Explain** the basic concepts of Decimal Fractions, Simplification and to solve the problems	Cognitive	Understanding

CO3	**Explain** the basic concepts of Square Roots & Cube Roots, Average and to solve the problems	Cognitive	Understanding
CO4	**Explain** the basic concepts of Problems on Numbers, Problems on Ages and to solvethe problems	Cognitive	Understanding
CO5	**Explain** the basic concepts of Surds & Indices, Percentage and to solvethe Problems	Cognitive	Understanding
UNIT 1			**6**
Numbers, H.C.F. &L.C.M of Numbers.			
UNIT 2			**6**
Decimal Fractions, Simplification			
UNIT 3			**6**
Square Roots & Cube Roots, Average.			
UNIT 4			**6**
Problems on Numbers, Problems on Ages.			
UNIT 5			**6**
Surds & Indices, Percentage.			

Lecture	**30**	**Tutorial**	**0**	**Practical**	**0**	**Total**	**30**

Text Book

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

References

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

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

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1

CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**10**	**5**	**15**	**1**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5 →1, 6-10 →2, 11-15 →3									

SEMESTER III

Course Name			**Differential Equations and Laplace Transforms**	**L**	**T**	**P**	**C**
Course Code			**XMT301**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**3**	**2**	**0**	**5**
Prerequisite			**Knowledge of Ordinary and Partial Derivatives**				

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

Course Outcomes		**Domain**	**Level**
CO1	**Identify** the solution of a given partial differential equation which is in the form of Clairaut's.	Cognitive	Applying
CO2	**Demonstrate** the methods for finding particular integral of the partial differential equation	Cognitive	Understanding
CO3	**Utilize** the concepts of variation of parameters for solving a given partial differential equations	Cognitive	Applying
CO4	**Solve** a given partial differential equation using Lagrange's Method	Cognitive	Applying
CO5	**Solve** second order differential equations using Laplace Transforms	Cognitive	Applying

UNIT 1	**9+3**
Formation of differential equation – equation of the first order and the first degree - exact differential equation – rules for finding integrating factors – Equation of first order, but of higher degree - Clairaut's form.	
UNIT 2	**9+3**
Linear differential equations with constant coefficients: Particular Integral – methods for finding P.I. - linear equations with variable coefficients.	
UNIT 3	**9+3**
Variation of parameters- Total differential equation Pdx+Qdy+Rdz=0– rules for integrating Pdx + Qdy + Rdz = 0	
UNIT	**9+3**

4		

Partial Differential Equation- Four standard types- Lagrange's method for solving Pq + Qq = R

UNIT 5		**9+3**

Laplace transform – Laplace transform of periodic functions – Some general theorems - Inverse transforms - Solving second order differential equations using Laplace transform - problems

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

Text Book

1.Calculus, volume III,S. Narayanan, T.K.M. Pillai, S. Viswanathan Pvt. Ltd., 2014.
Unit I : Chapter 1 (sec: 1 – 6), Pages: 1 – 38
Unit II : Chapter 2 (sec: 1 – 4, 8), Pages: 49 – 75, 81–89
Unit III: Chapter 2 (sec: 10), Chapter3(sec:7), Pages:91-95,108-114
Unit IV: Chapter 4 (sec: 1 – 6), Pages: 115 – 145
Unit V : Chapter 5 (sec: 1 – 8), Pages: 154 – 189

References

Engineering Mathematics- A. Singaravelu, Meenakshi Agency, 2022.
Ordinary and Partial Differential Equations- M.D. Raisinghania and R.S. Aggarwal. S.Chand& Company Ltd, New Delhi, 2022.

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name			Vector Calculus, Fourier Series and Fourier Transforms	L	T	P	C
Course Code			XMT302	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	2	0	5
Prerequisite			Knowledge In Differentiation, Integration				

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

Course Outcomes		Domain	Level
CO1	Identify	Cognitive	Applying
CO2	Identify	Cognitive	Applying
CO3	Identify	Cognitive	Applying
CO4	Identity	Cognitive	Applying
CO5	Identify	Cognitive	Applying

UNIT 1	VECTOR DIFFERENTIATION	9+3

Differentiation of vectors – Gradient, Divergence and Curl.

UNIT 2	VECTOR INTEGRATION	9+3

Integration as inverse of differentiation – The line integral – Surface integral – Gauss's Divergence theorem, Green's theorem, Stoke's theorem (Without Proof).

UNIT 3	FOURIER SERIES	9+3

Periodic functions – Fourier series – Dirichlet's Conditions – Even and odd functions- Half range sine series – Half range cosine series.

UNIT 4	FOURIER SERIES	9+3

Change of interval – Parseval's Theorem, Harmonic Analysis.

UNIT 5	FOURIER TRANSFORMS	9+3

Definition – Integral Transforms – Properties of Fourier Transforms – Parseval's identity – Infinite Fourier

cosine and sine transform.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

1. P. Kandasamyand K. Thilagavathy, Mathematics Volume IV: Vector Calculus, Fourier series and Fourier Transforms,S. Chand&Company Ltd,New Delhi, 2004.

Unit I : Vector Calculus: Pages 1 – 23.
Unit II : Vector Calculus: Pages 24 - 50
Unit III: Fourier series: Pages 93 - 144
Unit IV: Fourier series: Pages 145 – 174, 176 – 182
Unit V : Fourier Transforms: Pages 196 - 226

References

1. Vector Algebra and Analysis- T.K.M. Pillai, Anand Book Depot. 2009.
2. Calculus Volume III- T.K.M. Pillai, Anand Book Depot, 1991.
3.Engineering Mathematics- A. Singaravelu, Meenakshi Agency,2022.

E-References

https://courses.maths.ox.ac.uk/node/43944[Oxford University]
https://courses.maths.ox.ac.uk/node/43955 [Oxford University]
https://www.maths.cam.ac.uk/undergrad/files/coursesIA.pdf [Cambridge]

COs vs POs

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

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

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

Course Name			Mathematical Statistics- I	L	T	P	C
Course Code			XMT303	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	2	0	5
Prerequisite			Basic knowledge of statistics.				

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

Course Outcomes		Domain	Level
CO1	**Explain** the concepts of discrete and continuous random variable	Cognitive	Understanding
CO2	**Explain** the concepts of two-dimensional random variable	Cognitive	Understanding
CO3	**Utilize** moment generating function for finding expectation and variance of a given random variable	Cognitive	Applying
CO4	**Explain** the concepts of Normal distributions, Gamma distribution and Exponential distribution	Cognitive	Understanding
CO5	**Identify** correlation coefficient of the given random variables by way of regression analysis	Cognitive	Applying

UNIT 1	9+3

Random variables- distribution function- discrete random variable – probability mass function - discrete distribution function - continuous random variable- probability density function – continuous distribution function.

UNIT 2	9+3

Two-dimensional random variable: joint probability mass function – continuous probability function - Marginal Distribution Function – Stochastic independence -Mathematical Expectations - Properties of expectation – Properties of variance – simple problems only.

UNIT 3	9+3

M.G.F – Cumulants - Characteristic Functions - Binomial, Poisson distributions – Moments, mode and MGF only.

UNIT 4	9+3

Normaldistribution- Gammadistribution- Beta distribution (without problems) - Exponential distribution.

UNIT 5	9+3

Correlation: Karl Pearson coefficient of correlation–Rank correlation – Regression: Linear regression – Regression coefficient – properties of regression coefficients – related problems.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

"Fundamentals of Mathematical Statistics", S.C. Gupta, V.K. Kapoor, Sultan Chand & Sons, 2014

(11th revised edition)
Unit I : Chapter 5 (Sec. 5.1 - 5.4)
Unit II : Chapter 5 (Sec. 5.5- 5.5.6)
Chapter 6 (Sec. 6.1 - 6.5)
Unit III: Chapter 7 (Sec.7.1-7.3.1)
Chapter8(Sec.8.4, 8.4.1, 8.4.2, 8.4.5, 8.4.6, 8.5, 8.5.2 - 8.5.5)
Unit IV: Chapter 9 (Sec.9.2, 9.2.1-9.2.3, 9.2.5, 9.2.11, 9.3, 9.5, 9.8)
Unit V : Chapter 10 (Sec.10.2-10.4& 10.7)
Chapter 11 (Sec.11.1-11.2.2)

Reference

Dr. P.R. Vittal "Mathematical Statistics" Margham Publications Chennai, 2009.

E-References

https://science.korea.edu/science_en/undergraduate/under_math3.do
[Korea University college of science]
http://www.bath.ac.uk/catalogues/2019-2020/ma/MA10211.html
[University of Bath, United Kingdom

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**12**	**7**	**15**	**5**	**2**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

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

Course Name	Mathematical Statistics Practical - I	L	T	P	C
Course Code	XMT304	0	0	4	2

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

Prerequisite	

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

Course Outcomes		Domain	Level
CO1	**Apply** the concept of discrete and continuous random variables to solve the problems	Cognitive	Applying
CO2	**Utilizing** the concepts of two-dimensional random variables to find the marginal and conditional distribution of both discrete and continuous random variables	Cognitive	Applying
CO3	**Find** the mean, variance and mgf of binomial and Poisson distribution	Cognitive	Understanding
CO4	**Apply** the concept of given distribution to find the area of the given problems	Cognitive	Applying
CO5	**Apply** the concept of correlation and regression to solve the given problem	Cognitive	Applying

UNIT 1	6

Random variables- Discrete distribution function - continuous random variable- Probability density function – Continuous distribution function.

UNIT 2	6

Two-dimensional random variable: joint probability mass function – continuous probability function - Marginal Distribution Function -Mathematical Expectations - Properties of expectation – Properties of variance – simple problems only

UNIT 3	6

M.G.F – Cumulants - Characteristic Functions - Binomial, Poisson distributions – Moments, mode and MGF only

UNIT 4	6

Normaldistribution- Gammadistribution- Beta distribution - Exponential distribution

UNIT 5	6

Correlation: Karl Pearson coefficient of correlation–Rank correlation – Regression: Linear regression – Regression coefficient.

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Book

S.C. Gupta, V.K. Kapoor, Elements of Mathematical Statistics, Sultan Chand & Sons, Educational

Publishers, New Delhi, 3rd Edition, Reprint 2008.

Reference

Dr. P.R. Vittal "Mathematical Statistics" Margham Publications Chennai, 2009.

E-References

https://science.korea.edu/science_en/undergraduate/under_math3.do[Korea University college of science]
http://www.bath.ac.uk/catalogues/2019-2020/ma/MA10211.html[University of Bath, United Kingdom

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**11**	**9**	**15**	**5**	**4**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

1-5 →1, 6-10→2, 11-15→3

Course Name	**Quantitative Aptitude - II**	**L**	**T**	**P**	**C**
Course Code	**XMT305**	**2**	**0**	**0**	**2**

C	**P**	**A**		**L**	**T**	**P**	**H**
2	**0**	**0**		**2**	**0**	**0**	**2**

Prerequisite Basic higher secondary level mathematical knowledge.

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

Course Outcomes		**Domain**	**Level**
CO1	**Apply**the basic concepts of profit and loss, ratio & proportionto solve the problems	Cognitive	Applying
CO2	**Apply** the basic concepts of partnership, chain rule to solve the problems	Cognitive	Applying
CO3	**Explain** the basic concepts of time & work, pipes &cisternsto	Cognitive	Applying

	solve the problems		
CO4	**Explain** the basic concepts of time & distance and problems on trains to solve the problems	Cognitive	Applying
CO5	**Explain** the basic concepts of boats and streams and allegation or mixture to solve the problems	Cognitive	Applying
UNIT 1			**6**
Profit & Loss, Ratio & Proportion.			
UNIT 2			**6**
Partnership, Chain Rule.			
UNIT 3			**6**
Time & work, Pipes& Cisterns			
UNIT 4			**6**
Times & Distance, Problems on Trains.			
UNIT 5			**6**
Boats & Streams, Alligation or Mixture.			

Lecture	**30**	**Tutorial**	**0**	**Practical**	**0**	**Total**	**30**

Text Book

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

References

Banking awareness by Sangram Keshari Rout and Soumya Ranjan Behera, B.K. Publications Pvt. Ltd.; Second edition (2014).
UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
Fast Track Objective Arithmetic by Rajesh Verma, Arihant Publication, Edition 2012.

E-References

www.careerbless.com
www.jagranjosh.com
www.bestguru.com

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1

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

Course Name	**DISASTERMANAGEMENT**	**L**	**T**	**P**	**C**
Course Code	**XUM003**	**1**	**0**	**0**	**1**

C	**P**	**A**		**L**	**T**	**SS**	**H**
1	**0**	**0**		**1**	**0**	**1**	**2**

Prerequisite	Basic knowledge about environment.

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

Course Outcomes		**Domain**	**Level**
CO1	**Understanding** the concepts of application of types Of disaster preparedness	Cognitive	Apply
CO2	**Infer** the end conditions & **Discuss** the failures due to disaster.	Cognitive	Analyze
CO3	**Understanding** of importance of seismic waves occurring globally	Cognitive	Analyze
CO4	**Estimate** Disaster and mitigation problems.	Cognitive	Apply
CO5	Keen **knowledge** on essentials of risk reduction	Cognitive	Apply

UNIT 1	**INTRODUCTION**	**3**

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 2	**APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION**	**3**

Application of various technologies: Databases–RDBMS–Management Information Systems-Decision support system and other systems – Geographic information systems – Intranets and extranets–video tele conferencing. Trigger mechanism–Remote sensing-an insight–contribution of remote sensing and GIS-Case study.

UNIT 3	**AWARENESS OF RISK REDUCTION**	**3**

Trigger mechanism–constitution of trigger mechanism–risk reduction by education–disaster Information network–risk reduction by public awareness.

UNIT 4	**DEVELOPMENT PLANNING ON DISASTER**	**3**

Implication of development planning–Financial arrangements–Areas of improvement–Disaster Preparedness-Community based disaster management–Emergency response.

UNIT 5	SEISMICITY	3
Seismic waves–Earth quakes and faults– measures of an earth quake, magnitude and intensity–ground damage– Tsunamis and earth quakes.		

