PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
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Criterion 1 – Curricular Aspects

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

DEPARTMENT OF MATHEMATICS

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

1. List of courses for the programmes in order of

S. No.	Programme Name
1.	Bachelor of Science (Mathematics)
2.	Master of Science (Mathematics)

2. Syllabus of the courses as per the list.

Legend : Words highlighted with **Blue Color** - Entrepreneurship

Words highlighted with **Red Color** - Employability

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

1. LIST OF COURSES

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
Tamil – I	XGT101	2022-23	Employability-Assignment & Seminar. To acquire basic Learning skills
English – I	XGE102	2022-23	Employability-Assignment & Seminar. To acquire basic Learning skills
Algebra & Trigonometry	XMT103	2022-23	Employability- Assignment, Seminar and Group discussions
Differential Calculus	XMT104	2022-23	Employability- Assignment, Seminar and Quiz
Allied Physics – I	XPG105	2022-23	Employability- Assignment, Seminar and Quiz
Allied Physics Practical - I	XPG106	2022-23	Employability- Assignment, Seminar and Quiz
Human Ethics ,Values, Rights and Gender Equality	XUM001	2018-19	Employability-Assignment & Seminar. To acquire basic Learning skills
Foundation Course	XMT107	2023-24	Employability-Assignment & Seminar. To acquire basic Learning skills
Tamil – II	XGT201	2022-23	Employability- Assignment, Seminar and Group discussions
English – II	XGE202	2022-23	Employability- Assignment, Seminar and Group discussions
Analytical Geometry 3D and Integral Calculus	XMT203	2022-23	Employability- Assignment, Seminar and Quiz
Sequence and Series	XMT204	2018-19	Employability-Assignment & Seminar. To acquire basic Learning skills
Allied Physics – II	XPG205	2022-23	Employability- Assignment, Seminar and Group discussions
Allied Physics Practical - II	XPG206	2022-23	Employability- Assignment, Seminar and Quiz
Quantitative Aptitude - I	XMT207	2022-23	Skill Development- Seminar: To learn some application about aptitudes
Environmental Studies	XUM002	2023-24	Employability- Assignment, Seminar and Quiz
Differential Equations and Laplace Transforms	XMT301	2018-19	Employability- Assignment, Seminar and Quiz
Vector Calculus, Fourier Series and Fourier	XMT302	2018-19	Employability- Miniproject, Seminar and Group discussions

Transforms			
Mathematical Statistics - 1	XMT303	2023-24	Employability- Assignment, Seminar and Quiz
Mathematical Statistics Practical - 1	XMT304	2023-24	Employability- Assignment, Seminar and Quiz
Open Elective Accounting for everyone	XCOOE5	2018-19	Employability- Assignment, Seminar and Quiz
Open Elective Web Technologies	YSEOE2	2018-19	Employability- Assignment, Seminar and Quiz
Open Elective C++	XEAOE1	2018-19	Employability- Assignment, Seminar and Quiz
Quantitative Aptitude - II	XMT305	2023-24	Skill Development- Seminar: To learn some application about aptitudes
Disaster Management	XUM003	2018-19	Employability- Miniproject, Seminar and Group discussions
Abstract Algebra	XMT401	2023-24	Employability- Assignment, Seminar and Quiz
Mechanics	XMT402	2018-19	Employability- Assignment, Seminar and Quiz
Mathematical Statistics - 2	XMT403	2023-24	Employability- Assignment, Seminar and Quiz
Mathematical Statistics Practical - 2	XMT404	2023-24	Employability- Assignment, Seminar and Quiz
Open elective - Web Technologies	YSEOE2	2018-19	Employability- Assignment, Seminar and Group discussions
Open elective - Public Administration	XCOOE8	2018-19	Employability- Assignment, Seminar and Group discussions
Open Elective – Human Resources Management	XBAOE3	2018-19	Employability- Assignment, Seminar and Group discussions
Quantitative Aptitude - III	XMT405	2023-24	Skill Development- Seminar: To learn some application about aptitudes
Introduction to Entrepreneurship development	XUM004	2021-22	Entrepreneurship- Seminar and Group Discussions
Probability and Statistics	XMT501	2018-19	Employability- Assignment, Seminar and Quiz
Matrices	XMT502A	2018-19	Employability- Assignment, Seminar and Quiz
Discrete Mathematics	XMT502B	2018-19	Employability- Assignment, Seminar and Quiz
Numerical Methods	XMT503A	2018-19	Employability- Assignment, Seminar and Quiz
Mechanics	XMT503B	2018-19	Employability- Assignment, Seminar and Quiz

Linear Algebra	XMT504A	2018-19	Employability- Assignment, Seminar and Quiz
Astronomy	XMT504B	2018-19	Employability- Assignment, Seminar and Quiz
Open Elective - Business Analytics with worksheet	XCAOE3	2018-19	Employability- Assignment, Seminar and Quiz
Open Elective-Web Technologies	YSEOE2	2018-19	Employability- Assignment, Seminar and Quiz
Open Elective - Energy Studies	XMEOE04	2018-19	Employability- Assignment, Seminar and Quiz
Graph Theory	XMT601	2018-19	Employability- Assignment, Seminar and Quiz
Complex Analysis	XMT602A	2018-19	Employability- Assignment, Seminar and Quiz
Number Theory	XMT602B	2018-19	Employability- Assignment, Seminar and Quiz
Linear Programming	XMT603A	2018-19	Employability- Assignment, Seminar and Quiz
Stochastic Processes	XMT603B	2018-19	Employability- Assignment, Seminar and Quiz
Project	XMT604	2018-19	Employability- Mini project, Seminar and Group discussions
Linear Algebra	YMA101	2023-24	Employability- Assignment, test and case study.
Real Analysis	YMA102	2014-15	Employability- Assignment, test and case study.
Ordinary Differential Equations	YMA103	2014-15	Employability- Assignment, test and case study.
Graph Theory	YMA104	2014-15	Employability- Assignment, test and case study.
Mathematical Statistics	YMA1E1A	2014-15	Skill Development- Seminar: To learn how to apply mathematical statistics in real world problems
Fuzzy Sets and their Applications	YMA1E1B	2014-15	Skill Development- Seminar: To learn how to apply fuzzy sets and their applications in real world problems
AI and Machine Learning	YMA1E1C	2023-24	Skill Development- Seminar: To learn how to apply AI and machine learning in real world problems
Computer Programming (C++ Theory and Lab)	YMA1E2A	2022-23	Skill Development- Seminar: To learn how to apply C++ in real world problems
Number Theory and Cryptography	YMA1E2B	2022-23	Skill Development- Seminar: To learn how to apply number theory and cryptography in real world problems

Formal Languages and Automata Theory	YMA1E2C	2022-23	Skill Development- Seminar: To learn how to apply formal languages and automata theory in real world problems
Advanced Algebra	YMA201	2023-24	Employability- Assignment, test and case study.
Complex Analysis	YMA202	2023-24	Employability- Assignment, test and case study.
Partial Differential Equations	YMA203	2023-24	Employability- Assignment, test and case study.
Advanced Numerical Methods	YMA204	2023-24	Employability- Assignment, test and case study.
Resource Management Techniques	YMA2E1A	2022-23	Skill Development- Seminar: To learn how to apply resource management techniques in real world problems
Data Science Using R Programming	YMA2E1B	2023-24	Skill Development- Seminar: To learn how to apply data science using R programming in real world problems
Python for Mathematics	YMA2E1C	2023-24	Skill Development- Seminar: To learn how to apply python for mathematics in real world problems
Data Analysis Using SPSS	YMA2E2A	2022-23	Skill Development- Seminar: To learn how to apply data analysis using SPSS in real world problems
Numerical Methods Practical Using MATLAB	YMA2E2B	2023-24	Skill Development- Seminar: To learn how to apply numerical methods practical using MATLAB in real world problems
Data Analytics Practical with Python	YMA2E2C	2023-24	Skill Development- Seminar: To learn how to apply data analytics practical with python in real world problems
Research Methodology	YRM001	2023-24	Skill Development- Seminar: To learn how to apply research methodology in real world problems
Topology	YMA301	2014-15	Employability- Assignment, test and case study.
Integral Equations, Calculus of Variations and Transforms	YMA302	2022-23	Employability- Assignment, test and case study.
Functional Analysis	YMA303	2020-21	Employability- Assignment, test and case study.
Differential Geometry	YMA304	2022-23	Employability- Assignment, test and case study.
Complex Analysis	YMA305	2020-21	Employability- Assignment, test and case study.

Elements of Stochastic Process	YMA3E1	2022-23	Skill Development- Seminar: To learn how to apply elements of stochastic process in real world problems
Mathematical Modelling	YMA3E2	2014-15	Skill Development- Seminar: To learn about the application of mathematical modelling
Data Analysis Using SPSS	YMA3E3	2022-23	Skill Development- Seminar: To learn how to apply data analysis using SPSS in real world problems
Project work	YMA404	2014-15	Employability- Mini project, Seminar and Group discussions

2. SYLLABUS

B.Sc (MATHEMATICS)

பொதுத்தமிழ் - 1 (முதற்பருவம்)

பாடக் குறியீடு/ Course Code	பாடப் பெயர்/ Course Name	**Category**	**L**	**T**	**P**	**SS**	**H**	**C**
XGT101	**பொதுத்தமிழ் - 1**	Supportive	**3**	**0**	**0**	**0**	**3**	**3**
Pre-requisite	பன்னிரெண்டாம் வகுப்பில் தமிழை ஒரு பாடமாகப் பயின்றிருக்க வேண்டும்.							
பாடப்பயன்கள் / Course outcomes	இப்பாடத்தைக் கற்பதால் பின் வரும் பயன்களை மாணவர்கள் அடைவர்.							
CO1	கவிதை இலக்கியம் அறிமுகப்படுத்தப் படுவதால்படைப் பாற்றல்திறன் பெறுதல்.					புரிந்து கொள்ளல் (Understand)		
CO2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்.					புரிந்து கொள்ளல் (Understand)		
CO3	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர்.					பகுப்பாய்வு செய்தல் Analyze		
CO4	மொழி அறிவோடு சிந்தனைத்திறன் அதிகரித்தல்.					தெரிந்து கொள்ளல் (Apply)		
CO5	தமிழ் மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல்.					புரிந்து கொள்ளல் (Understand)		
	K1- Remember; K2 – Understand; K3 –Apply; K4 Analyze; K5 Evaluate; K6 – Create.							

அலகு - I	**மரபுக்கவிதை**	**9மணிகள்**

	1. பெ. சுந்தரனார்- தமிழ்த்தெய்வவணக்கம். 2. பாரதிதாசன் – சிறுத்தையைவெளியேவா. 3. கவிமணி- புத்தரும்சிறுவனும் 4. முடியரசன் – மொழிஉணர்ச்சி 5. கண்ணதாசன் – ஆட்டனத்திஆதிமந்தி – ஆதிமந்திபுலம்பல். 6. சுரதாதுறைமுகம்தொகுப்பிலிருந்துஏதேனும்ஒருகவிதை 7. தமிழ்ஒளி- கடல்	
அலகு - II	புதுக்கவிதை	9மணிகள்
	1. அப்துல்ரகுமான் – வீட்டுக்குஒருமரம்வளர்ப்போம். 2. ஈரோடுதமிழன்பன் - வணக்கம்வள்ளுவ. 3. வைரமுத்து – பிற்சேர்க்கை 4. மு.மேத்தா – வாழைமரம். 5. அறிவுமதி – வள்ளுவன்பத்து. 6. நா.முத்துக்குமார் – ஆனந்தயாழைமீட்டுகிறாய். 7. சுகிர்தாராணி – சபிக்கப்பட்டமுத்தம். 8. இளம்பிறை – நீஎழுதமறுக்கும்எனதுஅழகு.	
அலகு - III	சிறுகதைகள்	9மணிகள்
	1. வாய்ச்சொற்கள் – ஜெயகாந்தன் (மாலைமயக்கம்தொகுப்பு) 2. கடிதம் - புதுப்பித்தன். 3. கரு - உமாமகேஸ்வரி. 4. முள்முடி - திஜானகிராமன். 5. சிதறல்கள் - விழி.பா.இதயவேந்தன். 6. காகிதஉறவு - சு.சமுத்திரம். 7. வீட்டின்மூலையில்சமையலறை - அம்பை. (மொழிபெயர்ப்புக்கதை) ஆண்டன்செக்காவ் – நாய்க்காரச்சீமாட்டி.	
அலகு - IV	இலக்கியவரலாறு	9மணிகள்
	பாடம்தழுவியஇலக்கியவரலாறு	
அலகு - V	மொழித்திறன்/ போட்டித்தேர்வு	9மணிகள்
	1. பொருள்பொதிந்தசொற்றொடர்அமைத்தல் 2. ஓர்எழுத்துஒருமொழி 3. வேற்றுமைஉருபுகள்	

	4. திணை, பால், எண், இடம் 5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு (குறிப்பு :அலகு 4, 5 ஆகியபகுதிகள்போட்டித்தேர்வுநோக்கில்நடத்தப்படவேண்டும்)	
		9மணிகள்
பாடநூல்கள்		
1.	மேலேசுட்டப்பட்டுள்ளகவிதைகள், பாடம்தொடர்புடையநூல்கள்	
பார்வைநூல்கள்		
1.	தமிழ்இலக்கியவரலாறு – சிற்பிபாலசுப்பிரமணியன்.	
2.	புதியநோக்கில்தமிழ்இலக்கியவரலாறு - தமிழண்ணல்	
3.	வகைமைநோக்கில்தமிழ்இலக்கியவரலாறு – எஃப்.பாக்கியமேரி.	