Lecture	15	Tutorial	-	Practical	-	Total	15

Text Book

1.Siddhartha Gautamand K Leela krisha Rao,"Disaster Management Programmes and Policies",VistaInternationalPubHouse,2012
ArunKumar,"Global Disaster Management",SBS Publishers,2008

References

" Encyclopaedia Of Disaster Management",Neha Publishers &Distributors, 2008
Pardeep Sahni,Madha vimalalgoda and ariya bandu,"Disaster risk reduction in South Asia",PHI,2002
Amita sinvhal,"Understanding earth quake disasters"TMH,2010.
Pardeep Sahni,Alka Dhameja and Umamedury,"Disaste rmitigation : Experiences and reflections",PHI, 2000

E-References

http://icom.museum/disaster_preparedness_book/copyright.pdf
http://www.international.icomos.org/centre_documentation/bib/riskpreparedness.pdf

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	3	3	1	2	1	1
CO 3	3	3	3	3	3	1	2	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**15**	**12**	**15**	**5**	**7**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**

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

1-5 →1, 6-10 →2, 11-15 →3

SEMESTER IV

Course Name			Abstract Algebra	L	T	P	C
Course Code			XMT401	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	2	0	5

Prerequisite	Higher Secondary level Mathematics		
On successful completion of this course, the students will be able to:			
Course Outcomes		**Domain**	**Level**
CO1	**Construct** Cayley table for the given permutation groups	Cognitive	Applying
CO2	**Identify** the left and right coset of the given symmetric group	Cognitive	Applying
CO3	**Explain** normal subgroups and quotient groups	Cognitive	Understanding
CO4	**Explain** the concepts of ring and its properties	Cognitive	Understanding
CO5	**Explain** Integral domain and Euclidean domain	Cognitive	Understanding
UNIT 1			**9+3**
Groups: Definition and Examples – Elementary Properties of a Group – Equivalent definitions of a Group – Permutation Groups.			
UNIT 2			**9+3**
Subgroups – Cyclic Groups – Order of an Element – Cosets and Lagrange's Theorem.			
UNIT 3			**9+3**
Normal Subgroups and Quotient Groups – Isomorphism – Homomorphism.			
UNIT 4			**9+3**
Rings: Definitions and Examples – Elementary properties of rings – Isomorphism – Types of rings – Characteristic of a ring – Subrings – Ideals – Quotient rings.			
UNIT 5			**9+3**
Maximal and Prime Ideals – Homomorphism of rings – Field of quotients of an Integral domain – Unique factorization domain – Euclidean domain.			

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

Text Book

S. Arumugam and A. ThangapandiIssac, Modern Algebra, SciTech Publications Pvt. Ltd., Chennai, 2003.
Unit I -Chapter 3 - Sections 3.1 to 3.4
Unit II -Chapter 3 - Sections 3.5 to 3.8
Unit III-Chapter 3 - Sections 3.9 to 3.11
Unit IV -Chapter 4-Sections 4.1 to 4.8
Unit V -Chapter 4 - Sections 4.9 to 4.11, 4.13 & 4.14

References

N. Herstein, Topics in Algebra, John Wiley & Sons, Student 2nd edition, 1975.
Vijay, K. Khanna and S.K. Bhambri, A course in Abstract Algebra, Vikas Publishing House Pvt. Ltd, 2017.
Dr. R. Balakrishnan and N. Ramabadran, A text book of Modern Algebra, Vikas Publishing House Pvt. Ltd, New Delhi, 1994.

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https://courses.maths.ox.ac.uk/node/43955 [Oxford University]

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	15	15	12	7	15	5	2	5	5
SCALED VALUE	3	3	3	2	3	1	1	1	1

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

1-5 →1, 6-10→2, 11-15→3

Course Name			**Mechanics**	**L**	**T**	**P**	**C**
Course Code			**XMT402**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**3**	**2**	**0**	**5**

Prerequisite Basic Physics knowledge

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

Course Outcomes		**Domain**	**Level**
CO1	**Explain** about forces, velocity, acceleration, moments, couples, friction etc., in trigonometrically and geometrically	Cognitive	Understanding
CO2	**Explain** Newton's laws of motion and equilibrium of forces acting on a rigid body	Cognitive	Understanding
CO3	**Apply** geometrical concepts in parallel forces, moments, and couples in physics problems	Cognitive	Applying
CO4	**Analyze** for Newton's laws of motion and projectiles	Cognitive	Analyzing
CO5	**Analyze** the equation of central orbits	Cognitive	Analyzing
UNIT 1			**12**

Basic concepts and principles –Forces acting at a point-Lami's theorem and applications-Parallel forces –Like and unlike parallel forces-Moment of a force– Couples– Related problems.

UNIT 2		**12**

Equilibrium of three forces acting on a rigid body-Friction-Laws of friction-Angle of friction-Cone of friction- Properties and related problems.

UNIT 3		**12**

Motion in a straight line under uniform acceleration - Newton's laws of motion. Projectiles: Definition-Path of projectile-Range on an inclined plane- Properties and problems.

UNIT 4		**12**

Impulse and Impact: Collision of elastic Bodies–Direct and oblique impact–Loss of Kinetic Energy–Related Properties and Simple Problems.

UNIT 5		**12**

Central Orbits: Motion under the action of central Forces - Properties and related Problems –Differential equation of central orbit-Pedal equation of central orbit-Velocities in a central orbit- Law of forces- Properties and related Problems

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

Text Books

M.K.Venkataraman,"Statics",Agasthiar Publications,Trichy,2004.
Unit1: Chapters2,3,4
Unit2:Chapters 5,7
M.K.Venkataraman,"Dynamics",Agasthiar Publications,Trichy,2004.
Unit3:Chapters3: section3.22,Chapter4:Section4.3,Chapter6
Unit4:Chapter 8
Unit5:Chapter11

References

. T.K.Manickavasagam Pillai,"Statics",S.Viswanathan & Co.,Chennai,1980.
. S.Narayanan," Dynamics",S.Chand & Co.,New Delhi,1980.

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http://nptel.ac.in

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	**15**	**15**	**13**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

Course Name			**Mathematical Statistics - II**	**L**	**T**	**P**	**C**
Course Code			**XMT403**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**3**	**2**	**0**	**5**
Prerequisite			Basic knowledge of random variables and distributions.				

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

	Course Outcomes	**Domain**	**Level**
CO1	**Explain** the test of significance for large sampling	Cognitive	Understanding
CO2	**Explain** the chi square distribution	Cognitive	Understanding
CO3	**Explain** the Student's t-distribution	Cognitive	Understanding
CO4	**Explain** the F distribution	Cognitive	Understanding
CO5	**Classify** the various types of analysis of variance	Cognitive	Understanding

UNIT 1	**Large sampling theory**	**12**
Types of sampling- test of significance- null hypothesis- error in sampling- critical regions and level of significance- test of significance for large- samples- sampling of attributes.		
UNIT 2	**χ^2 Distribution**	**12**
χ^2 - variates- derivation of the χ^2 distribution (Method of M.G.F only)- M.G.F, C.G.F- mode and skewness - additive property - χ^2 probability curve - Theorems on χ^2 distribution - Application of χ^2 - distribution: Inference about a population variance – goodness of fit test.		
UNIT 3	**Student's t-distribution**	**12**
Derivation of t-distribution - constants of t-distribution- limiting of t-distribution- application of t-distribution - test of single mean, difference of mean.		
UNIT 4	**F- distribution**	**12**
Derivation of F-distribution- constant of F-distribution- mode of F-distribution- application of F-distribution - test for equality of two population variance (only simple problems of F- distribution). – Relation between t and F and relation between F and χ^2 tests.		
UNIT 5	**Analysis of Variance**	**12**
Introduction - one-way, two-way classifications – Experimental designs: Randomized block design - Latin		

squares.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

Fundamentals of mathematical statistics, S.C Gupta, V. K. Kapoor (11th edition) - Sultan Chand & Sons 2002.
Unit I : Chapter: 14 (Sec. 14.1 – 14.7.2)
Unit II : Chapter: 15 (Sec. 15.1- 15.4, 15.6(15.6.1-15.6.2))
Unit III :Chapter: 16 (16.2, 16.3(16.3.1, 16.3.2))
Unit IV :Chapter: 16(16.5- 16.8)
'Statistical Methods' Vol. II, Dr. S.P. Gupta, Sultan Chand & Sons 2008.
Unit V:Chapter: 5, 6

Reference

Dr. P.R. Vittal "Mathematical Statistics" Margham Publications Chennai,2009.

E-References

1.https://acadinfo.wustl.edu/CourseListings/CourseInfo.aspx?sem=FL2020&sch=L&dept=L24&crs=494[Washington University]
2.https://www.maths.cam.ac.uk/undergrad/files/coursesIB.pdf [Cambridge]

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name			Mathematical Statistics Practical - II	L	T	P	C
Course Code			XMT404	0	0	4	2
C	P	A		L	T	P	H
2	0	0		0	0	4	2

Prerequisite	Basic knowledge of random variables and distributions.

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

	Course Outcomes	Domain	Level
CO1	**Explain** the concept of large samples and solve the related problems	Cognitive	Applying
CO2	**Solve** the problems by using χ^2 Distribution	Cognitive	Applying
CO3	**Solve** the problems by usingt- test of single mean, difference of mean.	Cognitive	Applying
CO4	**Apply** the concept of F-distribution to solve simple problems	Cognitive	Applying
CO5	**Explain** the concept ofanalysis of variance to solve the problems by using methods such as one-way, two-way classifications, randomized block design and Latin squares	Cognitive	Applying

UNIT 1	**Large sampling theory**	**6**

Types of sampling- test of significance- null hypothesis- error in sampling- Critical regions and level of significance- test of significance for large sample.

UNIT 2	**χ^2 Distribution**	**6**

χ^2 Distribution- Theorems on χ^2 distribution - Application of χ^2 - distribution: Inference about a population variance – goodness of fit test.

UNIT 3	**Student's t-distribution**	**6**

Definition of t-distribution- application of t-distribution - test of single mean, difference of mean.

UNIT 4	**F-distribution**	**6**

Definition of F-distribution- application of F-distribution - test for equality of two population variance (only simple problems of F- distribution).

UNIT 5	**Analysis of variance**	**6**

Introduction - one-way, two-way classifications – Experimental designs: Randomized block design - Latin squares.

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

Fundamentals of mathematical statistics, S.C Gupta, V. K. Kapoor (11th edition) - Sultan Chand & Sons2002.
Unit I:Chapter: 14 (Sec. 14.1 – 14.7.2)
Unit II:Chapter: 15 (Sec. 15.1- 15.4, 15.6(15.6.1-15.6.2))
Unit III:Chapter: 16 (16.2, 16.3(16.3.1, 16.3.2))
Unit IV:Chapter: 16(16.5- 16.8)
'Statistical Methods' Vol. II, Dr. S.P. Gupta, Sultan Chand & Sons 2008.
Unit V: Chapter: 5, 6

Reference

Dr. P.R. Vittal "Mathematical Statistics" Margham Publications Chennai, 2009.

E-References

https://acadinfo.wustl.edu/CourseListings/CourseInfo.aspx?sem=FL2020&sch=L&dept=L24&crs=494[Washington University]
https://www.maths.cam.ac.uk/undergrad/files/coursesIB.pdf [Cambridge]

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name			Quantitative Aptitude - III	L	T	P	C
COURSE CODE			XMT405	2	0	0	2
C	P	A		L	T	P	H
2	0	0		2	0	0	2

Prerequisite	Basic mathematical knowledge.

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

	Course Outcomes	Domain	Level
CO1	**Find** simple interest and compound interest of the given problems	Cognitive	Remembering
CO2	**Find** the area of the bounded region	Cognitive	Remembering
CO3	**Find**the volume and surface area of the given region	Cognitive	Remembering
CO4	**Find**the angle between the hour hand and minute hand of the clock	Cognitive	Remembering
CO5	**Find**the permutations and combinations of the given problems	Cognitive	Remembering

UNIT 1		6
Simple Interest, Compound Interest.		
UNIT 2		**6**
Logarithms, Area.		
UNIT 3		**6**
Volume & Surface Areas, Races & Games of Skill.		
UNIT 4		**6**
Calendar, Clocks.		
UNIT 5		**6**
Stocks & Shares, Permutations & Combinations.		

Lecture	30	Tutorial	15	Practical	0	Total	30

Text Book

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

References

Banking awareness by Sangram Keshari Rout and Soumya Ranjan Behera, B.K. Publications Pvt. Ltd.; Second edition (2014).
UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
Fast Track Objective Arithmetic by Rajesh Verma, Arihant Publication, Edition 2012.

E-References

www.careerbless.com
www.jagranjosh.com

www.bestguru.com

COs vs POs

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

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

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

Course Name			Entrepreneurship Development	L	T	P	C
Course Code			XUM004	1	0	0	1
C	P	A		L	T	SS	H
2	0	0		1	0	1	2
Prerequisite			Basic skills like critical thinking, creativity, risk-taking, problem-solving, networking, leadership.				

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

Course Outcomes		Domain	Level
CO1	**Understand** the concept of Entrepreneurship	Cognitive	Understanding
CO2	**Understand** about an Entrepreneur	Cognitive	Understanding
CO3	**Understand** the characteristics of Entrepreneur	Cognitive	Understanding
CO4	**Understand** the ways to acquire skills of Entrepreneur	Cognitive	Understanding
CO5	**Understand**the concept of Intrepreneurship	Cognitive	Understanding

UNIT 1	**INTRODUCTION TO ENTREPRENEURSHIP**	**3 + 3**

Meaning and Concept of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Myths about Entrepreneurs, Agencies in Entrepreneurship Management and Future of Entrepreneurship.

UNIT 2	**THE ENTREPRENEUR**	**3 + 3**

Gender Discrimination in society and in family, Gender equity, equality, and empowerment. Social and Economic Status of Women in India in Education, Health, Employment, Definition of HDI, GDI and GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.

UNIT 3	**CHARACTERISTICS OF AN ENTREPRENEUR**	**3 + 3**

Introduction - Characteristic Features of Successful Indian Entrepreneurs - Differences between an Entrepreneur and a Manager - Difference between an Entrepreneur and an Intrapreneur - Relationship between the terms Entrepreneur, Entrepreneurial and Entrepreneurship - Difference between a Scientist, Inventor and Entrepreneur - Relationship between Entrepreneur and Enterprise - Difference between Entrepreneur and Enterprise - Difference between a Self-employed person and Entrepreneur - Common Myths on Entrepreneur.

UNIT 4	**SKILLS FOR AN ENTREPRENEUR**	**3 + 3**

Business Management Skills - Communication and active listening skills - Risk-taking skills – Networking Skills – Critical Thinking Skills – Problem Solving Skills – Creative Thinking Skills – Customer Service Skills – Financial Skills – Leadership Skills – Time Management and Organizational Skills – Technical Skills.

UNIT 5	INTRAPRENEURSHIP	3 + 3

What is Intrapreneurship? – Understanding Intrapreneurship – Types of Intrapreneurs – Characteristics of Intrapreneurs – Examples of Intrapreneurship.

Lecture	15	Self - Study	15	Total	30

Text Book

1. Jayashree Suresh, Entrepreneurial Development, Margham Publications.

References

1.Essentials of Entrepreneurship and Small Business Management (6th Edition) by Norman M. Scarborough (Paperback - Jan 13, 2010)

2. Entrepreneurship and Small Business Management, Student Edition by Glencoe McGraw-Hill (Hardcover -
Feb 24, 2005)

3. Vasant Desai, Dynamics of Entrepreneurship Development, Star Publication, New Delhi.

E-References

https://in.indeed.com/career-advice/career-development/entrepreneur-skills

2. https://www.investopedia.com/terms/i/intrapreneurship.asp

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

SEMESTER V

Course Name	Real Analysis	L	T	P	C
Course Code	XMT501	3	1	0	4

C	P	A	L	T	P	H
4	0	0	3	2	0	5

PREREQUISITE	Knowledge in the basic properties of real numbers

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

Course Outcomes		Domain	Level
CO1	**Explain** the basics of real numbers.	Cognitive	Understanding
CO2	**Explain** the neighborhoods and limit points.	Cognitive	Understanding
CO3	**Demonstrate**about continuity and discontinuity of various functions in different contexts.	Cognitive	Understanding
CO4	**Demonstrate** about derivatives and continuity	Cognitive	Understanding
CO5	**Explain** the Riemann integration and mean value theorems.	Cognitive	Understanding

UNIT 1	Real numbers	9 + 3

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 2	Neighborhoods and limit points	9 + 3

Open sets – Closed sets –Limit points of a set – Closure of a set.

UNIT 3	Limits and Continuity	9 + 3

Limits – Continuous functions – Types of discontinuities- Algebra of Continuous functions – Boundedness of continuous functions.

UNIT 4	Derivatives	9 + 3

Introduction – Derivability and continuity- Algebra of derivatives – Inverse function theorem for derivatives – Darboux's theorem.

UNIT 5		9 + 3

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	45	Tutorial	15	Practical	0	Total	60

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]

Reference

Arumugam. S. and Thangapandi Issac, "Sequences and Series", New Gamma, Publishing House, Palayamkottai - 627 002, 1997.
Goldberg. R. “Methods of Real Analysis”, Oxford and IBH Publishing Co., New Delhi (2000).
Arumugam and Issac,“Modern Analysis”, New Publishing House, 2017.
Malik S.C and Savitha Arora,“Mathematical Analysis”, 1991, Wiley Eastern Limited New Delhi.

E-References

https://nptel.ac.in

COs vs POs

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

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

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

Course Name	Discrete Mathematics	L	T	P	C
Course Code	XMT502	3	1	0	4

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

Prerequisite	Higher Secondary level Mathematics

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

Course Outcomes		Domain	Level
CO1	**Solve** second order recurrence relations by finding the corresponding generating functions	Cognitive	Applying
CO2	**Utilize** truth tables and the properties of logic to simplify given logic statements	Cognitive	Applying
CO3	**Determine** if the given statements are logically equivalent or not using logical operators	Cognitive	Evaluating
CO4	**Analyze** the basic structures of lattice and Boolean algebra	Cognitive	Analyzing
CO5	**Identify** different formal language classes and their relationships	Cognitive	Applying

UNIT 1		9 + 3

Recurrence relations and generating function: Recurrence-an introduction-polynomials and their evaluations- Recurrence relations- solution of finite order Homogeneous (linear) Relations- Solution of Non-Homogeneous relations.

UNIT 2		9 + 3

Logic: TF- statements – connectives- atomic and compound statements-well formed (statements) Formulae – parsing trees.

UNIT 3		9 + 3

Logic: Truth table of a formula – Tautology- Tautological Implications and Equivalence of Formulae - Replacement process- Functionally Complete sets of connectives and Duality law.

UNIT 4		9 + 3

Lattices and Boolean Algebras: Lattices- some properties of lattices- New lattices- Modular and distributive lattices.

UNIT 5		9 + 3

Automata and Languages: Finite Automata – definition of finite automation – Representation of finite automation Acceptability of a string by a finite automation - Languages accepted by a finite automation - Non-deterministic finite automata.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

"Discrete Mathematics**"** by Dr. M.K. Venkatraman, Dr.N. Sridharan, N. Chandrasekeran, the National Publishing Company, 2003.

Unit I :Chapter: 5 Sec 1-5 (Pages: 5.01- 5.19)
Unit II : Chapter: 9 Sec 1- 5 (Pages: 9.1- 9.20)
Unit III : Chapter: 9 Sec 6- 10 (Pages: 9.21- 9.42)
Unit IV : Chapter: 10 Sec 1- 4 (Pages: 10.1- 10.32)
Unit V : Chapter: 12 Sec 1 –7 (Pages: 12.1- 12.16)

Reference

Koleman and Bushy- Discrete Mathematical Structures, Prentice Hall of India, New Delhi- 2002.

E-References

https://www.cst.cam.ac.uk/teaching/2021/DiscMath[University of Cambridge]
https://explorecourses.stanford.edu/search?q=CS157[Stanford]

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	3	3	1	3	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**15**	**12**	**15**	**5**	**8**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**

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

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

Course Name	Numerical methods	L	T	P	C
Course Code	XMT503	4	1	0	5

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

Prerequisite	Knowledge In Higher Secondary Level Mathematics

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

Course Outcomes		Domain	Level
CO1	**Identify** the solution of numerical algebraic and transcendental equations using appropriate methods	Cognitive	Applying
CO2	**Identify** the solution of simultaneous linear algebraic equation using Gauss elimination and Gauss Jordan method	Cognitive	Applying
CO3	**Construct** a function which closely fits given n- points in the plane by using interpolation method	Cognitive	Applying
CO4	**Identify** the solution of an equation using the concepts of the Numerical Differentiation and integration	Cognitive	Applying
CO5	**Analyze**the solution of anordinary Differential Equations using Euler method, modified Euler method and Runge - Kutta method	Cognitive	Analyzing

UNIT 1		12 + 3

The solution of numerical algebraic and Transcendental Equations: The Bisection Method- iteration method- Order of convergence- Regula False method- Newton Raphson Method- order of convergence**.**

UNIT 2		12 + 3

Solution of simultaneous linear algebraic equation: Gauss elimination method- Gauss Jordan method- inversion of a matrix using Gauss elimination method- Gauss Jacobi method- Gauss- Seidel method.

UNIT 3		12 + 3

Interpolation - Gregory Newton forward interpolation formula - Backward interpolation formula- Gauss forward interpolation formula - Backward interpolation formula – Lagrange's interpolation formula – different forms of Lagrange's interpolation formula.

UNIT 4		12 + 3

Numerical Differentiation and integration- Newton's forward and backward difference method to compute derivatives- the trapezoidal- Romberg's method- Simpson's one third rule- Simpson's 3/8 rule- Weddle's rule.

UNIT 5		12 + 3

Numerical Solution of ordinary Differential Equations-Power series approximation- solution by Taylor's series- Picard's method of successive approximations- Euler method- modified Euler method- Runge- Kutta method- orders 2 and 4.

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

"Numerical Methods" (2001), P. Kandasamy, K. Thilagavathy, K. Gunavathy, S. Chand& Company Ltd., New Delhi.
Unit I : Chapter: 3 (3.1.1 to 3.4.3), Pages: 69 - 96
Unit II : Chapter: 4 (4.1- 4.3 and 4.7 - 4.9), Pages: 112-126, 145-158
Unit III: Chapter: 6 (6.1-6.6), Pages: 209 – 225,
Chapter: 7 (7.1-7.4), Pages: 231 – 240,
Chapter: 8 (8.7 only), Pages: 271 - 276.
Unit IV:Chapter: 9 (9.1- 9.3, 9.6- 9.15), Pages: 281 - 317
Unit V :Chapter: 11 (11.1- 11.15), Pages: 348 - 393

References

S. Sastri, Introduction methods of Numerical Analysis, Fifth Edition, PHI Learning Pvt. Ltd, 2012.
M.K. Venkataraman, Numerical methods in science and Engineering- Fifth Edition (Revised& Enlarged), The National Publishing Co., Chennai, 2004.
A. Singaravelu, Numerical methods Meenakshi Agency, 2019.

E-References

https://explorecourses.stanford.edu/search?q=CME206 [Stanford University]
https://courses.maths.ox.ac.uk/node/44065 [Oxford]

COs vs POs

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

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

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

Course Name			Number Theory	L	T	P	C
Course Code			XMT503	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

Prerequisite	Knowledge in Algebra

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

Course Outcomes		Domain	Level
CO1	**Apply** the Euclidean algorithm to compute the gcd of two integers.	Cognitive	Applying
CO2	**Apply** the Dirichlet product to Mobious functions.	Cognitive	Applying
CO3	**Apply** the Dirichlet multiplication to Mangold functions.	Cognitive	Applying
CO4	**Solve** the number theoretic problems on averages arithmetic functions	Cognitive	Applying
CO5	**Solve** the linear congruences using the concepts of congruence relations	Cognitive	Applying

UNIT 1	12 + 3

The Fundamental Theorem of Arithmetic: Introduction- Divisibility - Greatest Common divisor - Prime numbers - The fundamental theorem of arithmetic - The series of reciprocals of the primes - The Euclidean algorithm - The greatest Common divisor of more than two numbers.

UNIT 2	12 + 3

Arithmetical Functions and Dirichlet multiplication: The mobius function (n) - The Euler totient function- A relation connecting and - A product formula for (n) - the Dirichlet product of arithmetical functions - Dirichlet inverses and the Mobius inversion formula.

UNIT 3	12 + 3

The Mangoldt function (n) - multiplicative functions- Multiplicative function and Dirichlet multiplication - The inverse of a completely multiplicative function - Liouville's function A (n) - the divisor functions $\sigma_\alpha(n)$ - Generalized convolutions - formal power series.

UNIT 4	12 + 3

Averages of Arithmetical Functions: The big oh notation Asymptotic equality of functions – Euler's summation formula - some elementary asymptotic formulas - the average order of d (n).

UNIT 5	12 + 3

Congruences: Definition and basic properties of congruence's - Residue classes complete residue systems - Linear congruence's – solved problems and examples.

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

Analytic Number Theory by Tom.M.Apostal, Springer Science & Buisness Media, 2013.

Unit I Chapter 1 (1.1 - 1.8)
Unit II Chapter 2 (2.1 - 2.7)
Unit III Chapter 3 (2.8 – 2.15)
Unit IV Chapter 5 (3.1- 3.5)
Unit V Chapter 9 (5.1- 5.3)

References

Number Theory, GeorgeE. Andrews, Courier Corporation, 1994.
Introduction to theory of Number, G.H. Hardy and E.M. Wright, Oxford University Press, 6th edition (2008)..
Basic Number Theory, S.B. Malilk, Vikas Publishing, 2018.

E-References

http://nptel.ac.in

COs vs POs

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

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

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

Course Name			Graph Theory	L	T	P	C
Course Code			XMT504	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

Prerequisite	Knowledge In Basic Mathematics

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

	Course Outcomes	Domain	Level
CO1	**Explain** the basic concepts graphs and operation on graph	Cognitive	Understanding
CO2	**Demonstrate** the concepts of walks, trials, paths, connectedness and components	Cognitive	Understanding
CO3	**Infer** the characterization of trees and centre of a tree	Cognitive	Understanding
CO4	**Outline** the basics of matchings and planarity	Cognitive	Understanding
CO5	**Relate** the four colour theorem and five colour theorem	Cognitive	Understanding

UNIT 1	Graphs and Subgraphs	12 + 3

Introduction, definition – Degrees, subgraphs, Isomorphism, Ramsey numbers – Independent sets and coverings – Intersection graphs and line graphs – matrices and operations on graphs

UNIT 2	Degree sequences and connectedness	12 + 3

Degree sequences and graphic sequences – Walks, trials and paths – connectedness and components – Blocks and connectivity

UNIT 3	Eulerian and Hamiltonian Graphs, Trees	12 + 3

Eulerian and Hamiltonian Graphs – Trees – characterization of trees – centre of a tree

UNIT 4	Matchings and Planarity	12 + 3

Matchings - Matchings in Bipartite graphs – Planarity – Definition – characterization of planar graphs – Thickness, crossing and outer planarity

UNIT 5	Colourability	12 + 3

Chromatic number- Chromatic index – Five colour theorem – Four colour problem - Chromatic Polynomials

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

An invitation to Graph theory - Dr. S. Arumugam& S. Ramachandran,SCITECH publications (India) l Pvt.Ltd., Chennai, 2006.

Unit I : Chapter 2
Unit II : Chapter 3 and 4
Unit III : Chapter 5 and 6
Unit IV : Chapter7 and 8

Unit V : Chapter 9

References

1. Graphs Theory with Applications to Engineering and computer science – NarsinghDeo, Printice- Hall of India Private Ltd, 2014.
2. Graph Theory- F. Harary, Narosa Publishing House, edition 2013.
S.A. Choudham, A First Course in Graph Theory, Macmillan India Ltd,1987.

E-References

http://nptel.ac.in

COs vs POs

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

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

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

Course Name			Mathematical Modeling	L	T	P	C
Course Code			XMT504	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
Prerequisite			Basic knowledge of algebra ,differentiation concepts.				

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

Course Outcomes		Domain	Level
CO1	**Explain the c**lassification of mathematical models and limitations of mathematical modelling	Cognitive	Understanding
CO2	**Apply** the concepts offirst orderordinary differential equations to form mathematical modeling for Dynamic and Geometrical problems	Cognitive	Applying
CO3	**Analyze** the mathematical models involved in economics through first order ordinary differential equations	Cognitive	Analyzing
CO4	**Analyze** the mathematical models in Medicine, Arms Race, Battles and International Trade in terms of systems of ordinary differential equations	Cognitive	Analyzing
CO5	**Analyze** the models in Planetary motions, Circular motion and motion of Satellites	Cognitive	Analyzing

UNIT 1	**12 + 3**
Simple situation requiring Mathematical modeling and technique-Classification of mathematical models-some characteristics of mathematical models-Modeling through Geometry-Modeling through Algebra-Modeling through Trigonometry-Modeling through Calculus-Limitations of Mathematical modeling.	
UNIT 2	**12 + 3**
Mathematical Modeling through differential Equations-Linear Growth and Decay Models-Non-Linear Growth and Decay Models-Compartment Models-Modeling in Dynamics through Ordinary differential equations of first order- Mathematical modeling of Geometrical problems through ordinary differential equations of first order.	
UNIT 3	**12 + 3**
Mathematical Modeling in Population Dynamics-Modeling of Epidemics through systems of Ordinary differential equations of first order-Compartment models through systems of ordinary differential equations-Modeling in Economics through systems of ordinary differential equations of first order**.**	
UNIT 4	**12 + 3**

Mathematical models in Medicine, Arms Race, Battles and International Trade in terms of systems of ordinary differential equations-Modeling in Dynamics through systems of Ordinary Differential equations of first order.

UNIT 5		**12 + 3**

Mathematical modeling of Planetary motions – Modeling of Circular motion and motion of Satellites.

Lecture	**60**	**Tutorial**	**15**	**Practical**	**0**	**Total**	**75**

Text book

"Mathematical Modeling' by J.N. Kapur, New Age International Private Limited, Second edition, 2021.