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
Web Sources
• **Tamil Heritage Foundation - www.tamilheritage.org<http://www.tamilheritage.org>** • **Tamil virtual University Library - www.tamilvu.org/library http://www.virtualvu.org/library** • **Project Madurai - www.projectmadurai.org.** • **Chennai Library - www.chennailibrary.com<http://www.chennailibrary.com>.** • **Tamil Universal Digital Library-www.ulib.prg<http://www.ulib.prg>.** • **Tamil E-Books Downloads – tamilebooksdownloads.blogspot.com** • **Tamil Books online - books.tamilcube.com** • **Catalogue of the Tamil books in the Library of British Congress archive.org** • **Tamil novels online - books.tamilcube.com**
Strong-3, Medium-2, Low-1

COURSE CODE	XGE102	L	T	P	SS	H	C
COURSENAME	ENGLISH I	3	0	0	0	3	3
C:P:A- 3:0:0							

COURSE OUTCOMES: After the completion of course, the learners will be able to get comprehensive skills like:		Domain	Level
CO1	***Develop*** and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	Cognitive	Understand
CO2	***Understand*** the total content and underlying meaning in the context.	Cognitive	Apply
CO3	***Form*** the habit of reading for pleasure and for information	Cognitive	Understand
CO4	***Comprehend*** material other than the prescribed text	Cognitive	Understand
CO5	***Develop*** the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.	Cognitive	Understand

SYLLABUS		HOURS
UNIT-I	**POETRY**	**6+3+0=9**
1.1 A Patch of Land - Subramania Bharati 1.2 The Sparrow - Paul Laurence Dunbar 1.3 A Nation's Strength – Ralph Waldo Emerson 1.4 Love Cycle - Chinua Achebe		
UNIT-II	**PROSE**	**6+3+0=9**
2.1 JRD - Harish Bhat 2.2 Us and Them - David Sedaris From Dress Your Family in Corduroy and Denim 2.3 UnclePodger Hangs a Picture - Jerome K Jerome		
UNIT-III	**SHORT STORIES**	**6+3+0=9**
3.1 The Faltering Pendulum- Bhabani Bhattacharya 3.2 How I Taught my Grandmother to Read - Sudha Murthy 3.3 The Gold Frame- R.K. Laxman		
UNIT-IV	**LANGUAGE COMPETENCY**	**6+3+0=9**
4.1 Vocabulary : Synonyms, Antonyms, Word Formation 4.2 Appropriate use of Articles and Parts of Speech 4.3 Error correction		
UNIT - V	**ENGLISH FOR WORKPLACE**	**6+3+0=9**
5.1 Self - introduction, Greetings 5.2 Introducing others 5.3 Listening for General and Specific Information 5.4 Listening to and Giving Instructions / Directions		
L=30 / T=15	**Total Hours**	**45**
Tutorial Activities 1) Reading and understanding incomplete texts 2) Summarize a piece of prose or poetry 3) Communication Practice 4) Role play		
Text books		

- **Hogan, Sharon. The Art of Civilized Conversation: A Guide to Expressing Yourself withStyle and Grace -Margaret Shepherd,Penny Carter, (Illustrator), 2015.**
- Kumar, Vijay T. English in Use - *A Textbook For College Students* (English ,Paper back, - K Durga Bhavani, YL Srinivas,2015
- Murthy, Sudha. *How I taught my Grandmother to Read and other Stories*. Penguin Books, India, 2014
- Swan, Michael. *Practical English Usage* - 4th Edition By, 2018

COURSE NAME			Algebra & Trigonometry	L	T	P	C
COURSE CODE			XMT103	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Number systems

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Utilize** Horner's Method to obtain the roots of polynomials	Cognitive	Applying
CO 2	**Find** the summation of the given series such as binomial, exponential and logarithmic series	Cognitive	Remembering
CO 3	**Utilize** Cayley-Hamilton theorem to find powers of a given square matrix and inverse of a given matrix	Cognitive	Applying
CO 4	**Find** the expansion of trigonometric ratios in terms of θ	Cognitive	Remembering
CO 5	**Explain** the relation between circular and hyperbolic functions	Cognitive	Understanding

UNIT 1	9 + 3

Reciprocal Equations - Standard form – Increasing or decreasing the roots ofa given equation – Removal of terms, Approximate solutions of roots ofpolynomialsbyHorner'smethod–relatedproblems.

UNIT 2	9 + 3

Summation of Series: Binomial– Exponential –Logarithmic series(Theoremswithout proof)– Approximations–relatedproblems.

UNIT 3	9 + 3

Characteristicequation–Eigen valuesandEigen Vectors - Similar matrices - Cayley–HamiltonTheorem(Statementonly)-Findingpowersofsquare matrix, Inverse of a square matrix up to order 3, Diagonalization ofsquare matrices-related problems.

UNIT 4	9 + 3

Expansions of sinnθ, cosnθ in powers of sinθ, cosθ - Expansion of tannθ interms of tan θ, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ –Expansions oftan$(\theta_1+\theta_2+,\ldots,+\theta_n)$-Expansionsofsinθ,cosθandtanθintermsofθ-relatedproblems.

UNIT 5	9 + 3

Hyperbolic functions – Relation between circular and hyperbolic functions-Inverse hyperbolic functions, Logarithm of complex quantities, - relatedproblems.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book

1. Mathematics,Volume-IandII,P. Kandasamy,K. Thilagavathy,S.ChandPublication, 1st Edition, 2004.
Unit I - 1[Vol-I], 21-23,36-43,65-70
Unit II - 2,3,4[Vol-I], 71-100
Unit III - 4[Vol-II], 59-96
Unit IV - 6[Vol-I], 122-141
Unit V -7[Vol-I], 143-155, 1[Vol-II], 242-247.

References

1. AlgebraandTrigonometry,J.Stewart,L.Redlin,andS.Watson,CengageLearning,2012.
2. CalculusandAnalyticalGeometry,G.B.ThomasandR.L.Finny,PearsonPublication,9th Edition, 2010.

E-References

https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	2	1	0	0	0	1	1	1	2	1	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	2	1	0	0	0	1	1	1	2	1	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	13	10	5	0	2	10	10	10	13	10	0
SCALED VALUE	**3**	**3**	**1**	**0**	**1**	**2**	**2**	**2**	**3**	**2**	**0**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

COURSE NAME			Differential Calculus	L	T	P	C
COURSE CODE			XMT104	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4
PREREQUISITE			Basic differentiation formula				

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

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Utilize**Leibnitz formula to find n^{th} derivative of a given function.	Cognitive	Applying
CO 2	**Identify**thepartialderivatives of the given functions.	Cognitive	Applying
CO 3	**Utilize** Lagrange's method to findthemaximaand minima of a functionoftwo variables.	Cognitive	Applying
CO 4	**Identify** the envelope of various family of curves.	Cognitive	Applying
CO 5	**Identify**evolute of a given family of curves.	Cognitive	Applying

UNIT 1	9 + 3

Introduction (Review of basic concepts)–Thenthderivative–Standardresults–Fractionalexpressions–Trigonometricaltransformation–Formationofequationsinvolvingderivatives–Leibnitzformula forthe n^{th}derivative ofaproduct.

UNIT 2	9 + 3

Partial derivatives - Successive partial derivatives – Function of function rule – Total differential coefficient – Implicit functions

UNIT 3	9 + 3

Homogeneousfunctions–Partialderivatives of a function of two functions –Maxima and minima offunctionsoftwovariables–Lagrange'smethodofundeterminedmultipliers.

UNIT 4	9 + 3

Method of finding envelope – Another definition of envelope- Envelope of family of curves which are quadratic in the parameter.

UNIT 5	9 + 3

Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of curvature in polar co- ordinates.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book

1. Calculus Volume I, S. Narayanan and T.K. Manicavachagom Pillay, S. Viswanathan Pvt. Ltd., 2014.

Unit I - Chapter III All sections (Pages 69 to 87)
Unit II - Chapter VIII Sections: 1.1 to 1.5 (Pages 178 to 191)
Unit III - Chapter VIII Sections: 1.6 to 1.7,4 & 5 (Pages 191 to 204,222 to 2347)
Unit IV- Chapter IV Sections: 1.1 to 1.4, (Pages 281 to 291)
Unit V- Chapter V Sections :2.1 to 2.3& 2.5 (Pages 291 to 301,309 to 312)

References

1. Calculus, H. Anton, I. Birens and S. Davis, John Wiley and Sons, Inc., 2002.
2. Calculus, G.B. Thomas and R.L. Finney, Pearson Education, 2010.
3. Calculus, M.J. Strauss, G.L. Bradley and K. J. Smith, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
4. Introduction to Calculus and Analysis (Volumes I & II), R. Courant and F. John, Springer- Verlag, New

York, Inc., 1989.
5. Calculus, Volumes I and II, T. Apostol.
6. Calculus and mathematical analysis, S. Goldberg,

E-References

1. https://nptel.ac.in
2. https://www.math.columbia.edu/programs-math/undergraduate-program/ [Columbia University]
3. https://www.math.harvard.edu/undergraduate/?courseid=63/(Hardvard University)

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	15	15	10	0	5	15	15	15	15	15	0
SCALED VALUE	**3**	**3**	**2**	**0**	**1**	**3**	**3**	**3**	**3**	**3**	**0**

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

1-5→1, 6-10→2, 11-15→3

COURSE CODE			COURSE NAME	L	T	P	C
XPG105			ALLIED PHYSICS – I	3	0	0	3
C	P	A		L	T	P	H
2.7	0	0.3		3	1	0	4

COURSE OUTCOMES: At the end of the course, the student will be able to

	OBJECTIVES: To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.	**DOMAIN**	**LEVEL**
CO1	***Explain*** types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. ***Relate*** theory with practical applications in medical field.	Cognitive	Remember, Understand Apply
CO2	***Explain*** their knowledge of understanding about materials and ***apply*** it to various situations in laboratory and real life.	Cognitive	Understand apply
CO3	***Comprehend*** basic concept of thermodynamics concept of entropy and ***interpret*** the process of flow temperature.	Cognitive	Remember understand
CO4	***Articulate*** the knowledge about electric current resistance, capacitance in terms of potential electric field and ***analyze*** them mathematically verify circuits.	Cognitive	Understand Analyze
CO5	***Interpret*** the real life solutions using AND, OR, NOT basic logic gates and ***Infer*** operations using Boolean algebra and acquire elementary ideas of IC circuits.	Cognitive	Remember analyze

UNIT – I	**WAVES, OSCILLATIONS AND ULTRASONICS**	**9 + 3**
Simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasonic imaging- ultrasonics in dentistry – physiotheraphy, opthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry		
UNIT – II	**PROPERTIES OF MATTER**	**9 + 3**
Elasticity: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum *Viscosity*: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, *Surface tension*: definition – molecular theory – droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.		
UNIT – III	**HEAT AND THERMODYNAMICS**	**9 + 3**
: Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.		
UNIT – IV	**ELECTRICITY AND MAGNETISM**	**9 + 3**
Potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the		

coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses.