Unit I : Chapter 1.1-1.9
Unit II : Chapter 2.1-2.6
Unit III : Chapter 3.1-3.4
Unit IV : Chapter 3.5-3.6
Unit V : Chapter 4.1-4.2

References

1." An Introduction to Mathematical Modeling "byEdward A. Bender, Dover publications (2003)

E-References

http://nptel.ac.in

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	**15**	**15**	**14**	**12**	**15**	**5**	**7**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**

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

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

Course Name			Fundamentals of Data Science & R Programming	L	T	P	C
Course Code			XMT505	1	1	0	1
C	P	A		L	T	P	H
1	0	0		1	1	0	2
Prerequisite			Basic computer knowledge				

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

	Course Outcomes	Domain	Level
CO1	**Describe** the significance of data science and understand the Data Science process	Cognitive	Understanding
CO2	**Build, and prepare** data for use with a variety of statistical methods and models	Cognitive	Applying
CO3	**Analyze** Data using various Visualization techniques.	Cognitive	Analyzing
CO4	**Analyze** the variables, scalars, vectors in R programming.	Cognitive	Analyzing
CO5	**Apply** the various charts and plots.	Cognitive	Applying

UNIT 1		**12 + 3**
	Introduction To Data Science: Definition, Big Data and Data Science Hype, Datafication, Data Science Profile, Meta-Definition, Data Scientist, Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Big Data Can Mean Big Assumptions, Modeling, Philosophy of Exploratory Data Analysis, The Data Science Process, A Data Scientist's Role in this Process	
UNIT 2		**12 + 3**
	Data Munging: Properties of Data, Languages for Data Science, Collecting Data, Cleaning Data, Crowdsourcing. Scores and Rankings: Developing Scoring Systems, Z-scores and Normalization, Advanced Ranking Techniques Statistical Analysis: Sampling from Distributions, Statistical Distributions, Statistical Significance, Permutation Tests and P-values	
UNIT 3		**12 + 3**
	Introduction to R Understanding R data structure, Variables in R, Scalars, Vectors. Matrices, List, Data frames, Using c, Cbind, Rbind, attach and detach functions in R , Factors	
UNIT 4		**12 + 3**
	Importing data Importing data from excel, importing data from SAS, accessing database, Saving in R data, Loading R data objects, writing to files Manipulating Data, selecting rows/observations, selecting columns/fields, merging data, Relabeling the column names	
UNIT 5		**12 + 3**

	R Programming, While loop, If loop, For loop, Arithmetic operations Charts and Plots, Box plot, Histogram, Pareto charts, Pie graph, Line chart, Scatterplot	

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

Steven S. Skiena, "The Data Science Design Manual", Springer 2017.
Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Frontline O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.
Cotton, R., Learning R: a step-by-step function guide to data analysis. 1st edition. O'reilly Media Inc.

References

Joel Grus," Data Science from Scratch" First Edition, April 2015 2. Gareth James, Daniela Witten, Trevor Hatie, RoberstTibhirani, "An Introduction to Statistical Learning-with Applications in R ", 2013
R Programming for Data Science, Roger D. Peng, LeanPub, 2015.

E-References

1."Data science for engineers" https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28/
2.https://jrnold.github.io/r4ds-exercise-solutions/index.html
https://www.r-project.org/
https://cran.r-project.org/

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**12**	**7**	**15**	**5**	**2**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Quantitative Aptitude -IV	L	T	P	C
Course Code			XMT506	2	0	0	2
C	P	A		L	T	P	H
2	0	0		2	0	0	2
Prerequisite			Basic mathematical knowledge				

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

Course Outcomes		Domain	Level
CO1	**Explain** the basic concepts of Probability and True Discountand to solve problems	Cognitive	Applying
CO2	**Explain** the basic concepts of Banker's Discount, Heights & Distances and solve problems	Cognitive	Applying
CO3	**Explain** the basic concepts of odd man Out, Series and Patterns, Tabulation and to solve the problems	Cognitive	Applying
CO4	**Explain** the basic concepts of Bar Graphs Pie Charts and to solve the problems	Cognitive	Applying
CO5	**Explain** the basic concepts of Line Graphs and to solve the Problems	Cognitive	Applying
UNIT 1			**6**
Probability, True Discount.			
UNIT 2			**6**
Banker's Discount, Heights & Distances.			
UNIT 3			**6**
Odd man Out, Series and Patterns, Tabulation.			
UNIT 4			**6**
Bar Graphs Pie Charts			
UNIT 5			**15**
Line Graphs.			

Lecture	30	Tutorial	0	Practical	0	Total	30

Text Book

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

References

Banking awareness by Sangram Keshari Rout and Soumya Ranjan Behera, B.K. Publications Pvt. Ltd.; Second edition (2014).
UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
Fast Track Objective Arithmetic by Rajesh Verma, Arihant Publication, Edition 2012.

E-References

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

COs vs POs

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

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

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

SEMESTER VI

Course Name	Complex Analysis	L	T	P	C
Course Code	XMT601	3	1	0	4

C	P	A		L	T	P	H
4	0	0		3	2	0	5

Prerequisite	Knowledge in Calculus

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

Course Outcomes		Domain	Level
CO1	**Determine** whether the given function is Continuous / differentiable / analytic.	Cognitive	Evaluating
CO2	**Determine** the image of given region under the given bilinear transformation	Cognitive	Evaluating
CO3	**Explain** Cauchy's theorem and Cauchy Integral formula	Cognitive	Understanding
CO4	**Determine** the annulus of convergence of a given function using the concepts of series expansion	Cognitive	Evaluating
CO5	**Evaluate** complex contour integrals using the Cauchy Residue theorem	Cognitive	Evaluating

UNIT 1	**Complex numbers**	**9 + 3**

Complex numbers – Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability - The Cauchy Riemann equations – Analytic functions – Harmonic functions (Except Milne-Thompson method).

UNIT 2	**Bilinear Transformation**	**9 + 3**

Introduction – Elementary transformations – Bilinear transformation – cross ratio – fixed points of bilinear transformation – some special bilinear transformations

UNIT 3	**Complex Integration**	**9 + 3**

Introduction – definite integral – Cauchy's Theorem – Cauchy's integral formula – Maximum modulus theorem – Higher derivatives – Cauchy's inequality – Liouville's theorem – Fundamental theorem of algebra – Morera's theorem.

UNIT 4	**Series Expansions**	**9 + 3**

Introduction – Taylor's series – Laurent's series – Zeros of an analytic function – singularities and poles – Riemann's theorem - meromorphic function.

UNIT 5	**Calculus of residues**	**9 + 3**

Residues – Cauchy's Residue theorem – Argument theorem – Rouche's theorem - Evaluation of definite integral –Contour integration types.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

"Complex Analysis**"** by S. Arumugam, A. Thangapandi Isaac, A. Somasundaram, Scitech Publications,

2014.

Unit I : Chapter 1 (Sec: 1.1), Pages: 1 – 2
Chapter 2 (Sec: 2.1 – 2.8), Pages: 24 – 52
Unit II : Chapter 3 (Sec: 3.1 – 3.5), Pages: 74 – 100
Unit III : Chapter 6(Sec: 6.1 – 6.4), Pages: 132 – 170
Unit IV : Chapter 7(Sec: 7.1 – 7.4), Pages: 173 – 207
Unit V : Chapter 8(Sec: 8.1 – 8.3), Pages: 209 – 254

References

"Foundations of complex Analysis" by S. Ponnusamy- Narosa Publishing House- New Delhi Chennai.
2. "Functions of a complex variables with applications" by E.G. Phillis (1968)- Oliver & Boy D, Edinburg

E-References

http//nptel.ac.in

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	3	3	1	3	1	1
CO 2	3	3	3	3	3	1	3	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	3	3	1	3	1	1
CO 5	3	3	3	3	3	1	3	1	1
TOTAL	**15**	**15**	**14**	**13**	**15**	**5**	**12**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**1**

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

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

Course Name			Operations Research	L	T	P	C
Course Code			XMT602	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4
Prerequisite			Knowledge In Basic Mathematical Concepts				

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

Course Outcomes		Domain	Level
CO1	**Apply** graphical method to solve a given linear programming problem	Cognitive	Applying
CO2	**Solve** thelinear programming problem using simplex method and big M method	Cognitive	Applying
CO3	**Identify** the timeline of a given project using PERT	Cognitive	Applying
CO4	**Determine** the optimal solution for Transportation problems and Assignment Problems	Cognitive	Applying
CO5	**Utilize** dominance property for finding saddle point of the zero-sum game with mixed strategies	Cognitive	Applying

UNIT 1	9 + 3

Operations Research- An overview: Nature and characteristic Features of OR- Models in OR- OR and Decision Making- Applications and Limitations of OR- Linear Programming Problem: Formulation and Graphical methods.

UNIT 2	9 + 3

Simplex Method – Big M method - Two phase- Simplex Method-Duality in Linear Programming: Formulation of Primal Dual Pairs – Mathematical formulation of duality - problems.

UNIT 3	9 + 3

Dual Simplex Method - Network Scheduling by PERT/ CPM: Critical path Method and PERT calculations.

UNIT 4	9 + 3

Transportation Problem and Assignment Problem.

UNIT 5	9 + 3

Game Theory: Optimal solution of two person zero- sum games- games with mixed strategies - The graphical method- Dominance property- general solution of (m x n) rectangular games (LPP only)

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

Problems in operations Research**,** P.K Gupta & Man Mohan, Sultan Chand & Sons.
Unit I : Chapters 0 to 3

Unit II	:	Chapters 4, 5,6,8,9
Unit III	:	Chapters 9 and 27
Unit IV	:	Chapters 15 and 16
Unit V	:	Chapters 20

Reference

1.” Operations Research” Kanti Swarup, PK. Gupta and Man Mohan, Sultan Chand and Sons, edition 2020.

E-References

http//nptel.ac.in

COs vs POs

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

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

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

Course Name			Fuzzy Sets and its Applications	L	T	P	C
Course Code			XMT603	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
Prerequisite							

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

Course Outcomes		Domain	Level
CO1	**Define** the Fuzzy sets , Fuzzy graphs and their principles.	Cognitive	Understanding
CO2	**Understand**Fuzzy relations and Fuzzy graphs.	Cognitive	Analyzing
CO3	**Analyze**Fuzzy quantifiers and Multi conditional approximate reasoning	Cognitive	Analyzing
CO4	**Explain** the Fuzzification. Defuzzification and the various Defuzzification methods	Cognitive	Understanding
CO5	**Apply** the Fuzzy ranking methods in Civil Engineering, Mechanical Engineering, Industrial Engineering and Medicine	Cognitive	Applying

UNIT 1	**Fuzzy sets**	**12+ 3**

Basic Definitions – Basic set theoretic operations for Fuzzy sets – Extensions: Types of Fuzzy sets – algebraic operations - Extension Principle: operation for type 2 fuzzy sets – algebraic operations with fuzzy numbers – special extended operations – Extended operations for LR-representation of fuzzy sets.

UNIT 2	**Fuzzy relations and Fuzzy Graphs**	**12+ 3**

Fuzzy relations and fuzzy sets – Composition of Fuzzy relations – Min-max composition and its proper ties – Fuzzy graphs – Special fuzzy relation - Possibility Theory – Possibility of fuzzy events – Possibility Vs Probability.

UNIT 3	**Fuzzy Logic**	**12+ 3**

Classical logic: An overview – Multi valued logic – Fuzzy propositions – Fuzzy quantifiers – Linguistic hedges – Inference from conditional fuzzy propositions–**Approximate reasoning**: An overview of fuzzy expert system – Fuzzy implications and their selection – Multi conditional approximate reasoning – The role of fuzzy relation equation.

UNIT 4	**Fuzzy Systems**	**12+ 3**

Fuzzy controllers: An overview – Fuzzy rule base. Fuzzy inference engine. Fuzzification. Defuzzification and the various Defuzzification methods (the centre of area, the centre of maxima and the mean of maxima methods)

Fuzzy controllers: An example – Fuzzy systems and Neural Networks – Automata – Dynamical Systems.

UNIT 5	**Decision making in Fuzzy Environment**	**12+ 3**

Individual decision making – Multiperson decision making – Multicriteria decision making – Multi stage decision making – Fuzzy ranking methods – Fuzzy linear programming – Applications in Civil Engineering,

Mechanical Engineering, Industrial Engineering and Medicine.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Books

Fuzzy set theory and its applications Fourth edition, H. J. Zimmermann. Springer, 2015.
Unit – I: Chapters. 2, 3(Sec. 3.1 – 3.2.1), 5
Unit – II: Chapters. 6, 8(Sec. 8.2 – 8.4)
Fuzzy sets and Fuzzy Logic, Theory and Applications, George J. Klir and Bo Yuan, PHI, 2013.
Unit – III: Chapters. 8(Sec. 8.1 – 8.6), 11(Sec. 11.1 – 11.5)
Unit – IV: Chapters. 12
Unit – IV: Chapters. 15, 16(Sec. 16.2, 16.3), 17(Sec. 17.2)

References

1."Fuzzy Set Theory Fuzzy Logic and their Application" , Bhargava A.K.. Publisher, S. Chand Publishing, 2013

E-References

1.http://www.tezu.ernet.in/dmaths/programme/PhD-MathSc-syllabus_2013.pdf
[Cambridge *University]*
2. http://www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/environmental-engineering-cluster/syllabus/cive97035/
[Imperial College London]

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	3	3	1	2	1	1
CO 3	3	3	3	3	3	1	2	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**13**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name			Introduction to Industry 4.0	L	T	P	C
Course Code			XMT603	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
Prerequisite							

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

	Course Outcomes	Domain	Level
CO1	**Know** the reason for adopting Industry 4.0 and Artificial Intelligence.	Cognitive	Remembering
CO2	**Understand** the need for digital transformation.	Cognitive	Understanding
CO3	**Apply** the industry 4.0 tools.	Cognitive	Applying
CO4	**Analyze** the applications of Big Data.	Cognitive	Analyzing
CO5	**Examine** the applications and security of IoT Applications	Cognitive	Analyzing

UNIT 1	**Industry 4.0**	**12+ 3**

Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles - Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI) – Industrial Internet of Things - Cyber Security – Cloud – Augmented Reality.

UNIT 2	**Artificial Intelligence**	**12+ 3**

Artificial Intelligence: Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI -environment - Societal Influences of AI - Application Domains and Tools - Associated Technologies of AI - Future Prospects of AI - Challenges of AI .

UNIT 3	**Big Data and IoT**	**12+ 3**

Big Data : Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks - Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science - Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data Use cases Big Data in Social Causes - Big Data for Industry - Big Data Roles and Skills -Big Data Roles - Learning Platforms; Internet of Things (IoT) : Introduction to IoT - Architecture of IoT - Technologies for IoT - Developing IoT Applications - Applications of IoT - Security in IoT .

UNIT 4	**Applications And Tools Of Industry 4.0**	**12+ 3**

Applications of IoT – Manufacturing – Healthcare – Education – Aerospace and Defense – Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People. Tools for Artificial Intelligence, Big Data and Data Analytics, Virtual Reality, Augmented Reality, IoT, Robotics.

UNIT 5	**Jobs 2030**	**12+ 3**

Industry 4.0 – Education 4.0 – Curriculum 4.0 – Faculty 4.0 – Skills required for Future - Tools for Education – Artificial Intelligence Jobs in 2030 – Jobs 2030 - Framework for aligning Education with Industry 4.0 .

Lecture	**60**	**Tutorial**	**15**	**Practical**	**0**	**Total**	**75**

Text Book

Higher Education for Industry 4.0 and Transformation to Education 5.0(2020)- P. Kaliraj& T. Devi

References

1.” Industry 4.0”, by Jean-Claude André, Publisher: Wiley-ISTE (2019)

E-References

https://nptel.ac.in/courses/106/105/106105195/

COs vs POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	2	1	0	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	**15**	**15**	**12**	**9**	**15**	**5**	**5**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

1-5 →1, 6-10→2, 11-15→3

Course Name	Astronomy	L	T	P	C
Course Code	XMT604	4	1	0	5

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

Prerequisite	Knowledge In Physics and Mathematics

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

	Course Outcomes	Domain	Level
CO1	**Explain** the celestial sphere and its movement.	Cognitive	Understanding
CO2	**Demonstrate** the radius of earth and rotation of earth	Cognitive	Understanding
CO3	**Infer**the phenomenon of twilight and refraction.	Cognitive	Understanding
CO4	**Apply** Kepler's third law to construct explanations about planetary systems	Cognitive	Applying
CO5	**Interpret the e**quation of time, seasons and calendar	Cognitive	Understanding

UNIT 1		**12+ 3**

Celestial sphere – Diurnal motion

UNIT 2		**12+ 3**

The Earth: Zones of Earth – Terrestrial latitudes and longitudes – Radius of earth – Rotation of earth – Dip of horizon

UNIT 3		**12+ 3**

Twilight – Refraction

UNIT 4		**12+ 3**

Kepler's Laws

UNIT 5		**12+ 3**

Time: Equation of time – seasons – calendar

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

"Astronomy**"** by S. Kumaravelu and SusheelaKumaravelu, Agasthiyar Publication, 2013.

Unit : Chapter II, Article 39 – 79
Unit II : Chapter III (Sec: 3.1 – 3.5), Article 87 – 110
Unit III : Chapter III (sec: 3.6), Chapter IV, Article 111 – 134
Unit IV : Chapter VI, Article 146 – 165
Unit V : Chapter VII, Article 166 – 179

References

1 "Astronomy" by G.V. Ramachandran. Mission Press, Palayamkottai, 1965

2. Textbook on Astronomy H. SubramaniAiyar, Publisher : National Book Trust (1970)

E-References

http://bulletin.columbia.edu/columbia-college/departments-instruction/astronomy/#coursestext [Columbia University]
Https://Www.Physics.Utoronto.Ca/~Jharlow/Teaching/Astron03/Fullnotes/ [University Of Toronto]

COs vs POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**11**	**7**	**15**	**5**	**1**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**

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

1-5 →1, 6-10 →2, 11-15 →3

Course Name	Stochastic Processes	L	T	P	C
Course Code	XMT604	4	1	0	5

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

Prerequisite	Basic knowledge in probability theory and linear algebra including conditional expectation

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

	Course Outcomes	Domain	Level
CO1	**Explain** the classification of stochastic process and Markov chain	Cognitive	Understanding
CO2	**Identity** absorption probabilities and expected absorption time for Markov chains using the principle of conditioning with respect to the first jump	Cognitive	Applying
CO3	**Demonstrate** the concepts of birth and death processes	Cognitive	Understanding
CO4	**Summarize** the concepts of renewal process	Cognitive	Understanding
CO5	**Infer** the concepts of super martingales and sub martingales	Cognitive	Understanding

UNIT 1	12+ 3
Elements of Stochastic Processes-Two simple examples of Stochastic processes-Classification of general Stochastic processes – Markov Chains- Definitions – Examples of Markov Chain-Transition probability matrices of a Markov chain - classification of states of a Markov chain-Recurrence	
UNIT 2	**12+ 3**
The basic limit theorem of Markov chains and applications-Discrete renewal equation-proof of theorem-Absorption probabilities - criteria for recurrence- A queuing Example.	
UNIT 3	**12+ 3**
Classical Examples of continuous time Markov chains-General pure birth processes and Poisson processes-more about Poisson processes- A counter model-birth and death processes-Differential equations of birth and death processes-Examples of birth and death processes.	
UNIT 4	**12+ 3**
Renewal processes- Definition of Renewal process and related concepts – Some examples of Renewal Processes – More on some special Renewal processes – Renewal equations and elementary Renewal theorem - The Renewal Theorem – Applications of Renewal theorem	
UNIT 5	**12+ 3**
Martingales - Preliminary definitions and examples – Super martingales and Sub martingales- The optional sampling theorem.	

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

A First course in Stochastic Processes - Second Edition by Samuel karlin and M.Taylor, Academic

Press New York.

Unit I : Chapter (1.2 to 1.3)
Unit II : Chapter (2.1 to 2.5)
Unit III : Chapter (3.1 to 3.5)
Unit IV : Chapter (4.1 to 4.6)
Unit V : Chapter (6.1 to 6.3)

References

1. "Stochastic Processes" S.K. Srinivasan and K.M. Mehata, TataMcGraw - Hill Publishing Company Ltd., New Delhi.
2. "Stochastic Processes" Mehdi, Second Edition Wiley Eastern Ltd., New Delhi.

E-References

http//nptel.co.in

COs vs POs

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

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

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

Course Name			Cyber Security	L	T	P	C
Course Code			XUM005	1	0	0	1
C	P	A		L	T	SS	H
1	0	0		1	0	1	2
Prerequisite			Basic Programming knowledge and technical skills.				

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

Course Outcomes		Domain	Level
CO 1	**Understand** the fundamentals of Cyber Security and the technologies.	Cognitive	Understanding
CO 2	**Understand** the organizational structure of Cyber security	Cognitive	Understanding
CO 3	**Understand** the Cyber Security policy development	Cognitive	Understanding
CO 4	**Understand** the Indian IT act and the initiatives	Cognitive	Understanding
CO 5	**Understand** and **Apply** the Cyber security practices	Cognitive	Applying

UNIT 1	INTRODUCTION	3

Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration – Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges

UNIT 2	CYBER SECURITY OBJECTIVES AND GUIDANCE	3

Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.

UNIT 3	CYBER SECURITY POLICY CATALOG	3

Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging – Cyber User Issues – Malvertising – Impersonation –Appropriate Use – Cyber Crime – Geo location – Privacy – Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare– Computer Forensics – Steganography

UNIT 4	CYBER SECURITY INITIATIVES AND IT ACT	3

Counter Cyber Security Initiatives in India, Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance, IT Act, Hackers–Attacker–Counter measures ,Web Application Security , Digital Infrastructure Security ,Defensive Programming. Traditional Problems Associated with Computer Crime, Introduction to Incident Response.

UNIT 5	SECURITY PRACTICES	3

Guidelines to choose web browsers, Securing web browser, Antivirus, Email security ,Guidelines for setting

up a Secure password ,Two–steps authentication ,Password Manager ,Wi–Fi Security ,Guidelines for social media security ,Tips and best practices for safer Social Networking.

Basic Security for Windows, User Account Password Introduction to mobile Smartphone Security, AndroidSecurity, IOS Security Online Banking Security , Mobile Banking Security ,Security of Debit and Credit Card ,UPI Security Security of Micro ATMs e–wallet Security Guidelines Security Guidelines for Point of Sales(POS)

Lecture	15	Tutorial	0	Practical	0	Total	15

Text Books

Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.

Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.

Cyber Laws & Information Technology, Jothi Rathan, VijayRathan, Bhrath Pubishers,7th Edition January 2019.

References

Modern Cyber security Practices by Pascal Ackerman, BPB Publications,2020

Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011

Rhodes–Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw–Hill, 2013.

E–References

https://www.coursera.org/specializations/cyber–security

www. nptel.ac.in

http://professional.mit.edu/programs/short–programs/applied–cybersecurityhttps://us.norton.com/internetsecurity–how–to–cyber–security–best–practices–for–employees.html

https://www.meity.gov.in/content/cyber–laws

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

3.b. Curriculum and Syllabus of the programme – Before Revision

M.Sc. (Mathematics) - MASTER OF SCIENCE (Before Revision) (TWO YEARS - FULL TIME)

REGULATION – 2018 –(Revision I)

(Applicable to the students admitted from the academic year 2019-2020 onwards)

Semester	Course Code	Course Name	Lecture	Tutorial	Practical	Credit
I	YMA101	Groups and Rings	4	1	0	5
	YMA102	Analysis - I	4	1	0	5
	YMA103	Differential Equations	3	1	0	4
	YMA104	Discrete Mathematics	3	1	0	4
	YMA1E*	One among the list of Electives (1E)	3	0	0	3
						21

*** List of Electives (1E)**

Elective Code	Course Name	L	T	P	C
01	Graph Theory	3	0	0	3
02	Coding Theory	3	0	0	3
03	Mathematical Logic	3	0	0	3

Semester	Course Code	Course Name	Lecture	Tutorial	Practical	Credit
II	YMA201	Linear Algebra	4	1	0	5
	YMA202	Analysis - II	4	1	0	5
	YMA203	Integral Equations, Calculus Of Variations And Transforms	3	1	0	4
	YMA204	Operations Research	3	1	0	4
	YMA2E*	One among the list of Electives (2 E)	3	0	0	3
						21

List of Electives(2E)

Elective Code	Course Name	L	T	P	C
01	Algebraic Number Theory	3	0	0	3
02	Data structures and Algorithms	3	0	0	3
03	Fuzzy sets and Fuzzy logic	3	0	0	3

Semester	Course Code	Course Name	Lecture	Tutorial	Practical	Credit
III	YMA301	Field Theory	3	1	0	4
	YMA302	Topology	4	1	0	5
	YMA303	Automata Theory	3	1	0	4
	YMA304	Mathematical Statistics	3	1	0	4
	YMA3E*	One among the list of Electives (3 E)	3	0	0	3
						20

*** List of Electives(3E)**

Elective Code	Course Name	L	T	P	C
01	Data Analysis Using Spss	3	0	0	3
02	Numerical Methods	3	0	0	3
03	Commutative Algebra	4	0	0	3

Semester	Course Code	Course Name	Lecture	Tutorial	Practical	Credit
IV	YMA401	Complex Analysis	4	1	0	5
	YMA402	Functional Analysis	4	1	0	5
	YMA403	Mathematical Modeling	3	1	0	4
		Project work				8
						22

Total Numberof Credits : 84

SEMESTER I

COURSECODE			COURSENAME	L	T	P	C
YMA101			GROUPS AND RINGS	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Basic concepts of sets, groups and rings

COURSE OUTCOMES:

Course outcomes:	Domain	Level
Define and Explain Subgroups, Normal subgroups and Quotient Groups, Lagrange's Theorem.	Cognitive	Remembering Understanding
Define and Explain Homomorphism Theorems, Isomorphism Theorems, Automorphisms Theorems, Cayley's theorem. Permutation groups, Another Counting principle.	Cognitive	Remembering Understanding
Define and Explain Sylow's Theorems and their simple applications, Direct Products: External and Internal, Finite Abelian Groups.	Cognitive	Remembering Understanding
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
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	**15**
Definition & examples: Groups, Subgroups, Normal subgroups and Quotient Groups, Lagrange's Theorem.	
UNIT II	**15**
Homomorphism Theorems, Isomorphism Theorems, Automorphisms Theorems, Cayley's theorem. Permutation groups, Another Counting principle.	
UNITIII	**15**
Sylow's Theorems and their simple applications, Direct Products: External and Internal, Finite Abelian Groups.	
UNIT IV	**15**
Rings, Subrings, Ideals, Factor Rings, Homomorphism, Integral Domains. Maximal and prime ideals. The field of Quotients of an integral domain.	
UNIT V	**15**
Euclidean Ring, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rational Field, Polynomial Rings over Commutative Rings.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

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

John B. Fraleigh, “A First Course in Abstract Algebra”, Narosa Publication, Third Edition,2003.
Cohn P. M., “Basic Algebra”, Springer’s Publications, Second Edition,2005.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE:

COURSE OUTCOMES: 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:	**15**
Ordered sets, The real field, The complex field, Euclidean spaces.	
UNITII Basic Topology:	**15**
Finite, Countable and Uncountable sets, Metric space, Compact sets, Perfect Sets, Connected Sets.	
UNITIII Numerical Sequences and Series:	**15**
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 IVContinuity:	**15**
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:	**15**
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	TUTORIAL	TOTAL
60	15	75

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
Shanti Narayan,"A Course of Mathematical Analysis", S.Chand & Co,2005. Apostol, T.M,"Mathematical Analysis", 2nd Edition, 1996. Malik, S.C,"Mathematical Analysis", Wiley Eastern Ltd, 2017.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

COURSECODE			COURSETITLE	L	T	P	C
YMA103			DIFFERENTIAL EQUATIONS	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Differentiation and Integration

COURSE OUTCOMES:

Course outcomes:	Domain	Level
Find The general solution of the homogeneous equations using various methods.	Cognitive	Remembering Understanding
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
Solve First order linear partial differential equations using various methods.	Cognitive	Applying
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.

UNITIII **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 ofstring.

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

Simmons, G.F.,"Differential Equations with Applications and Historical Notes", TMH,New Delhi,2003
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, New york, 1955.
3. J.N. Sneddon, "Elements of Partial Differential Equations", Mc Graw Hill Publishing Company, New york,1957.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

COURSECODE			COURSENAME	L	T	P	C
YMA104			DISCRETE MATHEMATICS	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Algebra

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Basic logical operations.	Cognitive	Remembering Understanding
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 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	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

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

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

LIST OF ELECTIVES

COURSECODE			COURSENAME	L	T	P	C
YMA1E1			GRAPH THEORY	3	0	0	3
C	P	A					
3	0	0		L	T	P	H
				3	0	0	3

PREREQUISITE:

COURSE OUTCOMES: Basic concepts of Graph Theory

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

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.
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.