UNIT – V	DIGITAL ELECTRONICS AND DIGITAL INDIA	9 + 3

Logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India.

HOURS	LECTURE	TUTORIAL	TOTAL
	45	15	60

TEXT BOOKS

1. Murugeshan R , "Properties of Matter For B. Sc. Students", S Chand & Company Limited, Mohan Co-Operative Industrial Estate, New Delhi - 110 044, First edition 1994, Reprint 2022.
2. R. Murugeshan, Er. Kiruthiga Siva Prasath, "Properties of Matter and Acoustics", S.Chand& Company Ltd, Ram Nagar, New Delhi - 110 055, First edition 2005, Second Edition 2012.
3. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi
4. V.K.Metha(2004). Principles of electronics 6th Edn. S. Chand and company.
5. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand&Co.,New Delhi.

REFERENCE BOOKS

1. DS Mathur, "Elements of Properties of Matter", S. Chand Limited, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi - 110 055, First edition 1949, Reprint 2016.
2. Brij Lal, N Subrahmanyam, "*A Textbook of Sound*" 2nd Edition, Vikas Publishing House Pvt.Ltd.A–27, 2nd Floor, Mohan Co–operative Industrial Estate, New Delhi–110044, 2018.
3. ResnickHallidayandWalker(2018).FundamentalsofPhysics(11th edition),JohnWilleyand Sons, Asia Pvt.Ltd., Singapore.
4. R. Murugesan (2001), Allied Physics, S. Chand & Co, New Delhi
5. V.R. Khannaand R.S. Bedi (1998), Text book of Sound 1st Edn. Kedharnaath Publish &Co, Meerut.
6. N.S. Khare and S.S.Srivastava (1983), Electricity and Magnetism10th Edn., Atma Ram &Sons, New Delhi

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1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
7. https://www.youtube.com/watch?v=gT8Nth9NWPM
8. https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s
9. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s
10. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

Mapping with Programme Outcomes

Course Outcomes	**PO_1**	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**	**PO_7**	**PO_8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO_1	3	0	1	0	1	3	1	2	1	2	2	1
CO_2	2	0	1	2	1	3	1	1	1	2	2	1
CO_3	2	1	3	3	1	3	2	1	0	2	1	1
CO_4	1	1	2	3	2	3	1	2	0	2	2	2
CO_5	2	1	1	3	1	3	1	2	1	2	1	1
Total	10	3	8	11	6	15	6	8	3	10	8	6
Scaled to 1, 2, 3	**2**	**1**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**2**

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

COURSE CODE			COURSE NAME	L	T	P	C
XPG106			ALLIED PHYSICS PRACTICAL – I	0	0	1	1
C	P	A		L	T	P	H
0	0.75	0.25		0	0	2	2

COURSE OUTCOMES On the successful completion of this course students would able to		Domain	Level
CO1	***Develop*** *Knowledge* on bending of beams, its properties and *application*	Psychomotor	Mechanism
CO2	***Identify*** the principles of elasticity, ***derive*** expression for twisting couple and ***determine*** rigidity modulus of a wire.	Psychomotor: Affective:	Analyze, Mechanism Respond
CO3	. ***Understand*** *flow* of liquid, viscosity and *identify* its *applications and* ***Define*** surface tension	Psychomotor: Affective:	Apply Mechanism Receive
CO4	***recall*** the concepts of electric and magnetic field and ***explain*** the calibration of the equipments.	Psychomotor: Affective:	Analyze Mechanism Receive
CO5	. ***Understand*** basic concepts of gates and ***identify*** its ***applications***	Psychomotor: Affective:	Analyze Mechanism Receive

Ex. No	Experiments (Any eight experiments)	Cos
1.	Young's modulus by non-uniform bending using pin and microscope	CO2
2.	Young's modulus by non-uniform bending using optic lever,scale and telescope	CO2
3.	Rigidity modulus by static torsion method.	CO1
4.	Rigidity modulus by torsional oscillations without mass	CO1
5.	Surface tension and interfacial Surface tension – drop weight method	CO3
6.	Comparison of viscosities of two liquids – burette method	CO3
7.	Specific heat capacity of a liquid – half time correction	CO3
8.	Verification of laws of transverse vibrations using sonometer	CO4
9.	Calibration of low range voltmeter using potentiometer	CO4
10.	Determination of thermo emf using potentiometer	CO4
11	Verification of De Morgan's theorems using logic gate ICs.	CO5
12	Use of NAND as universal building block.	CO5

	LECTURE	PRACTICAL	TOTAL
HOURS	0	30	30

TEXT BOOKS

1. C. L. Arora,"B.Sc .Practical Physics", S. Chand & Company Ltd. Ram Nagar, New Delhi–110055. 2007.
2. R. K. Shukla &Anchal Srivastava. "Practical Physics," New Age International (P) Ltd, Publishers, (Formerly Wiley Eastern Limited), 4835/24, Ansari Raod, Daryagani, New Delhi–11002. 2006.

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1. Geeta Sanon, "B. Sc., Practical Physics", 1st Edition, S. Chand and Company, 2007.
2. Chattopadhyay, D., Rakshit, P. C. and Saha, B., "An Advanced Course in Practical Physics," 8th Edition, Books & Allied Ltd., Calcutta, 2007.
3. G. L. Squires, "Practical Physics", Fourth edition, Cambridge University Press, 2001.
4. Indu Prakash and Ramakrishna, "A Text Book of Practical Physics," 11th Edition, Kitab

Mahal, New Delhi, 2011.
5. C. Ouseph,K. Rangarajan, "A Text Book of Practical Physics", Volume I,II, S.Viswanathan Publishers,1997.

E–Resources:
1. Amal Kumar Das , Department of Physics, IIT Kanpur, "Introduction to Electromagnetic Theory", National Programme on Technology Enhanced Learning (NPTEL), https://onlinecourses.nptel.ac.in/noc20_ph16/preview

Course Outcomes	**PO_1**	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**	**PO_7**	**PO_8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO_1	1	1	3	3	2	3	1	3	0	1	2	1
CO_2	1	1	3	2	1	3	1	3	1	1	2	1
CO_3	1	1	3	3	1	3	2	3	1	2	2	1
CO_4	1	1	2	2	2	3	1	3	1	2	2	1
CO_5	1	1	3	3	2	3	1	3	1	2	2	1
Total	5	5	14	13	8	15	6	15	4	8	10	5
Scaled to 1, 2, 3	**1**	**1**	**3**	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**2**	**1**

Mapping of COs with POs
0 – No relation 1 – Low relation 2 – Medium relation 3 – High relation

COURSE NAME			Foundation Course	L	T	P	C
COURSE CODE			XMT107	1	1	0	2
C	P	A		L	T	P	H
2	0	0		1	1	0	2

PREREQUISITE	Number systems & Algebra

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Find** a general term and middle tern in a binomial expansion using binomial theorem.	Cognitive	Remembering
CO 2	**Find**the number of possible combinations for a given situation using the fundamental counting principle.	Cognitive	Remembering
CO 3	**Find** the combinations of objects with repetitions.	Cognitive	Remembering
CO 4	**Find** the 6 trigonometric functions using a calculator, as well as determining exact values for some special angles without a calculator.	Cognitive	Remembering
CO 5	**Find** derivatives of the given composite functions.	Cognitive	Remembering

UNIT 1	3+3
Binomial theorem, General term, middle term, problems based on these concepts.	
UNIT 2	**3+3**
Fundamental principle of counting. Factorial n.	
UNIT 3	**3+3**
Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.	
UNIT 4	**3+3**
Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule.	
UNIT 5	**3+3**
Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method.	

LECTURE	15	TUTORIAL	15	PRACTICAL	0	TOTAL	30

Text Book

1. NCERT class XI and XII text books
2. Any State Board Mathematics text books of class XI and XII current Edition

References

Any State Board Mathematics text books of class XI and XII, Old Edition.

E-References

https://nptel.ac.in

COs Vs POs											
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	2	1	0	0	0	1	1	1	2	1	0

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

COURSE CODE	XUM001	L	T	P	SS	C
COURSE NAME	HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY	1	0	0	1	1
PREREQUISITES	Not Required	L	T	P	SS	H
C:P:A	0.8:0.1:0.1	1	0	0	1	2

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 **3+3**

HUMAN ETHICS AND VALUES

Human Ethics and values - Family and Society, Social service, Social Justice, Integrity, Caring and Sharing, Honesty and Courage, Time Management, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence, Personality Development

UNIT IIGENDER EQUALITY **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, ThanthaiPeriyar and Phule to Women Empowerment.

UNIT IIIWOMEN ISSUES AND CHALLENGES **3+3**

Women Issues and Challenges- Female Infanticide and Feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Remedial Measures – Acts related to women: Political Right, Property Rights, and Rights to Education, Dowry Prohibition Act.

UNIT IVHUMAN RIGHTS **3+3**

Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Forced Labour, Child helpline- Intellectual Property Rights (IPR) and its types. National Policy on occupational safety and health.

UNIT VGOOD GOVERNANCE **3+3**

Good Governance - Democracy, People's Participation, Transparency in governance and audit, Corruption, Impact of corruption on society and Remedial measures, Government system of Redressal. Creation of People friendly environment and universal brotherhood.

	LECTURE	SELF STUDY	TOTAL
	15	15	30

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).
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8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996)
9. Veeramani, K. (ed) Periyar Feminism, (PeriyarManiammai 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

Table 1 : Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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		

பொதுத்தமிழ் - 2 (இரண்டாம்பருவம்)

பாடக்குறியீடு/ Course Code	பாடப்பெயர்/ Course Name	Category	L	T	P	SS	H	C
XGT201	**பொதுத்தமிழ் - 2**	Supportive	3	0	0	0	3	3
Pre-requisite	பன்னிரெண்டாம் வகுப்பில் தமிழை ஒருபாடமா கப்பயின்றிருக்க வேண்டும்.							
பாடப் பயன்கள் / Course outcomes	இப்பாடத்தைக் கற்பதால்பி ன் வரும் பயன்களை மாணவர்கள் அடைவர்.							
CO1	நீதிஇலக்கியங்களைக்கற்பதன்மூலம்நீதிநெறியினையும்வாழ்வியல் மற்றும்மேலாண்மைச்சிந்தனைகளையும்தெரிந்துபின்பற்றுவர்	புரிந்துகொள்ளல் (Understand)						
CO2	சிற்றிலக்கியங்களின்வழிஇலக்கியச்சுவையினையும்பண்பாட்டுஅறி வினையும்பெறுவர்	புரிந்துகொள்ளல் (Understand)						
CO3	பட்டப்படிப்பினைப்படிக்கும்போதேபெரும்பான்மையானதமிழ்இல க்கியங்கள்குறித்தஅறிவினைப்பெறுவர்	பகுப்பாய்வுசெய்தல் Analyze						
CO4	தமிழ்ச்சமூகப்பண்பாட்டுவரலாற்றினைஇலக்கியங்கள்வாயிலாகஅ றிவர்	தெரிந்துகொள்ளல் (Apply)						
CO5	போட்டித்தேர்வுகளில்வெற்றிபெறுவதற்குத்தமிழ்ப்பாடத்தினைப்பய ன்கொள்ளும்வகையில்ஏற்றபயிற்சிபெறுவர்	புரிந்துகொள்ளல் (Understand)						
	K1- Remember; K2 – Understand; K3 –Apply; K4 Analyze; K5 Evaluate; K6 – Create.							