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**
Total	**10**	**5**	**5**	**5**	**5**	**10**	**5**	**5**	**5**
Scaled Value	**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

PREREQUISITE:

COURSE OUTCOMES:

Course outcomes:	Domain	Level
DefineandExplain 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
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 Explain 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 – Enconding 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:

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

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**
Total	**10**	**5**	**5**	**5**	**5**	**10**	**5**	**5**	**5**
Scaled Value	**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
YMA1E3			Mathematical Logic	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3

PREREQUISITE: **Discrete Mathematics**

COURSE OUTCOMES:

Course outcomes:	Domain	Level
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
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:

Shoenfield J. R. Mathematical logic, Addison-Wesley PublishingCo.
Srivastava S. M. A Course on Mathematical Logic, Universitext,Springe

REFERENCES:

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

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

SEMESTER II

COURSECODE			COURSENAME	L	T	P	C
YMA201			LINEAR ALGEBRA	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Group theory and Ring theory

COURSE OUTCOMES:

Course outcomes:	Domain	Level
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
Define and Explain Canonical Forms, Triangular form, Nilpotent Transformations, Jordan Form and Rational Canonical form.	Cognitive	Remembering Understanding
Define and Explain Trace and Transpose, Determinants, Hermitian, Unitary and Normal Transformations, Real Quadratic forms.	Cognitive	Remembering Understanding

UNIT I	**15**
Elementary Basic Concepts- Linear Independence and Bases.	
UNIT II	**15**
Dual Spaces- Inner Product Space- Modules.	
UNITIII	**15**
The Algebra of Linear Transformations- Characteristics Roots- Matrices.	
UNIT IV	**15**
Canonical Forms: Triangular form- Nilpotent Transformations- Jordan Form - Rational Canonical form.	
UNIT V	**15**
Trace and Transpose – Determinants- Hermitian, Unitary and Normal Transformations- Real Quadratic forms.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

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

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

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
Total	15	10	10	5	5	5	5	5	5
Scaled Value	3	2	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

COURSECODE			COURSENAME	L	T	P	C
YMA202			ANALYSIS - II	4	1	0	5
C	P	A					
5	0	0		L	T	P	H
				4	1	0	5

PREREQUISITE: Basic concepts of convergence and uniform convergence

COURSE OUTCOMES:

Course outcomes:	Domain	Level
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
Define and Explain Uniform convergence and Integration and Differentiation.	Cognitive	Remembering Understanding
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 theRiemann Integral, Integration of Complex functions, Functions of class $\mathbf{J}^2$.	Cognitive	Remembering Understanding

UNIT I	**15**
Definition and Existence of the Integral, Properties of the Integral, Integration and Differentiation.	
UNIT II	**15**
Uniform Convergence, Uniform convergence and Continuity.	
UNITIII	**15**
Uniform convergence and Integration, Uniform convergence and Differentiation.	
UNIT IV	**15**
Set functions, Construction of Lebesgue Measures, Measurable function, Simple functions in measure.	
UNIT V	**15**
Integration Comparison with the Riemann Integral, Integration of Complex functions, Functions of class $\mathbf{J}^2$.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

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:

Shanti Narayan, "A course of Mathematical Analysis", S. Chand & CompanyLtd New Delhi,2005.

Apostol, T.M, "Mathematical Analysis", Narosa Book Distributors Pvt Ltd, 2nd Edition, New Delhi,1996.

Malik, S.C, "Mathematical Analysis", Wiley Eastern Ltd.2017.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Multivariable calculus and vector calculus

COURSE OUTCOMES:

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 Besselfunction – 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 Integralequation – 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 boundaryand transition conditions - variational notation – more general case – constraints andLagrange'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 cosinetransforms - Fourier integral theorem - Parseval's identity.	
UNITIII	**12**
Hankel Transform **:** Definition – Inverse formula – Some important results for Besselfunction – 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 Integralequation – examples – some results about the resolvent kernel. Classical FredholmTheory: the method of solution of Fredholm – Fredholm's first theorem – secondtheorem – third theorem.	

	LECTURE	TUTORIAL	TOTAL

	45	**15**	**60**
TEXTBOOK			
[1] Ram.P.Kanwal – Linear Integral Equations Theory and Practise, Academic Press1971. [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 PvtLtd, 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 BookAgency, 1960. [2] I.N. Snedden, Mixed Boundary Value Problems in Potential Theory, North Holland,1966.			

COs vs POs Mapping

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

COURSECODE			COURSENAME	L	T	P	C
YMA204			OPERATIONS RESEARCH	3	1	0	4
C	P	A					
4	0	0		L	T	P	H
				3	1	0	4

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Decision theory in detail.	Cognitive	Remembering Understanding
CO2: Explain and solve problems in PERT and CPM	Cognitive	Understanding Applying
Explain deterministic inventory control models and probabilistic Inventory Control Models and **solve** problems by using the methods:	Cognitive	Understanding Applying
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.

UNITII PROJECT MANAGEMENT : PERT ANDCPM **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 .

UNITIII DETERMINISTIC INVENTORY CONTROLMODELS **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 withk-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	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

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

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

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

1 - Low , 2 – Medium , 3- high

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:

Course outcomes:	Domain	Level
Define and Explain Primes,Congruences, Fermat's, Euler's and Wilson's Theorems	Cognitive	Remembering Understanding
Define and Explain Techniques of numerical calculations – Public key cryptography – Prime power Moduli – Primitive roots and Power Residues	Cognitive	Remembering Understanding
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
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
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:

van 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:

Elementary Number Theory, David M. Burton W.M.C. Brown Publishers,Dubuque, Lawa,1989

Number Theory, George Andrews, Courier Dover Publications,1994.

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:

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 algorithmtechniques.	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

Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, Reprint 2011.

Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introductionto Algorithms", Second Edition, Mcgraw Hill,2002

ReemaThareja, “Data Structures Using C”, Oxford University Press,2011

Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley PublishingCompany

“How to Solve it by Computer”, 2nd Impression by R. G. Dromey, PearsonEducation

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

COURSECODE			COURSENAME	L	T	P	C
YMA2E3			FUZZY SETS AND FUZZY LOGIC	3	0	0	3
C	P	A					
3	0	0		L	T	P	H
				3	0	0	3

PREREQUISITE: Discrete Mathematics

COURSE OUTCOMES:

Course outcomes:	Domain	Level
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
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.	
UNITII Operation on FuzzySets	**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

George J. Klir & Tina A. Folger, "Fuzzy Sets, Uncertainty, and Information", Prentice Hall of India Pvt. Ltd., New Delhi, 1988

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.

Bart Kosko, "Neural Networks and Fuzzy Systems", Prentice-Hall International,1992.

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

SEMESTER III

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

PREREQUISITE: Algebra

COURSE OUTCOMES:

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

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

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

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

REFERENCES

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

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Analysis

COURSE OUTCOMES:

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

UNIT I Topological Spaces	**15**
Topological spaces - Basis for a topology - The order topology - The product topologyon X x Y - The subspace topology.	
UNIT II Continuous Functions	**15**
Closed sets and limit points-Continuous functions - the product topology - The metrictopology. - The metric topology (continued) - Uniform limit theorem.	
UNIT III Connectedness	**15**
Connected spaces - connected subspaces of the Real line - Components and local connectedness.	
UNIT IV Compactness	**15**
Compact spaces - compact subspaces of the Real line - Limit Point Compactness – LocalCompactness.	
UNIT V Countability and Separation Axiom	**15**
The Countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization Theorem - The Tietz extension theorem.	

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

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

Unit V - Chapter 4: Sections 30 to 35

REFERENCES

J. Dugundji, “Topology”, Prentice Hall of India, New Delhi,1975.

George F.Sinmons, “Introduction to Topology and Modern Analysis”, McGraw Hill Book Co., 1963.
J.L. Kelly, “General Topology”, Van Nostrand, Reinhold Co., NewYork.1995
L.Steen and J.Subhash, “Counter Examples in Topology”, Holt, Rinehart and Winston, New York,1970.
S.Willard, “General Topology”, Addison - Wesley,Mas.1970.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Analysis

COURSE OUTCOMES:

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

UNIT I	**12**
Strings,Alphabets and Languages (Section 1.1 of the Text)Finite Automata (Chapters 2, Sections 2.1 to 2.4)	
UNIT II	**12**
Regular expressions and Properties of Regular sets.(Sections 2.5 to 2.8 and 3.1 to 3.4)	
UNITIII	**12**
Context Free grammars (Section 4.1 to 4.5)	
UNIT IV	**12**
Pushdown Automata & properties of Context free languagesTheorem 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

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Nil

COURSE OUTCOMES:

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

UNIT I Estimation Theory **12**

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

UNIT II Testing Of Hypothesis **12**

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

UNIT III Correlation And Regression **12**

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

UNIT IV Design of Experiments **12**

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

UNIT V Statistical Quality Control **12**

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

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOK

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

REFERENCES

J.E. Freund, "Mathematical Statistical", 5th Edition, Prentice Hall of India,2001.

Jay L. Devore, "Probability and Statistics for Engineering and the Sciences",5thEdition, Thomas and Duxbury, Singapore,2002.

Mapping of CO's with PO's:

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

1-5→1, 6-10→2, 11-15→3

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

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**

TEXTBOOK

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

REFERENCES:

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

Mapping of CO's with PO's:

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Algebra

COURSE OUTCOMES:

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

UNIT I **9**

Solution of Numerical Algebraic Equations & Curve fitting Bisection method-Newton-Raphson method-Curve fitting straight line and parabola.

UNIT II **9**

Solutionof SimultaneousLinear Equations-Gauss-Eliminationmethod-Methodoffactorization-Gauss Jacobi and Gauss-Seidel methods

UNITIII **9**

Interpolation - Gregory-Newton forward and backward interpolation formulae Sterling's formula-Lagrange's formula.

UNIT IV **9**

Numerical Differentiation and Integration, Numerical differentiation, Trapezoidal rule-Simpson'sone-third rule –Simpson's three-eighth rule.

UNIT V **9**

Numerical Solution of Ordinary Differential Equations, Euler's method – fourth order Runge-Kutta method-Milne's predictor corrector method.

LECTURE		TOTAL
45		45

TEXTBOOK

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

REFERENCES

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

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Nil

COURSE OUTCOMES:

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

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

LECTURE		TOTAL
45		45

TEXT BOOKS:

tiyah, 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.

COs VS POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

SEMESTER IV

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

PREREQUISITE: Analysis

COURSE OUTCOMES:

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

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

	LECTURE	TUTORIAL	TOTAL
	60	15	75

TEXTBOOK

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:
. Poonusamy, "Complex Analysis", Alpha Science International Ltd; 2nd Revised edition, 2005.

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Analysis

COURSE OUTCOMES:

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

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

LECTURE	TUTORIAL	TOTAL
60	15	75

TEXTBOOK

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

REFERENCES

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

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

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

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

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

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

PREREQUISITE: Probability and Statistics

COURSE OUTCOMES:

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

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

LECTURE	TUTORIAL	TOTAL
45	15	60

TEXTBOOKS

1.J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.

REFERENCES

1. J. N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East –West Press Pvt Limited, New Delhi, 19

COs vs POs Mapping

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

1-5→1, 6-10→2, 11-15→3

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

3.b. Curriculum and Syllabus of the programme – Before Revision

4.b. Curriculum and Syllabus of the programme – After Revision –M.Sc Maths

CURRICULUM AND SYLLABUS FOR M.Sc. (MATHEMATICS) - MASTER OF SCIENCE AFTER REVISION (TWO YEAR - FULL TIME) REGULATION - 2022

(Applicable to the students admitted from the academic year 2022-2023 onwards)

Semester	Course Code	Course Name	L	T	P	H	C
I	YMA101	Algebra - I	4	1	0	5	5
	YMA102	RealAnalysis - I	4	1	0	5	5
	YMA103	Graph Theory	4	1	0	5	5
	YMA104	Ordinary Differential Equations	4	1	0	5	5
	YMA105	Optimization Techniques	4	1	0	5	5
	YMA1E*	One among the list of electives (1E)	3	0	0	3	3
		Mentoring	0	0	0	1	0
		Library/ E- Library	0	0	0	1	0
		Total	**23**	**5**	**0**	**30**	**28**

***Listof Electives (1E)**

Elective Code	Course Name	L	T	P	C
1	Fuzzy sets and Fuzzy logic	3	0	0	3
2	Coding Theory	3	0	0	3
3	Neural Networks	3	0	0	3

Semester	Course Code	Course Name	L	T	P	H	C
II	YMA201	Algebra -II	4	1	0	5	5
	YMA202	Real Analysis -II	4	1	0	5	5
	YMA203	Partial Differential Equations	4	1	0	5	5
	YMA204	Classical Dynamics	4	1	0	5	5
	YMA2E*	One among the list of electives (2E)	3	0	0	3	3
NME	YMA205	Computer Programming (c++ Theory and Lab)	3	0	2	5	5
		Mentoring	0	0	0	1	0

		Library/ E- Library	0	0	0	1	0
		Total	**22**	**4**	**2**	**30**	**28**

***List of Electives (2E)**

Elective Code	Course Name	L	T	P	C
1	Fluid Dynamics	3	0	0	3
2	Combinatorics	3	0	0	3
3	Cryptography	3	0	0	3

Semester	Course Code	Course Name	L	T	P	H	C
III	YMA301	Topology	4	1	0	5	5
	YMA302	Integral Equations, Calculus of Variations and Transforms	4	1	0	5	5
	YMA303	Functional Analysis	4	1	0	5	5
	YMA304	Differential Geometry	4	1	0	5	5
	YMA305	Complex Analysis	4	1	0	5	5
	YMA3E*	One among the list of Electives (3E)	3	0	0	3	3
		Mentoring	0	0	0	1	0
		Library/ E- Library	0	0	0	1	0
		Total	**23**	**5**	**0**	**30**	**28**

***List of Electives (3E)**

Elective code	Course Name	L	T	P	C
1	Elements of Stochastic Processes	3	0	0	3
2	Mathematical Modeling	3	0	0	3
3	Data Analysis using SPSS	3	0	0	3

Semester	Course Code	Course Name	L	T	P	H	C
IV	YMA401	Project	0	0	0	30	8
		Total				**30**	**8**

Mandatory: Value Added courseand Self LearningCourse – (NPTEL) will be offered during theprogramme

Total Number of Credits: 92

Total Number of Hours :120

COURSE NAME			ALGEBRA - I	L	T	P	C
COURSE CODE			YMA101	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Basics of sets, relations and functions				

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

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

UNIT 1	15 hours
Binary Operations – Groups - Subgroups – Permutations I – Permutations II – Cyclic Groups	
UNIT 2	**15 hours**
Isomorphisms – Direct Products – Finitely Generated Abelian groups - Groups of Cosets - Normal subgroups and factor groups- Homomorphisms	
UNIT 3	**15 hours**
Series of Groups – Isomorphism theorems- Proof of the Jordan Holder theorem—Group action on a set- Applications of G-sets to counting - Sylow's theorems –ApplicationsofSylow theorems	
UNIT 4	**15 hours**
Rings – Integral Domains - Some non-commutative examples –The Field of quotients – Quotient rings and Ideal.	
UNIT 5	**15 hours**
Homomorphism of Rings – Rings of polynomials – Factorization of Polynomialsoverafield –	