அலகு - I	**நீதிஇலக்கியம்**	**9 மணிகள்**
	திருக்குறளில் வாழ்வியல் – திருக்குறளில் மேலாண்மைச் சிந்தனைகள்	
அலகு - II	**பிறஇலக்கியங்கள்**	**9 மணிகள்**
	வள்ளலார் – அருள்விளக்கமாலை (முதல் 10 பாடல்கள்) – எச்.ஏ.கிருட்டிணப்பிள்ளை – இரட்சணியமனோகரம் – பால்யபிரார்த்தனை – குணங்குடிமஸ்தான்சாகிபு – பராபரக்கண்ணி (முதல் 10 கண்ணி)	
அலகு - III	**சிற்றிலக்கியங்கள்**	**9 மணிகள்**
	தமிழ்விடுதூது (முதல் 20 கண்ணி) – திருக்குற்றாலக்குறவஞ்சி – குறத்திமலைவளம்கூறல் – முக்கூடல்பள்ளு – நாட்டுவளம்	
அலகு -IV	**இலக்கியவரலாறு**	**9 மணிகள்**

	பாடம்தழுவியஇலக்கியவரலாறு (பல்லவர்காலம், நாயக்கர்காலம்)	
அலகு - V	**மொழித்திறன்/ போட்டித்தேர்வுத்திறன்**	**9மணிகள்**
	1. தொடர்வகைகள் 2. மரபுத்தொடர், பழமொழிகள் 3. பிறமொழிச்சொற்களைக்களைதல் 4. வழுச்சொற்கள்நீக்குதல் 5. இலக்கணக்குறிப்புஅறிதல்	
	(குறிப்பு :அலகு 4, 5 ஆகியபகுதிகள்போட்டித்தேர்வுநோக்கில்நடத்தப்படவேண்டும்)	**45 மணிகள்**
பாடநூல்கள்		
1.	திருக்குறள், மணிவாசகர்பதிப்பகம், சென்னை	
2.	இலக்கியத்தல்மனிதவளமேம்பாடு, சி. சரவணஜோதி, பாவைபப்ளிகேசன்ஸ்	
3.	தமிழ்விடுதூது	
4.	திருக்குற்றாலக்குறவஞ்சி	
5.	எச்.ஏ.கிருட்டிணப்பிள்ளை – இரட்சணியமனோகரம்	
பார்வைநூல்கள்		
1.	தமிழ்இலக்கியவரலாறு – சிற்பிபாலசுப்பிரமணியன்.	
2.	புதியநோக்கில்தமிழ்இலக்கியவரலாறு - தமிழண்ணல்	
3.	வகைமைநோக்கில்தமிழ்இலக்கியவரலாறு – எஃப்.பாக்கியமேரி.	

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

- **Tamil Heritage Foundation - www.tamilheritage.org<http://www.tamilheritage.org>**
- **Tamil virtual University Library - www.tamilvu.org/library http://www.virtualvu.org/library**
- **Project Madurai - www.projectmadurai.org.**
- **Chennai Library - www.chennailibrary.com<http://www.chennailibrary.com>.**
- **Tamil Universal Digital Library-www.ulib.prg<http://www.ulib.prg>.**
- **Tamil E-Books Downloads – tamilebooksdownloads.blogspot.com**
- **Tamil Books online - books.tamilcube.com**
- **Catalogue of the Tamil books in the Library of British Congress archive.org**
- **Tamil novels online - books.tamilcube.com**

Strong-3, Medium-2, Low-1

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

COURSE OUTCOMES: After the completion of course, the learners will be able to get comprehensive skills like:		Domain	Level
CO1	***Learn*** to introduce themselves and talk about everyday activities confidently	Cognitive	Understand
CO2	A***ble*** to write short paragraphs on people, places and events	Cognitive	Apply
CO3	***Identify*** the purpose of using various tenses and effectively employ them in speaking and writing	Cognitive	Understand
CO4	***Gain*** knowledge to write subjective and objective descriptions	Cognitive	Understand
CO5	***Identify*** and use their skills effectively in formal contexts.	Cognitive	Understand

SYLLABUS		HOURS
UNIT-I	**POETRY**	**6+3+0=9**
1.1Very Indian Poem in Indian English - Nissim Ezekiel 1.2 Still I Rise - Maya Angelou 1.3 The Flower -Tennyson 1.4 On Killing a Tree - Gieve Patel		
UNIT-II	**PROSE**	**6+3+0=9**
2.1 If You Are Wrong Admit it- Dale Carnegie 2.2 Kindly Adjust Please - Shashi Tharoor 2.3 The Spoon-fed Age- W.R. Inge		
UNIT-III	**FICTION**	**6+3+0=9**
Alchemist - Paulo Coelho		
UNIT-IV	**LANGUAGE COMPETENCY**	**6+3+0=9**
4.1 Homonyms, Homophones, Homographs Portmanteau words 4.2 Verbs and Tenses, Subject Verb Agreement 4.3 Error correction		
UNIT - V	**ENGLISH FOR WORKPLACE**	**6+3+0=9**
5.1 Reading for General and Specific Information [charts, tables, schedules, graphs etc] 5.2 Reading news and weather reports 5.3 Writing paragraphs 5.4 Taking and making notes		
L=30 / T=15	**Total Hours**	**45**

Tutorial Activities

5) Reading and understanding incomplete texts
6) Summarize a piece of prose or poetry
7) Communication Practice
8) Role play

Textbooks

- Coelho, Paulo.*The Alchemist.* Harper ,2016
- Chambers, Pearson.*Brilliant Speed Reading: Whatever you need to read, however* ...Phil, 2013

• Hewings, Martin.*Advanced English Grammar*. Cambridge University Press, 2000 • Sharma, Richa *Descriptive English*. Arihant Publications (India) Ltd, 2019 **E- Resources:** • Very Indian poem by Nissim Ezekiel • http://econtent.in/pacc.in/admin/contents/40_%20_2020103001102714.pdf • Still I Rise by Maya Angelou https://www.poetryfoundation.org/poems/46446/still-i-rise • Kindly Adjust please - Shashi Tharoor • https://www.theweek.in/columns/shashi-tharoor/2018/05/25/kindly-adjust-to-our-english.html?fbclid=IwAR3IhtdXqvuV4ySECn9S7SA6HmCEYISyd1QHd3BlwKgiNKKwdkeSg3qWp-U/ • The Alchemist: https://www.youtube.com/watch?v=lxBYpmxjeDU	

COURSE NAME			Analytical Geometry 3-D and Integral Calculus	L	T	P	C
COURSE CODE			XMT203	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE 2D and 3D Shapes & Basic Integration Formulae

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO1	**Find** the equation tangent plane to a given sphere.	Cognitive	Remembering
CO2	**Find** the equation tangent plane to a given cone and cylinder.	Cognitive	Remembering
CO3	**Apply** the properties of definite integral to find reduction formulae for a given integral.	Cognitive	Applying
CO4	**Examine** the relation between beta and gamma function and also find recurrence for gamma function.	Cognitive	Analyzing
CO5	**Utilize** the change of order of integration to obtain area the given bounded region.	Cognitive	Applying

UNIT 1 **9 + 3**

Sphere- Tangent plane- intersection of two spheres – Equation of tangent planetoasphere.

UNIT 2 **9 + 3**

The equation of surface – cone- Right Circular Cone- Tangent plane and normal –Cylinder- Enveloping Cylinder.

UNIT 3 **9 + 3**

Propertiesofdefiniteintegrals-Reductionformulaeofthetypes:
$\int x^n e^{ax} dx, \int x^n e^{ax} cosaxdx, \int sin^n xdx, \int cos^n xdx, \int sin^m xcos^n x\, dx, \int tan^n xdx.$

UNIT 4 **9 + 3**

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 **9 + 3**

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 Book

1. Analytical Geometry Part II – Three Dimensions: T.K. M. Pillai, 2015 (for Unit I, II)

Unit I - Chapter 4 Sec: 1 – 8 (pages:92 -111)
Unit II - Chapter 5 Sec: 1 – 8 (pages :115-139)

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

Unit III - Chapter 1 Sec: 11, 13.1 – 13.6 (pages: 66-72,79-88)
Unit IV- Chapter 7 Sec: 2 – 5 (pages 278-290)
Unit V- Chapter 5 Sec: 2 – 5.4(pages 203-231)

References

1. AnalyticalGeometryandVectorCalculus,S.ArumugamandIssac, New Gamma, 2008.
2. EngineeringMathematics,Dr.M.K.Venkatraman, National Publishing Company.
3. AncillaryMathematics,T.K.M.Pillai,P.Natarajan, S. Viswanathan (Printers & Publishers) Pvt Ltd. 1992.

E-References
1. https://sites.math.washington.edu/~m125/[WashingtonUniversity] 2. https://courses.maths.ox.ac.uk/node/28[OxfordUniversity]

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO 2**
CO 1	2	1	0	0	0	1	1	1	2	1	0
CO 2	2	1	0	0	0	1	1	1	2	1	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	3	1	2	3	3	3	3	3	1
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	13	11	7	1	4	11	11	11	13	11	1
SCALED VALUE	**3**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

COURSE NAME			Sequence and Series	L	T	P	C
COURSE CODE			XMT204	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4
PREREQUISITE			Algebra and Number Systems				

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Demonstrate** if an infinite sequence is bounded, monotonic or oscillating.	Cognitive	Understanding
CO 2	**Demonstrate** the given series whether it is convergent or divergent by using the appropriate tests.	Cognitive	Understanding
CO 3	**Demonstrate** the series whether it is convergent or divergent by using the appropriate tests such as Raabe's test and Cauchy's root test.	Cognitive	Understanding
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	9 + 3

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

UNIT 2	9 + 3

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	9 + 3

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

UNIT 4	9 + 3

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

UNIT 5	9 + 3

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

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Books

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

Reference

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

E-References

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

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	11	6	0	1	11	11	11	15	11	0
SCALED VALUE	**3**	**3**	**2**	**0**	**1**	**3**	**3**	**3**	**3**	**3**	**0**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

COURSE CODE			COURSE NAME	L	T	P	C
XPG205			ALLIED PHYSICS –II	3	0	0	3
C	P	A		L	T	P	H
2.7	0	0.3		3	1	0	4

COURSE OUTCOMES

On the successful completion of this course students would able to

OBJECTIVES : To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.		**DOMAIN**	**LEVEL**
CO1	***Explain*** the concepts of interference diffraction and ***rephrase*** the concept of polarization based on wave patterns	Cognitive	Understanding analyze
CO2	***Outline*** the basic foundation of different atom models and ***Relate*** the importance of interpreting improving theoretical models based on observation.	Cognitive	Remembering understanding
CO3	***Summarize*** the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. ***Interpret*** nuclear processes like fission and fusion. ***Understand*** the importance of nuclear energy, safety measures.	Cognitive	Remembering, understanding apply
CO4	***Describe*** the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation.	Cognitive	Remembering, understanding apply
CO5	***Summarize*** the working of semiconductor devices, Zener diode, transistors and practical devices.	Cognitive	Remembering understanding

UNIT – I	**OPTICS**	**9 + 3**
Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries.		
UNIT – II	**ATOMIC PHYSICS**	**9 + 3**
Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices		
UNIT – III	**NUCLEAR PHYSICS**	**9 + 3**
Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods – introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.		
UNIT – IV	**INTRODUCTION TO RELATIVITY AND**	**9 + 3**

	GRAVITATIONAL WAVES	
Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence –introduction on gravitational waves, LIGO, ICTS opportunities at International Centre for Theoretical Sciences.		
UNIT – V	**SEMICONDUCTOR PHYSICS**	**9 + 3**
p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger –introduction to e-vehicles and EV charging stations		

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

TEXT BOOKS

1. R. Murugesan (2005), Allied Physics, S. Chand & Co, New Delhi.
2. K. Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3. Brijlal and N. Subramanyam(2002), Text book of Optics, S. Chand & Co, New Delhi.
4. R.Murugesan (2005), Modern Physics, S. Chand & Co, New Delhi.
5. A. SubramaniyamApplied Electronics, 2nd Edn., National Publishing Co., Chennai..

REFERENCE BOOKS

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. D.R. Khannaand H.R. Gulati (1979).Optics, S.Chand& Co. Ltd., New Delhi.
3. A. Beiser (1997), Concepts of Modern Physics, Tata Mc Graw Hill Publication, New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
5. V.K.Metha (2004), Principles of electronics, 6th Edn. ,S. Chand and Company, New Delhi.

E REFERENCES

1. https://www.berkshire.com/learning-center/delta-p-facemask/
2. https://www.youtube.com/watch?v=QrhxU47gtj4
3. https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo
4. https://www.youtube.com/watch?v=JrRrp5F-Qu4
5. https://www.validyne.com/blog/leak-test-using-pressure-transducers/
6. https://www.atoptics.co.uk/atoptics/blsky.htm -
7. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

Mapping with Programme Outcomes

Course Outcomes	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO9	PO10	PSO1	PSO2
CO_1	3	0	1	0	1	3	1	2	1	2	2	1
CO_2	2	0	1	2	1	3	1	1	1	2	2	1
CO_3	2	1	3	3	1	3	2	1	0	2	1	1
CO_4	1	1	2	3	2	3	1	2	0	2	2	2
CO_5	2	1	1	3	1	3	1	2	1	2	1	1
Total	10	3	8	11	6	15	6	8	3	10	8	6
Scaled to 1, 2, 3	**2**	**1**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**2**

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

COURSE CODE			COURSE NAME	L	T	P	C
XPG206			ALLIED PHYSICS PRACTICAL – II	0	0	1	1
C	P	A		L	T	P	H
0	0.75	0.25		0	0	2	2

COURSE OUTCOMES On the successful completion of this course students would able to			
OBJECTIVES : Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results		**Domain**	**Level**
CO1	***Understand*** basic concepts of physics and ***identify*** its ***applications***	Psychomotor	Mechanism
CO2	***Identify*** the principles of optics, and ***determine*** refractive index.	Psychomotor: Affective:	Analyze, Respond
CO3	***Develop*** *Knowledge* to differentiate resistance of material affected by temperature.	Psychomotor: Affective:	Mechanism Receive
CO4	***Recall*** the concepts of laws and ***explain*** the methods of magnetic field.	Psychomotor: Affective:	Mechanism Receive
CO5	***Understand*** function of semiconductor and zener diode and how it is working regulator.	Psychomotor: Affective:	Analyze Receive

Any Eight of the experiments

Ex. No	Experiments (Any eight experiments)	Cos
1.	Radius of curvature of lens by forming Newton's rings	CO1
2.	Thickness of a wire using air wedge	CO1
3.	Wavelength of mercury lines using spectrometer and grating	CO1
4.	Refractive index of material of the lens by minimum deviation	CO2
5.	Refractive index of liquid using liquid prism	CO2
6.	Specific resistance of a wire using PO box	CO3
7.	Thermal conductivity of poor conductor using Lee's disc	CO3
8.	Determination of Earth's magnetic field using field along the axis of a coil	CO4
9.	Characterisation of Zener diode	CO5
10.	Construction of Zerner/IC regulated power supply	CO5
11.	Construction of AND, OR, NOT gates using diodes and transistor	CO5
12.	NOR gate as a universal building block	CO5

	LECTURE	PRACTICAL	TOTAL
HOURS	0	30	30

TEXT BOOKS

1. C. L. Arora,"B.Sc .Practical Physics", S. Chand & Company Ltd. Ram Nagar, New Delhi–110055. 2007.
2. R. K. Shukla &Anchal Srivastava. "Practical Physics," New Age International (P) Ltd, Publishers, (Formerly Wiley Eastern Limited), 4835/24, Ansari Raod, Daryagani, New Delhi–11002. 2006.

REFERENCE BOOKS

1. Geeta Sanon, "B. Sc., Practical Physics", 1st Edition, S. Chand and Company, 2007.
2. Chattopadhyay, D., Rakshit, P. C. and Saha, B., "An Advanced Course in Practical Physics," 8th Edition, Books & Allied Ltd., Calcutta, 2007.
3. G. L. Squires, "Practical Physics", Fourth edition, Cambridge University Press, 2001.

4. Indu Prakash and Ramakrishna, "A Text Book of Practical Physics," 11th Edition, Kitab Mahal, New Delhi, 2011.
5. C. Ouseph,K. Rangarajan, "A Text Book of Practical Physics", Volume I,II, S.Viswanathan Publishers,1997.

E–Resources:

1. Amal Kumar Das , Department of Physics, IIT Kanpur, "Introduction to Electromagnetic Theory", National Programme on Technology Enhanced Learning (NPTEL), https://onlinecourses.nptel.ac.in/noc20_ph16/preview

Mapping of COs with POs

Course Outcomes	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO9	PO10	PSO1	PSO2
CO_1	1	1	3	3	2	3	1	3	0	1	2	1
CO_2	1	1	3	2	1	3	1	3	1	1	2	1
CO_3	1	1	3	3	1	3	2	3	1	2	2	1
CO_4	1	1	2	2	2	3	1	3	1	2	2	1
CO_5	1	1	3	3	2	3	1	3	1	2	2	1
Total	5	5	14	13	8	15	6	15	4	8	10	5
Scaled to 1, 2, 3	**1**	**1**	**3**	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**2**	**1**

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

COURSE NAME			Quantitative Aptitude – I	L	T	P	C
COURSE CODE			XMT207	1	1	0	2
C	P	A		L	T	P	H
2	0	0		1	1	0	2

PREREQUISITE	Number Systems

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** the basic concepts of Numbers, H.C.F. & L.C.M of Numbers and to solve the problems.	Cognitive	Understanding
CO 2	**Explain** the basic concepts of Decimal Fractions, Simplification and to solve the problems.	Cognitive	Understanding
CO 3	**Explain** the basic concepts of Square Roots & Cube Roots, Average and to solve the problems.	Cognitive	Understanding
CO 4	**Explain** the basic concepts of Problems on Numbers, Problems on Ages and to solve the problems.	Cognitive	Understanding
CO 5	**Explain** the basic concepts of Surds & Indices, Percentage and to solve the Problems.	Cognitive	Understanding

UNIT 1		**3+3**
Numbers, H.C.F. &L.C.M of Numbers.		
UNIT 2		**3+3**
Decimal Fractions, Simplification.		
UNIT 3		**3+3**
Square Roots & Cube Roots, Average.		
UNIT 4		**3+3**
Problems on Numbers, Problems on Ages.		
UNIT 5		**3+3**
Surds & Indices, Percentage.		

LECTURE	15	TUTORIAL	15	PRACTICAL	0	TOTAL	30

Text Book

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

References

1. Banking awareness by SangramKeshari Rout and SoumyaRanjanBehera, B.K. Publications Pvt. Ltd.; Second edition (2014).
2. UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
3. Fast Track Objective Arithmetic by Rajesh Verma, 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	PSO1	PSO2
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	2	1	0	0	2	2	2	3	2	0

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

		L	T	P	SS	C
COURSE CODE	**XUM002**	**1**	**0**	**0**	**1**	**1**
COURSE NAME	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**SS**	**H**
C: P: A	**0.8:0.1:0.1**	**1**	**0**	**0**	**1**	**2**

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 Receiving
CO4	***Explain*** the socio-economic, policy dynamics and***practice*** the control measures of global issues for sustainable development.	Cognitive		Understand Analyse
CO5	***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** themodern technology towards environmental protection.	Cognitive Psychomotor		Understand Apply

UNIT - I NATURAL RESOURCES AND ENERGY	**3+3**
World Environment Day and its need- Forest resources: Use, Deforestation– Water resources: over-utilization of surface and ground water- Mineral resources: Environmental effects of mining– Food resources: Modern agriculture, Fertilizer-Pesticide problems, Water logging, Salinity-Energy resources: Renewable and Non-renewable energy sources; Alternate energy resources-Role Of individual in Conservation of Resources.	

UNIT - IIECOSYSTEMS AND BIODIVERSITY	**3+3**
Structure and function of an ecosystem – Producers, consumers and decomposers –Biogeochemical cycles- Food chains, Food webs, Structure and Function of the Forest ecosystem and Aquatic ecosystem– Introduction to Biodiversity- Endemic, Extinct and Endangered species- Conservation of Biodiversity: In-situ and Ex-situ conservation.	

UNIT – IIIENVIRONMENTAL POLLUTION	**3+3**
Definition – Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards – Solid waste management: Causes, effects and control measures of industrial wastes – Role of an individual in prevention of pollution – Pollution case studies	

UNIT –IVSOCIAL ISSUES AND THE ENVIRONMENT	**3+3**
Rain water harvesting– Resettlement and Rehabilitation of people, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust – Environment Protection Act – Water Act – Wildlife Protection Act – Forest Conservation Act.	

UNIT –VHUMAN POPULATION AND THE ENVIRONMENT	**3+3**
Population growth, Variation among nations - Population explosion - Environment and Human health- HIV / AIDS – Role of Information Technology in Environment and human health – Case studies.	

LECTURE	**TUTORIALS**	**PRACTICALS**		**TOTAL**
30	**0**	**-------**		**30**

TEXT BOOKS

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, (2000).
2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, (2003).

3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, (2003).
4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, (2006).
5. Introduction to International disaster management, Butterworth Heinemann, (2006).
6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, (2004).

REFERENCES

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

E RESOURCES

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

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	1	0	4

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 4 **9+3**

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

1. Engineering Mathematics- A. Singaravelu, Meenakshi Agency, 2022.
2. 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**	**PO 9**
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 $\rightarrow$ 1, 6-10 $\rightarrow$ 2, 11-15 $\rightarrow$ 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	1	0	4

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&CompanyLtd,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.

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1. *https://courses.maths.ox.ac.uk/node/43944[Oxford University]*
2. https://courses.maths.ox.ac.uk/node/43955 [Oxford University]
3. 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	1	0	4

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**

Normal distribution- Gamma distribution- 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

1. "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

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

E-References

1. https://science.korea.edu/science_en/undergraduate/under_math3.do
   [Korea University college of science]
2. 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**

Normal distribution- Gamma distribution- 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

1. S.C. Gupta, V.K. Kapoor, Elements of Mathematical Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi, 3rd Edition, Reprint 2008.

Reference

1. Dr. P.R. Vittal “Mathematical Statistics” Margham Publications Chennai, 2009.

E-References

1. https://science.korea.edu/science_en/undergraduate/under_math3.do[Korea University college of science]
2. 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 $\rightarrow$ 1, 6-10 $\rightarrow$ 2, 11-15 $\rightarrow$ 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 solve the problems	Cognitive	Applying
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

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

References

1. Banking awareness by Sangram Keshari Rout and Soumya Ranjan Behera, 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, 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

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	1

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**o f importance of seismic waves occurring globally	Cognitive	Analyze
CO4	**Estimate** Disaster and mitigation problems.	Cognitive	Apply
CO5	Keen **knowledge** one essentials of riskr eduction	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 APPLICATIONOFTECHNOLOGY INDISASTERRISK REDUCTION **3**

Application of various technologies: Databases–RDBMS–Management Information Systems-Decision support system and other systems – Geographic information systems – Intranets andextranets– videoteleconferencing.Triggermechanism–Remotesensing-aninsight–contributionof remote sensing and GIS-Case study.

UNIT 3 AWARENESSOF RISKREDUCTION **3**

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

UNIT 4 DEVELOPMENTPLANNING ONDISASTER **3**

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

UNIT 5 SEISMICITY **3**

Seismic waves–Earthquakes and faults– measures of a earth quake, magnitude and intensity–ground damage– Tsunamis and earthquakes.

Lecture	15	Tutorial	-	Practical	-	Total	15

Text Book

1.SiddharthaGautamandKLeelakrishaRao,"DisasterManagementProgrammesandPolicies", VistaInternationalPubHouse,2012

2. ArunKumar,"GlobalDisasterManagement",SBSPublishers,2008

References

1. " EncyclopediaOfDisaster Management", Neha Publishers &Distributors, 2008
2. PardeepSahni, Madhavimalalgodaandariyabandu, "DisasterriskreductioninSouthAsia",PHI,2002
3. Amitasinvhal, "Understandingearthquakedisasters"TMH,2010.
4. PardeepSahni,AlkaDhamejaandUmamedury,"Disastermitigation:Experiencesandreflections",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 $\rightarrow$ 1, 6-10 $\rightarrow$ 2, 11-15 $\rightarrow$ 3

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	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	**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

1. 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

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

E-References

1. *https://courses.maths.ox.ac.uk/node/43944[Oxford University]*
2. 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	1	0	4

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	**9+3**

Basic concepts and principles -Forcesactingatapoint-Lami'stheoremandapplications-Parallelforces -Like and unlike parallel forces-Moment of aforce– Couples– Related problems.