Euclideandomains-Gaussian integers and norms							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**

TEXT BOOK

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

UNIT – I Chapter 1, 2, 3,4,5,6

UNIT – II Chapter 7,8,9,11,12,13

UNIT – III Chapter 14,15,16,17,18,19

UNIT – IV Chapter 23,24,25,26,27,28

UNIT – V Chapter 29,30,31,33,34

REFERENCES

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

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

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

CO Vs PO

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME			REAL ANALYSIS - I	L	T	P	C
COURSE CODE			YMA102	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Basic concepts of real numbers				

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

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

UNIT 1	15 hours

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

UNIT 2	15 hours

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

UNIT 3	15 hours

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

UNIT 4	15 hours

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

UNIT 5	15 hours

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOKS

R.G. Bartle and D.R. Sherbert,Introduction to Real Analysis 3rdEdn,John Wiley &Sons, 2000.
S.Kumaresan,TopologyofMetricSpaces,NarosaPublishingHouse,New Delhi,2005.
UNIT–I- Chapters 1 and 2from [1]
UNIT–II -Chapter1from [2]
UNIT–III-Chapter3from [1]andChapter2sections 2.1to2.5 from[2]
UNIT–IV-Chapter3, Chapter4from[2](sections3.3and 3.6omitted)and Chapter5 from [1]
UNITV-Chapter 5section5.1andChapter 6sections 6.1,6.3and6.4(section6.2,6.3.16 and6.3.17 omitted)from [2]

REFERENCES

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

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

PREREQUISITE	Basic concepts of Graphs

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

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

UNIT 1	Basic Results	15 hours

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

UNIT 2	Connectivity	15 hours

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

UNIT 3	Independent Sets and Matchings	15 hours

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

UNIT 4	Graph Colourings	15 hours

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

UNIT 5	Planarity	15 hours

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK
1.Douglas B. West, “Introduction to Graph Theory”, Prentice Hall of India, Second Edition, 2002.
REFERENCES
Bondy J. A, and Murty U. S. R., “Graph Theory”, Springer, 2008. Balakrishnan R. and Ranganathan K., “A textbook of Graph Theory”, Springer, 2012. Graham R.L., Rothschild B.L and Spencer J.H., “Ramsey Theory”, Wiley Publishers, Second Edition, 1990. Biggs N., “Algebraic Graph Theory”, Cambridge Tracts in Mathematics 67, Cambridge University Press, 1994. MX8003 Algebraic Theory of Semigroups.

COs VS POs

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

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

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

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

UNIT 1		15 hours

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

UNIT 2		15 hours

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

UNIT 3		15 hours

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

UNIT 4		15 hours
Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions– Sturm Comparison Theorems – Eigenvalues, Eigenfunctions and the Vibrating String.		
UNIT 5		**15 hours**
Nonlinearequations:AutonomousSystems;thephaseplaneanditsphenomena–Types of criticalpoints;Stability – critical points and stability for linear systems – StabilitybyLiapunov's direct method – Simple critical pointsof nonlinear systems.		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

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

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

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

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

UNIT – IV -Chapter 4: Sections 22 to 24

UNIT – V -Chapter 8: Sections 40 to 44

REFERENCES

M.E. Taylor, Introduction to Differential Equations, AMS Indian Edition, 2011.

M. Braun, Differential Equations and Their Applications, Springer, 1992.

E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill, 1955.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

PREREQUISITE	Probability and random process

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

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

UNIT 1	DECISION THEORY	15 hours

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

UNIT 2	PROJECT MANAGEMENT: PERT AND CPM	15 hours

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

UNIT 3	DETERMINISTIC INVENTORY CONTROLMODELS	15 hours

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

UNIT 4	Classical Optimization Theory	15 hours

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

UNIT 5	Nonlinear Programming Algorithms	15 hours

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

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

2007

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

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

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

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

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

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

REFERENCES

HillierF.S. andJ.Lieberman, "Introduction to Operations Research" (8th Edition), Tata McGraw Hill Publishing Company, New Delhi, 2006.

Beightler. C, D.Phillips, B. Wilde, "Foundations of Optimization" (2nd Edition) Prentice Hall Pvt Ltd., New York,1979

Bazaraa, M.S; J.J.Jarvis, H.D.Sharall, "Linear Programming and Network flow", John Wiley and sons, New York,1990.

Gross, D and C.M.Harris, "Fundamentals of Queueing Theory", (3rd Edition), Wiley andSons, New York, 1998.

Hamdy A. Taha , "Operations Research" (sixth edition), Prentice - Hall of India PrivateLimited, New Delhi.2007

COs VS POs

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

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

PREREQUISITE	Basic concepts of sets

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

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

UNIT 1	Crisp Sets and Fuzzy Sets	9 hours

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

UNIT 2	Operation on FuzzySets	9 hours

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

UNIT 3	Fuzzy Relations	9 hours

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

UNIT 4	Classical Logic	9 hours

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

UNIT 5	Fuzzy Logic	9hours

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

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

George J. Klir& Tina A. Folger, “Fuzzy Sets, Uncertainty, and Information”, Prentice Hall of India Pvt. Ltd., New Delhi, 1988

Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, 3rd edition, McGraw-Hill. Inc, 2010.

REFERENCES

Zimmermann. H.J, "Fuzzy Set Theory and Its Applications", 4th edition, Springer, Netherlands,2015.

Bart Kosko, "Neural Networks and Fuzzy Systems", Prentice-Hall International,1992.

COs VS POs

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

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

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

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

UNIT 1		9hours

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

UNIT 2		9hours

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

UNIT 3		9 hours

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

UNIT 4		9 hours

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

UNIT 5							9 hours
Special cyclic codes: BCH codes – Parameters of BCH codes – Decoding of BCHcodes – Reed Solomon codes.							
LECTURE	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

TEXT BOOK

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

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

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

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

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

Unit 5 : Sections 8.1, 8.2

REFERENCES

S. Lin &D. J. Costello, Jr., Error Control Coding: Fundamentals andApplications, Prentice-Hall, Inc., New Jersey,1983.

Vera Pless, Introduction to the Theory of Error Correcting Codes, Wiley, NewYork, 1982.

E. R Berlekamp, Algebraic Coding Theory, Mc Graw-Hill,1968.

H. Hill, A First Course in Coding Theory, OUP,1986

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

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

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

UNIT 1	Neuron Model and Network Architectures	9 hours

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

UNIT 2	Perceptron Architectures	9 hours

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

UNIT 3	Supervised Hebbian Learning	9 hours

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

UNIT 4	Back Propagation	9 hours

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

UNIT 5	PerformanceSurfacesandPerformanceOptimizations	9 hours

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

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOK

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

REFERENCES

James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications and Programming Techniques, Pearson Education, 2003.

Robert J. Schalkoff, Artificial Neural Network, McGraw-Hill International Edition, 1997.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME			ALGEBRA - II	L	T	P	C
COURSE CODE			YMA201	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			YMA101				

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

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

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

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

UNIT – I Pages 31 - 43

UNIT – II Pages 44 -58

UNIT – III Pages 59 - 75

UNIT – IV Pages 76-82

UNIT – V Pages 83-95
REFERENCES
DavidS. DummitandRichardM.Foote,AbstractAlgebra,2nd Edition,Wiley StudentEdition, 2008. SergeLang. Algebra-Revisedthird edition-Springer–Verlag-2002. IanStewart,GaloisTheory,ChapmanandHall,1973

COs VS POs

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

COURSE NAME			REAL ANALYSIS - II	L	T	P	C
COURSE CODE			YMA202	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Basic concepts of convergence and uniform convergence				

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

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

UNIT 1	15 hours

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

UNIT 2	15 hours

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

UNIT 3	15 hours

Sequenceandseriesoffunctions–Pointwiseconvergence–Uniformconvergence– Uniformconvergenceandintegration–UniformconvergenceandDifferentiation– Sufficientconditionsforuniformconvergenceofaseries.

UNIT 4		**15 hours**
Functions of Several variables – Directional derivative –Total derivative – Jacobian – Chain rule –Mean Value Theorem – Taylor's formula.		
UNIT 5		**15hours**
Inverse function theorem – Implicit function theorem – Extremum problems with side conditions.		

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

TEXT BOOK

TomM.Apostol, MathematicalAnalysisSecondEdition,NarosaPublishingHouse,NewDelhi,1985.
UNIT–I-Chapter5 and 6
UNIT–II-Chapter7Section 7.1-7.22
UNIT–III- Chapter 9Section 9.1 - 9.11 and 9.14 -9.18
UNIT–IV-Chapter12
UNIT–V-Chapter13

REFERENCES

WalterRudin,PrinciplesofMathematicalAnalysis,ThirdEdition,Mc GrawHill,1976.
TomApostol,CalculusII,Mc GrawHill,1983.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME			PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
COURSE CODE			YMA203	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Knowledge in Undergraduate differential equations				

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

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

UNIT 1	Partial Differential Equations of the First Order	15 hours

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

UNIT 2	Partial Differential Equations of the Second Order	15 hours

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

UNIT 3	Laplace's Equation	15 hours

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

UNIT 4	The Wave Equation	15 hours
The Occurrence of the wave equation in Physics–Elementary Solutions of the One–dimensional Wave equations – Vibrating membrane, Application of the calculus of variations –Three dimensional problem– General solutions of the Wave equation		
UNIT 5	**The Diffusion Equation**	**15hours**
Elementary Solutions of the Diffusion Equation – Separation of variables – The use of Integral Transforms – The use of Green's functions		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

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

REFERENCES

M. D. Raisinghania, Advanced Differential Equations, S. Chand and Company Ltd., New Delhi, 2001.

K. Sankara Rao, Introduction to Partial Differential Equations, Second edition, Prentice-Hall of India, New Delhi, 2006.

J. N. Sharma and K. Singh, Partial Differential Equations for Engineers and Scientists, Narosa Publishing House, 2001.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

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

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

UNIT 1		15 hours

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

UNIT 2		15 hours

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

UNIT 3		15 hours

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

UNIT 4		15 hours

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

UNIT 5		15hours

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

1.Donald T. Greenwood,Classical Dynamics, PHI Pvt. Ltd., New Delhi-1985. UNIT – I Chapter 1:

Sections 1.1 to 1.5 UNIT – II Chapter 2: Sections 2.1 to 2.4 UNIT – III Chapter 3 : Sections 3.1 to 3.4 UNIT – IV Chapter 4: Sections 4.1 to 4.4 UNIT – V Chapter 5: Sections 5.1 to 5.3
REFERENCES
1.H. Goldstein, Classical Mechanics, (2nd Edition), Narosa Publishing House, New Delhi. 2. Narayan Chandra Rana&PromodSharad Chandra Joag, Classical Mechanics, Tata McGrawHill, 1991.

COs VS POs

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

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

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

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

UNIT 1	INTRODUCTION TO C LANGUAGE	15 hours

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

Lab:

1.Program to implement formatted I/O operations

2. Program to implement formatted I/O operations

3.Program to implement control structures

UNIT 2	ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS	15 hours

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

Lab:

4. Program using 2D arrays

5.Program to implement calling the function through call by value method&call by reference

6.Program to implement Structures

UNIT 3	POINTERS AND FILE MANAGEMENT	15 hours

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

Lab:

7.Program to implement dynamic memory allocation

8.Program to implement pointer to function

9.Program to implement an array of pointers

UNIT 4	INTRODUCTION TO C++	15 hours

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

Lab:

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

UNIT 5	ADDITIONAL FEATURES	15 hours

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

Lab:

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

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOKS

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

REFERENCES

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

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

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

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

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

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

UNIT 2	Equations of Motion (Contd)	9 hours

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

UNIT 3	Two-Dimensional Motion	9 hours

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

UNIT 4	Dynamics of Real Fluids	9 hours

Viscous flows – Navier-Stokes equations – Vorticity and circulation in a viscous fluid – Steady flow

through an arbitrary cylinder under pressure – Steady Couette flow between cylinders in relative motion – Steady flow between parallel planes.							
UNIT 5	**The Laminar Boundary Layer in Incompressible Flow**						**9hours**
Boundary Layer concept – Boundary Layer equations – Displacement thickness, Momentum thickness – Kinetic energy thickness – integral equation of boundary layer – flow parallel to semi infinite flat plate – Blasius equation and its solution in series.							
LECTURE	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

TEXT BOOKS

Units I and II: L. M. Milne Thomson, Theoretical Hydro Dynamics, Macmillan Company, 5th Edition (1968). Chapter I : Sections 1.0 – 1.3., 3.10-3.41 (omit 3.32) Chapter III : Sections 3.42 – 3.53 (omit 3.44)

Units III, IV and V: Modern Fluid Dynamics Volume I, N. Curle and H. J. Davies, D. Van Nostrand Company Limited, London, 1968. Chapter III : Sections 3.1 – 3.7.5 (omit 3.3.4, 3.4, 3.5.2,3.6) Chapter V : Sections 5.2.1– 5.3.3 Chapter VI : Sections 6.1 – 6.3.1 (omit 6.2.2., 6.2.5)

REFERENCES

F. Chorlton, Textbook of Fluid Dynamics, CBS Publishers, New Delhi, 2004.

A. J. Chorin and A. Marsden, A Mathematical Introduction to Fluid Dynamics, SpringerVerlag, New York, 1993.

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

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

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

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

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

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

UNIT 1	Permutations and combinations	9 hours

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

UNIT 2	Generating functions	9 hours

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

UNIT 3	Recurrence relation	9hours

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

UNIT 4	The principle of inclusion and exclusion	9 hours

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

UNIT 5	Polya's theory of counting	9 hours

Equivalence classes under a permutation group – Burnside theorem – Equivalence classes of functions – Weights and inventories of functions – Polya's fundamental theorem – Generalization of Polya's theorem							
LECTURE	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**
TEXT BOOKS							
Cameron, P.J. (1998) Combinatorics: Topics, Techniques, Algorithms. Cambridge: Cambridge University Press. Liu, C.L., Eddberg, M. (1968).Solutions to problems in Introduction to Combinatorial Mathematics. New York: McGraw-Hill Book & Co.							
REFERENCES							
Liu, C.L. (1968). Introduction of Combinatorial Mathematics. New York: McGraw Hill Book Co. Stanley, R.P.(1997). Enumerative Combinatorics, Volume I, Cambridge Studies in Advanced Mathematics, Volume 49. Cambridge University Press.							

COs VS POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	15	15	14	9	15	5	4	5	5
SCALED VALUE	3	3	3	2	3	1	1	1	1
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			CRYPTOGRAPHY	L	T	P	C
COURSE CODE			YMA2E3	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Basic concepts of number theory				

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

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

UNIT 1		9 hours

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

UNIT 2		9 hours

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

UNIT 3		9 hours

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

UNIT 4		9 hours

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

UNIT 5		9 hours
Public key cryptography – Concepts of public key cryptography – Modular arithmetic – RSA – Discrete logarithm – Elliptic curve cryptography.		