UNIT 2	**9+3**

Equilibrium of three forces acting on a rigidbody-Friction-Lawsoffriction-Angleoffriction-Coneoffriction- Properties and related problems.

UNIT 3	**9+3**

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	**9+3**

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

UNIT 5	**9+3**

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. M.K.Venkataraman,"Statics",AgasthiarPublications,Trichy,200 4.
   Unit1: Chapters2,3,4
   Unit2:Chapters 5,7
2. M.K.Venkataraman,"Dynamics",AgasthiarPublications,Trichy,200 4.
   Unit3:Chapters3: section3.22,Chapter4:Section4.3,Chapter6

Unit4:Chapter 8
Unit5:Chapter11

References

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

E-References

http://nptel.ac.in

COs vs POs

	PO 1	PO2	PO3	PO4	PO 5	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 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	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	1	0	4

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**	9+3

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**	9+3

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**	9+3

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**	9+3

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**	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. 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)

2. 'Statistical Methods' Vol. II, Dr. S.P. Gupta, Sultan Chand & Sons 2008.
Unit V:Chapter: 5, 6

Reference

1. 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	**PO 2**	**PO3**	**PO4**	**PO 5**	**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 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

1. 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)
2. 'Statistical Methods' Vol. II, Dr. S.P. Gupta, Sultan Chand & Sons 2008.
   Unit V: Chapter: 5, 6

Reference

1. 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	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
2	0	0

L	T	P	H
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 t**he 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

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

References

1. Banking awareness by Sangram Keshari Rout and Soumya Ranjan Behera, 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, 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	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 → 1, 6-10 → 2, 11-15 → 3

Course Name			Introduction to Entrepreneurship Development	L	T	P	C
Course Code			XUM004	1	0	0	1
C	P	A		L	T	SS	H
1	0	0		1	0	1	1
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 Entrepreneurship	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

Why to become Entrepreneur, Skills/ Traits required for being an Entrepreneur, Creative and Design Thinking, Entrepreneurial Decision Process, Skill Gap Analysis, Role Models, Mentors and Support System, Entrepreneurial Success Stories.

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 Intapreneurship

Lecture	15	Self - Study	15	Total	30

Text Book

1. Jayashree Suresh, Entrepreneurial Development, Margham Publications.

References

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

1. 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	2	1					1	2	1
CO 2	2	1							1
CO 3	2	1					1		1
CO 4	2	2							1
CO 5	2	2							1
TOTAL	10	7	0	0	0	0	2	2	5
SCALED VALUE	2	2	0	0	0	0	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 CODE			COURSE NAME	L	T	P		C
XMT501			Probability and Statistics	2	0	0		2
C	P	A		L	T	P	SS	H
2	0	0		2	0	0	2	4

PREREQUISITE:Algebra

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

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

	LECTURE	TOTAL
	30	30

TEXTBOOK

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

REFERENCES

1. Irwin Miller and Marylees Miller, John E. Freund, “Mathematical Statistics withApplication”, 7th Ed., Pearson Education, Asia, 2006.

2. Sheldon Ross, "Introduction to Probability Model", 9th Ed., Academic Press, Indian Reprint, 2007.

TABLE 1: COs VS POs Mapping

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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

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

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

PREREQUISITE:Logic and Sets

Course Outcomes:	Domain	Level
CO1:Define and Apply truth tables and the rules of propositional and predicate calculus.	Cognitive	Remembering Applying
CO2: Apply the following methods direct proof, indirect proof, and proof by contradiction, and case analysis to formulate short proofs.	Cognitive	Applying
CO3: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- Non homogeneous recurrence relations solution of Non – homogeneous recurrence relations- Methods of generating functions.	
UNIT IV	**18**
Basic theorems on Boolean Algebra- Duality principle Boolean functions.	
UNIT V	**18**
Boolean functions- Applications of Boolean algebra- Logic gates and circuits -combinatorial circuits- Boolean expression – karnaugh map.	

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOK

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

REFERENCE

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

Table 1: COs VS POs Mapping

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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

COURSE CODE			COURSE NAME	L	T	P	C
XMT503A			Numerical Methods	4	2	0	6
C	P	A		L	T	P	H
6	0	0		4	2	0	6
PREREQUISITE:			Differential Calculus and Integral Calculus				

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

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

	LECTURE	TUTORIAL	TOTAL
	60	30	90

TEXT BOOKS

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

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

Table 1: COs VS POs Mapping

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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

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

PREREQUISITE:Matrices

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

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

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

TEXT BOOK

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

Unit1: Chapter 5, Sec 5.1 to 5.4

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

Table 1: COs VS POs Mapping

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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

VI SEMESTER

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

PREREQUISITE: Matrices

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

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

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

TEXT BOOK

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

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

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

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

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

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

REFERENCES

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

Table 1: CO Vs PO Mapping

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

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

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

PREREQUISITE: Differential Calculus and Integral Calculus

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

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

LECTURE	TUTORIAL	TOTAL
60	30	90

TEXT BOOK

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

Unit 1: Chapter 1

Unit 2: Chapter 2

Unit 3: Chapter 3

Unit 4: Chapter 4

Unit 5: Chapter 5

REFERENCES

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

Table 1: CO Vs PO Mapping

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

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

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

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

PREREQUISITE: NIL

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

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

	LECTURE	TUTORIAL	TOTAL
	60	30	90

TEXT BOOK

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

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

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

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

Unit 4: Chapter 12: 12.1 – 12.6.

Unit 5: Chapter 17: 17.1 – 17.7.

REFERENCES

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

Table 1: COs VS POs Mapping

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

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

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

M.SC (MATHEMATICS)
I SEMESTER

COURSE NAME			LINEAR ALGEBRA	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			Algebraic Structures				

Objective:
The objective of this course is to develop a strong foundation in linear algebra that provide a basic for advanced studies not only in mathematics but also in other branches like engineering, physics and computers, etc. Particular attention is given to canonical forms of linear transformations, diagonalizations of linear transformations, matrices and determinants.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Utilize** properties of linear transformations to solve problems.	Cognitive	Applying
CO 2	**Demonstrate** the concept of prime factorization of a given polynomial.	Cognitive	Understanding
CO 3	**Utilize** the concept of determinant find the adjoint, inverse, and characteristic values.	Cognitive	Applying
CO 4	**Compare**Simultaneous triangulations, diagonalization and decomposition.	Cognitive	Understanding
CO 5	**Demonstrate** the Rational and Jordan forms.	Cognitive	Understanding

UNIT 1	**Linear transformations**	**12 + 3**

Linear transformations – The Algebra of Linear Transformation - Isomorphism of vector spaces – Representations of linear transformations by matrices – Linear functional.

UNIT 2	**Algebra of polynomials**	**12 + 3**

Algebras - The algebra of polynomials –Polynomial ideals - The prime factorization of a polynomial – Commutative Rings - Determinant functions.

UNIT 3	**Determinants**	**12 + 3**

Permutations and the Uniqueness of Determinants – Classical adjoint of A (square) matrix – Inverse of an invertible matrix using determinants – Characteristic values – Annihilating polynomials.

UNIT 4	**Diagonalization**	**12 + 3**

Invariant subspaces – Simultaneous triangulations – Simultaneous diagonalization – Direct-sum decompositions – Invariant direct sums – Primary decomposition theorem.

UNIT 5	**The Rational and Jordan forms**	**12 + 3**

Cyclic subspaces – Cyclic decompositions theorem (Statement only) – Generalized Cayley – Hamilton theorem - Rational forms – Jordan forms.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Book:

1. Kenneth M Hoffman and Ray Kunze, Linear Algebra, 2nd Edition, Prentice-Hall of India Pvt. Ltd, New Delhi, 2013.

Unit	Chapter(s)	Sections
I	3	3.1 – 3.5
II	4 & 5	4.1, 4.2, 4.4, 4.5 and 5.1, 5.2
III	5 & 6	5.3, 5.4 and 6.1-6.3
IV	6	6.4 – 6.8
V	7	7.1 - 7.3

References:

1.M.Artin,"Algebra",PrenticeHallofIndiaPvt.Ltd.,2005.

2.S.H.Friedberg,A.J.InselandL.ESpence,"LinearAlgebra",4th Edition, Pritice-HallofIndiaPvt.Ltd.,2009.

3.I.N. Herstein, "Topics in Algebra", 2nd Edition, Wiley Eastern Ltd,NewDelhi,2013.

4.J.J. Rotman, "Advanced Modern Algebra", 2nd Edition, Graduate Studies in Mathematics, Vol. 114, AMS, Providence, Rhode Island,2010.

5.G.Strang,"IntroductiontoLinearAlgebra", 2nd Edition, PrenticeHallof IndiaPvt.Ltd,2013.

E-References

1. http://asian-university.org/wp-content/uploads/2018/02/Linear-Algebra_Fall18.pdf [Asian women university]
2. http://people.math.harvard.edu/~knill/teaching/math21b2010/21b_text.pdf [Harvard University]

COs VS Pos

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	2	1	0	0	2	2	2	3	2	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	12	7	0	2	12	12	12	15	12	0
SCALED VALUE	**3**	**3**	**2**	**0**	**1**	**3**	**3**	**3**	**3**	**3**	**0**

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

1-5→1, 6-10→2, 11-15→3

Course Name			REALANALYSIS	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			Algebraic Structures				

Objective:

Aim of this course is to work comfortably with functions of bounded variation, Riemann-Stieltjes Integration, convergence of infinite series, infinite product and uniform convergence and its interplay between various limiting operations.

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Explain** and evaluate functions of bounded variation and Rectifiable Curves.	Cognitive	Understanding
CO 2	**Demonstrate** the concept of Riemann-Stieltjes integral and its properties.	Cognitive	Understanding
CO 3	**Demonstrate** the concept of step function, upper function, Lebesgue function and their integrals.	Cognitive	Understanding
CO 4	**Construct** various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem.	Cognitive	Applying
CO 5	**Demonstrate** the concept and properties of inner products, norms and measurable functions.	Cognitive	Understanding

UNIT I	**Functionsofboundedvariation**	12 + 3

Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.

Infinite Series: Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.

UNIT 2	**The Riemann - Stieltjes Integral**	12 + 3

Introduction-Notation-ThedefinitionoftheRiemann-Stieltjesintegral-LinearProperties-Integration by parts- Change of variable in a Riemann - Stieltjes integral -ReductiontoaRiemannIntegral–Euler'ssummationformula-Monotonicallyincreasingintegrators,Upperandlowerintegrals-Additiveandlinearitypropertiesofupper,lowerintegrals-Riemann's condition -Comparisontheorems.

UNIT 3	**The Riemann - Stieltjes Integral**	12 + 3

Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of RS integrals- Mean value theorems - integrals as a function of the interval – Second fundamental theorem of integral calculus-Change of variable -Second Mean Value Theorem for Riemann integral- Riemann-Stieltjes integrals depending on a parameter- Differentiationunderintegralsign-Lebesguecriterionforexistenceof Riemannintegrals.

UNIT 4	**Infinite Series and infinite Products**	12 + 3

Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series – Cesarosummability - Infinite products. **Power series** - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem.

UNIT 5	**Sequences of Functions**	12 + 3

Pointwise convergence of sequences of functions - Examples of sequences of real - valued functions -Uniform convergence and continuity - Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions - Riemann - Stieltjes integration – Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Book:

TomM.Apostol:*MathematicalAnalysis*,2nd Edition,Addison-WesleyPublishingCompanyInc. NewYork, 1974.

Unit	Chapter	Sections
I	6 8	Sections6.1 to 6.8 Sections8.8, 8.15, 8.17, 8.18
II	7	Sections7.1 to 7.14
III	7	Sections7.15 to 7.26

IV	8 9	Sections8.20, 8.21 to 8.26 Sections9.149.15, 9.19, 9.20
V	9	Sections9.1to 9.6,9.8,9.9,9.10,9.11,9.13

References:

1.Walter Rudin, Principles of Mathematical Analysis, Tata McGraw Hill, New York, 1988.
2. G. de Barra, Measure Theory and Integration, Wiley Eastern Ltd., New Delhi 1981.
3. Tom M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
4. H. L. Royden, Real Analysis, Third Edition, Macmillan Publishing Company, New Delhi, 1988.
5. Inder K. Rana, An Introduction to Measure and Integration, 2nd Edition, Narosa Publishing House, 2015.
6. Gelbaum, B. R. and J. Olmsted, Counter Examples in Analysis, Holden day, San Francisco, 1964.
7. Burkill. J. C, The Lebesgue Integral, Cambridge University Press, 1951.
8. Munroe. M. E, Measure and Integration, Addison- Wesley, Mass, 1971.

Website and e-Learning Source

1. http://mathforum.org,
2. http://ocw.mit.edu/ocwweb/Mathematics,
3. http://www.opensource.org,
4. www.mathpages.com

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	10	6	0	1	11	11	11	15	11	0
SCALED VALUE	**3**	**2**	**2**	**0**	**1**	**3**	**3**	**3**	**3**	**3**	**0**

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

1-5→1, 6-10→2, 11-15→3

Course Name	**ORDINARYDIFFERENTIALEQUATIONS**	**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	UG level Calculus and Differential Equations

Objective:

To develop a strong background on finding solutions to linear differential equations with constant and variable coefficients and also with regular singular points.

.

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

	COURSE OUTCOMES	**DOMAIN**	**LEVEL**
CO 1	**Explain** the qualitative behavior of solutions of systems of differential Equations.	Cognitive	Understanding

CO 2	**Recall** the physical phenomena modeled by differential equations and dynamical systems.	Cognitive	Remembering
CO 3	**Analyze** the solutions of linear equations with variable coefficients.	Cognitive	Analyzing
CO 4	**Formulate** Green's function for boundary value problems.	Cognitive	Creating
CO 5	**Solve** the First order linear equations by using method of successive approximations.	Cognitive	Applying

UNIT I	**Linear equations with constant coefficients**	**12 + 3**

Second order homogeneous equations-Initial value problems-Linear dependence and independence-Wronskian and a formula for Wronskian- Non-homogeneous equation of order two.

UNIT 2	**Linear equations with constant coefficients**	**12 + 3**

Homogeneous and non-homogeneous equation of order n –Initial value problems- Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators.

UNIT 3	**Linearequationwithvariablecoefficients**	**12 + 3**

Initial value problems -Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – Reduction of the order of a homogeneous equation – Homogeneous equation with analytic coefficients-The Legendre equation.

UNIT 4	**Linear equation with regular singular points**	**12 + 3**

Euler equation – Second order equations with regular singular points –Exceptional cases – Bessel Function.

UNIT 5	**Existence and uniqueness of solutions to first order equations**	**12 + 3**

Equationwithvariableseparated–Exactequation–Methodofsuccessiveapproximations–theLipschitzcondition–ConvergenceoftheSuccessiveapproximationsand theexistence theorem.

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

Text Book:

1. E.A. Coddington, *An introduction to ordinary differential equations* (3rd Printing) Prentice-Hall of India Ltd., New Delhi, 1987.

Unit	Chapter	Sections
I	2	Sections 1 to 6
II	2	Sections 7 to 12.
III	3	Sections 1 to 8
IV	4	Sections 1 to 4 and 6 to 8
V	5	Sections 1 to 6

References:

1. WilliamsE.BoyceandRichardC.DIPrima,*Elementarydifferentialequationsandboundary valueproblems*, JohnWileyandsons,NewYork, 1967.
2. GeorgeFSimmons,*Differentialequationswithapplicationsandhistoricalnotes*, TataMcGrawHill,NewDelhi,1974.
3. N.N.Lebedev,*Specialfunctionsandtheirapplications*,PrenticeHallofIndia,NewDelhi, 1965.
4. W.T.Reid.*OrdinaryDifferentialEquations*,JohnWileyandSons,NewYork,1971
5. M.D. Raisinghania,*AdvancedDifferentialEquations*,S. Chand&CompanyLtd.NewDelhi 2001
6. B. Rai,D. P. ChoudaryandH.I.Freedman,*ACourseinOrdinaryDifferentialEquations*,Narosa PublishingHouse, NewDelhi, 2002.

Website and e-Learning Source

1. http://mathforum.org,
2. http://ocw.mit.edu/ocwweb/Mathematics,
3. http://www.opensource.org,
4. www.mathpages.com

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	2	1	0	0	0	1	1	1	2	1	0
CO 3	3	3	3	1	2	3	3	3	3	3	1
CO 4	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	14	12	9	4	6	12	12	12	14	12	4
SCALED VALUE	**3**	**3**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**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	YMA104	4	1	0	5

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

PREREQUISITE	Concept of relation, mapping, Discrete Structures

Objective:

To develop a strong background on finding solutions to linear differential equations with constant and variable coefficients and also with regular singular points.

.

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Demonstrate** to state that basic definitions and relevant theorems.	Cognitive	Understanding
CO 2	**Construct** graph theoretic models for real life problems.	Cognitive	Applying
CO 3	**Analyze** graphs satisfying certain properties.	Cognitive	Analyzing
CO 4	**Apply** core theoretical knowledge of graph theory to solve problems.	Cognitive	Applying
CO 5	**Demonstrate** the significance of planar graphs.	Cognitive	Understanding

UNIT I	**Graphs, sub graphs and Trees**	**12 + 3**

Graphsandsimplegraphs–Graphisomorphism–Theincidenceandadjacencymatrices–Subgraphs–Vertex Degrees – Paths and Connection – Cycles – Trees – Cut edges andBonds– Cutvertices – Cayley'sFormula.

UNIT 2	**Connectivity, Euler Tours and Hamilton Cycles**	**12 + 3**

Connectivity–Edge Connectivity - Blocks – Whitney's Theorem – Euler Tours –Hamilton Cycles – Dirac's Theorem – Closure of a graph –Chvatal'sTheorem.

UNIT 3	**Matchings,EdgeColourings**	**12 + 3**

Matchings–Berge's Theorem–Matchings and Coverings in Bipartite Graphs – Hall's Theorem –Perfect Matchings – Tutte's Theorem – Peterson's Theorem - Edge Chromatic Number– Vizing'sTheorem.

UNIT 4	**Independent Sets and Cliques, Vertex Colouring**	**12 + 3**

Independent Sets –Gallai's Theorem-Ramsey's Theorem–Ramsey's graph–Erdos's Theorem -Chromatic Number – Critical Graph - Brook's Theorem –Hajos'Conjecture.

UNIT 5	**PlanarGraphs**	**12 + 3**

Plane and Planar Graphs–Planar Embedding of a graph –Stereo graphic Projection-Dual Graphs–Isomorphic plane graphs with non-isomorphicduals–Euler's Formula–Bridges–The transfer of a bridge -Kuratowski's Theorem. The five-color theorem and the four-color conjecture

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Book:

1. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan, London,1976.

Unit	Chapter	Sections
1	1 2	Sec: 1.1 - 1.7 Sec: 2.1 - 2.4
2	3 4	Sec: 3.1 - 3.2 Sec: 4.1 - 4.2
3	5 6	Sec: 5.1 - 5.3 Sec: 6.1 - 6.2
4	7 8	Sec: 7.1 - 7.2 Sec: 8.1 - 8.3
5	9	Sec: 9.1 - 9.5

References:

1. Balakrishnan R. and Ranganathan K., "A textbook of Graph Theory", Springer, 2012.
2. D.B. West, Introduction to Graph Theory, II Ed., PHI, New Delhi, 2007.

3. J. Clark and D.A. Holton, A First look at Graph Theory, Allied Publishers, New Delhi, 1995.
4. F. Harary, Graph Theory, Addison –Wesley, Reading Mass, 1969.
5. Graham R.L., Rothschild B.L and Spencer J.H., "Ramsey Theory", Wiley Publishers, Second Edition, 1990.
6. Biggs N., "Algebraic Graph Theory", Cambridge Tracts in Mathematics 67, Cambridge University Press, 1994. MX8003 Algebraic Theory of Semigroups.

Website and e-Learning Source

1. **https://www.zib.de/groetschel/teaching/WS1314/BondyMurtyGTWA.pdf**
2. **https://en.wikipedia.org/wiki/Graph_theory**
3. http://tezu.ernet.in/dmaths/programme/m.sc.syllabus-2019.pdf[OxfordUniversity]
4. https://www-wp.maths.cam.ac.uk/documents/schedules.pdf/[CambridgeUniversity
5. GraphTheoryANPTELCoursebyS.A.Choudum,DepartmentofMathematicsIITMadras Chennai,Indiahttps://nptel.ac.in/courses/111/106/111106050/

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	3	1	2	3	3	3	3	3	1
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	13	9	1	4	13	13	13	15	13	1
SCALED VALUE	**3**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**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	L	T	P	C
Course Code			YMA1E1A	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	

Objective:

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Demonstrate** the knowledge of probability and statistical Distributions.	Cognitive	Understanding
CO 2	**Solve** the probability distributions of transformed variables and various parameters usings pecial distributions.	Cognitive	Applying
CO 3	**Examine** transformations of variables using special distributions.	Cognitive	Analyzing
CO 4	**Elaborate** the concepts of prob ability in multi variable distribution.	Cognitive	Creating
CO 5	**Estimate** probability value using central limit theorem.	Cognitive	Evaluating

UNIT I	**Probability and Distributions**	**9 + 3**

The probability set function – Randomvariables–Distributionfunction–Mathematicalexpectation–Special mathematicalexpectations–Specialmathematicalexpectations–Chebyshev'sinequality.

UNIT 2	**Multi variate Distributions**	**9 + 3**

DistributionsoftwoRandomvariables–Conditionaldistributionsandexpectations–IndependentRandomvariables–SomespecialDistributions:TheBinomialandrelateddistributions– The Poisson distribution.

UNIT 3	**Some Special Distributions**	**9 + 3**

The Gamma and Chi-Square distributions –TheNormaldistributions–TheBivariatenormaldistribution–DistributionsofFunctionsofRandomVariables:Samplingtheory–Transformations of variables of the discrete Type–Transformation of variables of the continuous type.

UNIT 4	**Distributions of Functions of Random Variables**	**9 + 3**

The Beta, t and F distributions, - Distributions of order statistics – The moment generating function technique – the distributions of x and $n S^2$ - Expectations of functions of Random variables.

UNIT 5	**Limiting Distributions**	**9 + 3**

Convergence in distribution– Convergence in Probability – Limiting moment generation functions – The central limit theorem– some the orem on limiting distributions.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. Introduction to Mathematical Statistics (Fifth Edition) by Robert V. Hogg, Allen T. Craig.,

Unit	Chapter(s)	Section(s)	Page (s)
1	1	1.3, 1.5, 1.7, 1.8, 1.9, 1.10	12-17, 28-35, 44-50, 52-56, 57-64, 68-70
2	2 3	2.1, 2.2, 3.1, 3.2	74-81, 82-90, 116-124, 126-129
3	3 4	3.3, 3.4, 4.1, 4.2, 4.3	131-136, 138-144, 146-150, 155-178

4	4	4.4, 4.7, 4.8, 4.9	179-184, 193-200, 203-220.
5	5	5.1, 5.3, 5.4, 5.5	233-255.

References:

1. M. Fisz, Probability theory and Mathematical Statistics, John Wiley & Sons, New York, 1963.
2. E.J. Dudewiczn and S.N. Mishra, Modern Mathematical Statistics, John Wiley & Sons, New York, 1988.
3. V.N. Rohatgi, An introduction to Probability theory and Mathematical Statistics, Wiley Eastern Limited, New Delhi, 1988.