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOKS

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

Alfred J. Menezes, Paul C. Van Oorschot, Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2000.

William Stallings, Cryptography and Network Security, Prentice Hall of India, 2000.

REFERENCES

Pachghare V.K., Cryptography and Information Security, PHI Learning Pvt. Ltd., New Delhi, 2009

Behrouz A. Forouzan and DebdeepMukhopathyey, Cryptography and Network Security, 2013, second edition, McGraw Hill Education Pvt. Ltd., New Delhi.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME			TOPOLOGY	L	T	P	C
COURSE CODE			YMA301	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Basic concepts of sets				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Identify** whether a given family of subsets is a topology or not	Cognitive	Applying
CO 2	**Apply** the concepts of continuous function on product topology and metric topology	Cognitive	Applying
CO 3	**Explain** the concepts of local connectedness and path connectedness	Cognitive	Understanding
CO 4	**Explain** the concepts of limit point compactness and local compactness	Cognitive	Understanding
CO 5	**Apply** the concept of separation axiom and normal spaces to prove the Urysohnmetriziationtheoremand the Tietz extension theorem	Cognitive	Applying

UNIT 1	Topological Spaces	15 hours

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

UNIT 2	Continuous Functions	15 hours

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

UNIT 3	Connectedness	15 hours

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

UNIT 4	Compactness	15 hours

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

UNIT 5	Countability and Separation Axiom	15hours

The Countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The

Urysohnmetrization Theorem - The Tietz extension theorem							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**

TEXT BOOK

1.James R. Munkres, "Topology", (2nd Edition) PHI Learning Pvt. Ltd., (Third Indian Reprint) NewDelhi,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 to25

Unit IV - Chapter 3: Sections 26 to29

Unit V - Chapter 4: Sections 30 to 35

REFERENCES

J. Dugundji, "Topology", Prentice Hall of India, New Delhi,1975.

George F. Simmons, "Introduction to Topology and Modern Analysis", McGraw Hill Book Co., 1963.

J.L. Kelly, "General Topology", Van Nostrand, Reinhold Co., NewYork.1995

L.Steen and J.Subhash, "Counter Examples in Topology", Holt, Rinehart and Winston, New York,1970.

S.Willard, "General Topology", Addison - Wesley,Mas.1970.

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME	**INTEGRAL EQUATIONS, CALCULUS OF VARIATIONS AND TRANSFORMS**	**L**	**T**	**P**	**C**

COURSE CODE			YMA302	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Multivariable calculus and vector calculus				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Identify** maxima and minima of functionals	Cognitive	Applying
CO 2	**Utilize** Fourier transform for solving boundary value problems	Cognitive	Applying
CO 3	**Solve** Bessel function integrals over a finite interval	Cognitive	Applying
CO 4	**Identify** eigenvalues and eigenfunction of the homogeneous integral equations with degenerate kernels	Cognitive	Applying
CO 5	**Solve**Volterra integral equation and Fredholm integral equations by using method of successive approximations	Cognitive	Applying

UNIT 1		15 hours

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 2		15hours

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 3		15 hours

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 4		15hours

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

approximate method.							
UNIT 5							**15hours**
Method of successive approximations: Iterative scheme – examples – Volterra Integral equation – examples – some results about the resolvent kernel. Classical Fredholm Theory: the method of solution of Fredholm – Fredholm's first theorem – second theorem – third theorem							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**
TEXT BOOKS							
Ram.P.Kanwal – Linear Integral Equations Theory and Practice, Academic Press 1971. F.B. Hildebrand, Methods of Applied Mathematics II ed. PHI, ND 1972. 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							
S.J. Mikhlin, Linear Integral Equations (translated from Russian), Hindustan Book Agency, 1960. I.N. Snedden, Mixed Boundary Value Problems in Potential Theory, North Holland,1966.							

COs VS POs

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

COURSE NAME			FUNCTIONAL ANALYSIS	L	T	P	C
COURSE CODE			YMA303	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basic concepts of algebra

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** Normed Spaces and Hahn – Banach Theorems	Cognitive	Understanding
CO 2	**Explain** Closed Graph and Open Mapping Theorems	Cognitive	Understanding
CO 3	**Explain** Bounded Inverse Theorem – Spectrum of a Bounded Operator	Cognitive	Understanding
CO 4	**Explain** Inner Product Spaces and Riesz Representation Theorems	Cognitive	Understanding
CO 5	**Explain** Bounded Operators and Self-adjoint Operators	Cognitive	Understanding

UNIT 1		15 hours
Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems		
UNIT 2		**15 hours**
Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems		
UNIT 3		**15 hours**
Bounded Inverse Theorem – Spectrum of a Bounded Operator		
UNIT 4		**15 hours**
Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems		
UNIT 5		**15hours**
Bounded Operators and adjoint, Normal , Unitary and Self-adjoint Operators		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK

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

REFERENCES

G.F.Simmons,“Introduction to Topology and Modern Analysis”,McGraw Hill International Book

Company, New York, 1963.

W. Rudin, “Functional Analysis”, Tata McGraw-Hill Publishing Company, New Delhi, 1973.

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

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

COs VS POs

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

COURSE NAME			DIFFERENTIAL GEOMETRY	L	T	P	C
COURSE CODE			YMA304	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
PREREQUISITE			Multivariable Calculus and Vector Calculus				

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

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Identify** involutes and evolutes of a given curve	Cognitive	Applying
CO 2	**Explain** the concept of Helicoids and Families of curves	Cognitive	Understanding
CO 3	**Identify**Geodesic curvature, Gaussian curvature and Surfaces of constant curvature of a given curve	Cognitive	Applying
CO 4	**Explain** non intrinsic properties of a surface	Cognitive	Understanding
CO 5	**Explain** compact surface and complete surface	Cognitive	Understanding

UNIT 1	SPACE CURVES	15 hours

Definition of Space curves – Arc length – tangent – normal and binormal – curvature and torsion – contact between curves and surfaces – tangent surface – involutes and evolutes – intrinsic equations – Fundamental Existence Theorem for space curves – Helics.

UNIT 2	INTRINSIC PROPERTIES OF A SURFACE	15 hours

Definition of surface - Curves on a surface - Surfaces of revolution – Helicoids – Metric - Direction coefficients - Families of curves - Isometric correspondence - Intrinsic properties – Geodesics - Canonical geodesic equations.

UNIT 3	GEODESICS	15 hours

Normal property of geodesic - Existence theorems - Geodesic parallels - Geodesic curvature - Gauss Bonnet theorem - Gaussian curvature - Surfaces of constant curvature - Conformal mapping - Geodesic mapping.

UNIT 4	NON INTRINSIC PROPERTIES OF A SURFACE	15hours

Second fundamental form - Principal curvatures- Lines of curvature – Developables - Developables associated with space curves - Developables associated with curves on surfaces- Minimal surfaces and ruled surfaces - Fundamental equations of Surface theory - Parallel surfaces.

UNIT 5	DIFFERENTIAL GEOMETRY OF SURFACES	15 hours

Compact surfaces whose points are umbilics- Hilbert's lemma- Compact surfaces of constant Gaussian

or mean curvature- Complete surfaces- Characterization of complete surfaces- Hilbert's theorem- Conjugate points on geodesics.							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**75**
TEXT BOOK							
1.T. J. Wilmore, "An introduction to Differential Geometry", Oxford University Press, 1997.							
REFERENCES							
Do Carmo,"Geometry of curves and surfaces", Academic Press, 2017. D.Somasundaram, "Differential Geometry", Narosa Publ. House, Chennai, 2005. J.A.Thorpe, "Elementary Topics in Differential Geometry", Springer - Verlag, New York, 1979.							

COs VS POs

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

COURSE NAME			COMPLEX ANALYSIS	L	T	P	C
COURSE CODE			YMA305	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basic concepts of real numbers

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** Cauchy's Theorem for rectangle and disc	Cognitive	Understanding
CO 2	**Apply** Cauchy's integral formula and Taylor's theorem for finding the higher order derivatives	Cognitive	Applying
CO 3	**Explain** Locally Exact Differentials – Multiply Connected regions	Cognitive	Applying
CO 4	**Evaluate** the given definite integrals using Cauchy' theorem	Cognitive	Analyzing
CO 5	**Utilize** the Taylor Series and the Laurent Series for finding zeros and poles for the given problem	Cognitive	Applying

UNIT 1		15 hours
Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauchy's Theorem for rectangle- Cauchy's Theorem for disc		
UNIT 2		**15 hours**
The Index of a point - Integral Formula – Higher derivatives – Removable singularities – Taylor's theorem – Zeros and Poles – The Local Mapping – The Maximum Principle		
UNIT 3		**15 hours**
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 4		**15 hours**
The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals – The Mean – value property – Poisson's formula- Schwarz's Theorem – The Reflection Principle		
UNIT 5		**15hours**
Weierstrass's Theorem – The Taylor Series – The Laurent Series – Partial Fractions- Jensen's Formula – Hadamard's Theorem		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

TEXT BOOK
1.LarsV.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.
REFERENCE
1.S. Ponnusamy, “Complex Analysis”, Alpha Science International Ltd; 2nd Revised edition, 2005

COs VS POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	3	2	3	1	1	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**14**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			ELEMENTS OF STOCHASTIC PROCESS	L	T	P	C
COURSE CODE			YMA3E1	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Probability and Statistics				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Utilize** continuous time Markov model for constructing TPM.	Cognitive	Applying
CO 2	**Explain** renewal process and long term analysis with examples	Cognitive	Understanding
CO 3	**Apply** different methods and solve Birth and Death queues	Cognitive	Applying
CO 4	**Examine** the computations of M/G/1 and G/M/1 Queues and Network of Queues	Cognitive	Analyzing
CO 5	**Conclude** the idea of Brownian Motion and First Passage Times	Cognitive	Evaluating

UNIT 1	Continuous-Time Markov Models	9hours
Continuous Time Markov Chain, Examples, Transient Analysis, Occupancy Times, Limiting Behavior		
UNIT 2	**Generalized Markov Models**	**9 hours**
Renewal Process, Cumulative Process, Semi-Markov Process, Examples and Long-term Analysis.		
UNIT 3	**Queueing Models**	**9 hours**
Queueing Systems, Single-Station Queues, Birth and Death queues with Finite and Infinite Capacity.		
UNIT 4	**Queueing Models (Contd)**	**9 hours**
M/G/1 and G/M/1 Queues and Network of Queues.		
UNIT 5	**Brownian Motion**	**9 hours**
Standard Brownian Motion, Brownian Motion and First Passage Times.		

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOK

1.V. G. Kulkarni, Introduction to Modeling and Analysis of Stochastic Systems, Second Edition, Springer, 2011

REFERENCES
J. Medhi, Stochastic Processes, New Age, 2009.
S. M. Ross, Stochastic Processes, Wiley Series in Probability and Statistics, 1996

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	3	1	1
TOTAL	**15**	**15**	**14**	**11**	**15**	**5**	**7**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

COURSE NAME			MATHEMATICAL MODELING	L	T	P	C
COURSE CODE			YMA3E2	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			YMA103				

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

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Compare** models that can be constructed by ordinary differential equations of first order under study	Cognitive	Applying
CO 2	**Utilize** compartment models to solve the problems involved in economics and medicine	Cognitive	Applying
CO 3	**Analyze** mathematical models that can be developed by second order linear differential equations	Cognitive	Analyzing
CO 4	**Apply** linear difference equation to solve problems in finance and economics	Cognitive	Applying
CO 5	**Identify** the solutions of the given problems that can be modeled through graphs	Cognitive	Applying

UNIT 1	**Mathematical Modeling through Ordinary Differential Equations of First order**	**9 hours**

Linear Growth and Decay Models – Non-Linear Growth and Decay Models –Compartment Models – Dynamics problems – Geometrical problems

UNIT 2	**Mathematical Modeling through Systems of OrdinaryDifferential Equations of First Order**	**9hours**

Population Dynamics – Epidemics – Compartment Models – Economics –Medicine, Arms Race, Battles and International Trade – Dynamics

UNIT 3	**Mathematical Modeling through Ordinary Differential Equationsof Second Order**	**9 hours**

Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modeling through Linear Differential Equations of Second Order –Miscellaneous Mathematical Models

UNIT 4	**Mathematical Modeling through Difference Equations**	**9 hours**

Simple Models – Basic Theory of Linear Difference Equations with ConstantCoefficients – Economics and Finance – Population Dynamics and Genetics –Probability Theory

UNIT 5	Mathematical Modeling through Graphs	9 hours
Solutions that can be Modeled through Graphs – Mathematical Modeling inTerms of Directed Graphs, Signed Graphs, Weighted Digraphs and UnorientedGraphs		

LECTURE	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

TEXT BOOK

1.J.N. Kapur, Mathematical Modeling, Wiley Eastern Limited, New Delhi, 1988

REFERENCE

1.J. N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East –West Press Pvt Limited, New Delhi, 19

COs VS POs

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

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

1-5→1, 6-10→2, 11-15→3

COURSE NAME			DATA ANALYSIS USING SPSS	L	T	P	C
COURSE CODE			YMA3E3	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
PREREQUISITE			Probability and Statistics				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** basic concepts of SPSS, working with the Data Editor and Plotting of Charts using Bar and Pie diagram	Cognitive	Understanding
CO 2	**Explain** measures of central tendencies and measures of dispersion using SPSS	Understanding	Understanding
CO 3	**Utilize** concept of testing hypothesis for finding significance level for the given data using one sample t-test, independent sample t-test and paired t-test in SPSS	Cognitive	Applying
CO 4	**Apply** One-way ANOVA, two-way ANOVA and Chi-square test for the given data in SPSS	Cognitive	Applying
CO 5	**Compare** the relationship for the datausing methods of correlation and regression in SPSS	Cognitive	Applying

UNIT 1		9 hours

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 2		9 hours

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 3		9 hours

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 4		9 hours

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 5							**9 hours**
Correlation: Karl Pearson's coefficient of Correlation – Spearman's Rank correlation – Simple linear Regression using SPSS with interpretation.							
LECTURE	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**
TEXT BOOK							
1.Ajai J Gaur and Sanjay S. Gaur (2008): Statistical Methods for Practice and Research:A guide to data analysis using SPSS, First Edition, Sage Publications							
REFERENCES							
Andy Field.(2011); Discovering Statistics Using SPSS, Sage Publications. Hinton P R, Brownlow C, McMurray,I. and Cozens, B. (2004) SPSS Explained, Routledge							

COs VS POs

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	**15**	**15**	**13**	**8**	**15**	**5**	**3**	**5**	**5**
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation									
1-5→1, 6-10→2, 11-15→3									

SEMESTER	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**H**	**C**
IV	YMA401	PROJECT WORK	0	0	0	30	8
		TOTAL				**30**	**8**