Website and e-Learning Source

1.https://nptel.ac.in/courses/111/105/111105124/
2.https://nptel.ac.in/courses/111/102/111102134

COs VS Pos											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	3	1	2	3	3	3	3	3	1
CO 4	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	15	14	12	6	9	14	14	14	15	14	6
SCALED VALUE	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**

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 THEIR APPLICATIONS**	**L**	**T**	**P**	**C**
Course Code			**YMA1E1B**	**3**	**1**	**0**	**4**
C	**P**	**A**		**L**	**T**	**P**	**H**
4	**0**	**0**		**3**	**1**	**0**	**4**
PREREQUISITE			**Basic knowledge in set theory & Analysis**				

Objective:

The main objectives of this course are to:

1. To understand the basic knowledge of fuzzy set theory.
2. To gain know ledge in fuzzy relations and fuzzy measures.
3. To learn the basics of pattern recognition and decision making.
4. To learn about relations between crisp and fuzzy in applications.

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

COURSE OUTCOMES	**DOMAIN**	**LEVEL**

CO 1	**Demonstrate** the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.	Cognitive	Understanding
CO 2	**Demonstrate** Standard fuzzy operations.	Cognitive	Understanding
CO 3	**Compare** Crisp and fuzzy relations.	Cognitive	Understanding
CO 4	**Compare** random and non-random uncertainty, and the decision-making processes in Fuzzy environment.	Cognitive	Understanding
CO 5	**Demonstrate** the applications of Fuzzy in different fields.	Cognitive	Understanding

UNIT I	**Crisp sets and fuzzy sets**	**9 + 3**

Overview of Classical Sets, Membership Function, Height of a fuzzy set – Normal and sub normal fuzzy sets – Support – Level sets, fuzzy points, α–cuts – Decomposition Theorems, Extension Principle.

UNIT 2	**Operation on fuzzy sets**	**9 + 3**

Standard fuzzy operations – Union, intersection and complement – properties of De Morgan's laws - α–Cuts of fuzzy operations.

UNIT 3	**Fuzzyrelations**	**9 + 3**

Cartesian Product, Crisp relations – Cardinality – operations and properties of Crisp and Fuzzy relations. Image and inverse image of fuzzy sets - Various definitions of fuzzy operations – Generalizations – Non interacting fuzzy sets, Tolerance and equivalence relations.

UNIT 4	**Decisionmaking inFuzzyEnvironments**	**9 + 3**

General Discussion – Individual Decision making – Multi person decision making – Multi criteria decision making – Multi stage decision making – Fuzzy ranking methods – Fuzzy linear programming.

UNIT 5	**Applications**	**9 + 3**

Medicine – Economics – Fuzzy Systems and Genetic Algorithms – Fuzzy Regression – Interpersonal Communication – Other Applications.

LECTURE	**45**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**60**

Text Book:

1. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications, PHI Leaning Private Limited, New Delhi (2009).

References:

1. A. K. Bhargava; Fuzzy Set Theory, Fuzzy Logic and their Applications, published by S. Chand Pvt. Limited (2013).
2. K. Pundir and R. Pundir, Fuzzy sets and their application, Published by A Pragati edition (2012)
3. H. J. Zimmermann, Fuzzy set theory and its applications, Springer (2012).

Website and e-Learning Source: NPTEL

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	2	1	0	0	2	2	2	3	2	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	10	5	0	0	10	10	10	15	10	0
SCALED VALUE	**3**	**2**	**1**	**0**	**0**	**2**	**2**	**2**	**3**	**2**	**0**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name Course Code			AI AND MACHINE LEARNING YMA1E1C	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	

Objective:

.

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

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	Overview of AI.	Cognitive	Understanding
CO 2	Categorize knowledge using propositional calculus and predicate calculus.	Cognitive	Analyzing
CO 3	Explain the foundations of Learning models.	Cognitive	Understanding
CO 4	Construct Linear Regression Models and Probabilistic discriminative model.	Cognitive	Applying
CO 5	Determine ensemble Learning and unsupervised learning.	Cognitive	Evaluating

UNIT I	INTRODUCTION	9 + 3

General Issues and overview of AI The AI problems: what is an AI technique; Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving; Production systems; Control strategies; forward and backward chaining Exhaustive searches: Depth first Breadth first search.

UNIT 2	LOGIC IN AI	9 + 3

Syntax and Semantics: Knowledge Representation – Predicate Calculus; Reasoning in Predicate Logic: Modus Ponens-Inference Rules; Applying Resolution: Normal Form Conversion-Reasoning through Refutation

UNIT 3	FOUNDATIONS OF LEARNING	9 + 3

Components of learning – Learning models – Geometric models – Pprobabilistic models – Logical models – Grouping and grading – Learning versus design – Types of learning – Ssupervised – Unsupervised – reinforcement – Theory of learning – Feasibility of learning – error and noise – Training versus testing – Ttheory of generalization – generalization bound – Approximation generalization trade off – bias and variance – Learning curve.

UNIT 4	SUPERVISED LEARNING	9 + 3

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, Gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT 5	ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING	9 + 3

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking; Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

References:

1. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall, Third Edition (2009)
2. AurélienGéron - Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition. September 2019, Reilly Media, Inc., ISBN: 9781492032649.

3. Shai Shalev-Shwartz and Shai Ben-David," Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press 2014.
Website and e-Learning Source; https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	3	1	2	3	3	3	3	3	1
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	15	13	10	3	6	13	13	13	15	13	3
SCALED VALUE	3	3	2	1	2	3	3	3	3	3	1
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name Course Code			COMPUTER PROGRAMMING (C++ Theory and Lab) YMA1E2A	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Basic knowledge from C Language

Objective:

To develop programming skills in C++and its object-oriented concepts.

	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** the concept of objects and constructors.	Cognitive	Understanding
CO 4	**Explain** Destructors & Operator Over loading and Types Conversions.	Cognitive	Understanding
CO 5	**Explain** Extending Classes and Pointers, Virtual Functions and Polymorphism.	Cognitive	Understanding

UNIT I	**Beginning with C++ & Tokens, Expressions and Control Structures**	9 + 3

Applications of C++– A simple C++ Program— An Example with Class– Structure of C++ Program– Creating the Source File– Compiling and Linking–Introduction– Token and Keyword.

UNIT 2	**Function sin C++and classes**	9 + 3

Introduction– the Main Function– Function Prototyping– Call by Reference–Return by Reference– Inline Function– Defaults Arguments– const Arguments– Function Overloading– Friend and Virtual Functions– C Structures Revisited– Specifying a Class– Defining Membership Functions– A C++ Program with Class– Making an Outside Function Inline– Nesting of Member Functions– Private Member Functions– Arrays with an Class.

UNIT 3	**Objects, Constructors**	9 + 3

Introduction– – Memory Allocation for Objects– Static Data Member– Static Member Functions–Arrays of Objects– Objects as Function Arguments– Friendly Functions– Returning Objects– const. Member Functions– Pointers of Members– Local Classes– Constructors– Parameterized Constructors– Multiple constructors in a class– Constructors with Default Arguments.

UNIT 4	**Destructors & Operator Over loading and Types Conversions**	9 + 3

Introduction — Dynamic Initialization of Objects– Copy Constructor– Dynamic Constructors–Constructing Two – Dimensional Arrays – constant Objects– Destructors – Introduction – Defining Operator Overloading – Overloading Unary Operators – Overloading Binary Operators – Overloading Binary Operators Using Friends– Manipulation of Strings Using Operators– Rules for Overloading Operators– Type Conversions.

UNIT 5	**Inheritance: Extending Classes and Pointers, Virtual Functions and Polymorphism**	9 + 3

Introduction–Defining Derived Classes– Single Inheritance–Making a Private Member Inheritance–Making a Private Member Inheritable– Multilevel Inheritance–Multiple Inheritance–Hierarchical Inheritance– Hybrid Inheritance– Virtual Base Classes–Abstract Classes– Constructors in Derived Classes– Member Classes: Nesting of Classes– Introduction– Pointers to Objects–this Pointer–Pointers to Derived Classes–Virtual Functions– Pure Virtual Functions.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. E.Balagurusamy, Object Oriented Programming with C++, 4th Edition, The McGraw–Hill Company Ltd, New Delhi, 2008.

References:

1. V. Ravichandran, Programming with C++, Second Edition Tata McGraw – Hill, New Delhi, 2006.
2. H. Schildt, The complete Reference of C++, Tata–McGraw–Hill publishing

Company Ltd. New Delhi, 2003.

3. S.B. Lipman and J.Lafer, C++ Primer, Addition Wesley, Mass., 1998.
4. Ashok N.Kamthane, Object Oriented Programming with ANSI and TURBO C++, Pearson Education(P) Ltd, 2003.
5. BjarmeStroustrup, The C++ Programming Language, AT & T Labs, Murray Hills, NewJersey, 1998.

Website and e-Learning Source: https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	2	1	0	0	2	2	2	3	2	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	11	6	0	1	11	11	11	15	11	0
SCALED VALUE	3	3	2	0	1	3	3	3	3	3	0

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

1-5→1, 6-10→2, 11-15→3

Course Name			NUMBER THEORY AND CRYPTOGRAPHY	L	T	P	C
Course Code			YMA1E2B	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Basic knowledge from C Language

Objective:

1. To provide techniques for keeping information secret.
2. To impart some techniques for determining the information has not been tampered with.
3. To explain fundamentals of cryptography and its application to network security.

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	**Analyze** the concepts of public key cryptography, RSA and Elliptic curve cryptography.	Cognitive	Analyzing
CO 3	**Demonstrate** the concepts of Pseudo primes.	Cognitive	Understanding
CO 4	**Utilize** basic properties of finite fields for factoring polynomials over finite fields.	Cognitive	Applying
CO 5	**Utilize** Pollard's rho method for solving the elliptic curve discrete logarithm problem.	Cognitive	Applying

UNIT I	**Cryptography**	**9 + 3**

Some simple Cryptosystems: Basic notions – Digraph transformation – Enciphering Matrices – Linear algebra modulo.

UNIT 2	**Public Key**	**9 + 3**

Idea of Public Key Cryptography: Classical versus public key – Authentication – Hash function – Key exchange – Probabilistic encryption – RSA – Discrete Log: Diffle-Hellman key exchange system – Massey-Omura cryptosystem – ELGamel cryptosystem – Digital signature standard

UNIT 3	**Primality**	**9 + 3**

Pseudo primes: Definitions and Propositions – The rho method.

UNIT 4	**Factoring**	**9 + 3**

Fermat factorization and factor bases – Factor base algorithm – Heuristic time estimate – Continued Fraction Method – Continued fraction factoring algorithm.

UNIT 5	**Elliptic Curves**	**9 + 3**

Basic Facts - Elliptic curve Cryptosystems: Discrete Log on E – Analog of Diffle-Hellman key exchange – Analog of Massey- Omura – Analog of EL Gamel cryptosystems - Elliptic curve factorization: Pollard's p-1 method.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. N. Koblitz, "A Course in Number Theory and Cryptography", Second edition, Springer- Verlag, New York, 2014.

Unit	Chapter	Sections
I	III	Sec 1-2 (Pages 54-74)
II	IV	Sec 1-3 (Pages 83-103)
III	V	Sec 1-2 (Pages 126-134, 138-142)
IV	V	Sec 3-4 (Pages 143-159)
V	VI	Sec 1-3 (Pages 166-182, 191-192)

References:

1. D.R.Stinson, "**Cryptography**", CRC Press, New York, 1995.

2. A. J Meneze, P.R.Oorche and S.A Vans ton " **Hand book of applied Cryptography**", Crc Press New York, 1995.
3. William Stallings, "**Cryptograpy and Network Security Principles and Practice**" Prentice Hall, Fifth Edition, New Delhi, 2011.

Website and e-Learning Source

1. http://abel.harvard.edu/quals/index.html[HavardUniversity]
2. https://www-wp.maths.cam.ac.uk/documents/schedules.pdf/[CambridgeUniversity]

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	3	1	2	3	3	3	3	3	1
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	15	14	10	1	5	14	14	14	15	14	1
SCALED VALUE	3	**3**	**2**	1	1	3	3	3	3	3	1
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

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Course Name Course Code			FORMAL LANGUAGES AND AUTOMATA THEORY YMA1E2C	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Knowledge about Set theory, Relations, functions and basic concepts of Grammars.

Objective:

The purpose of this course is to acquaint the student with an overview of the theoretical foundations of computer science from the perspective of formal languages.

- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- Explain deterministic and non-deterministic machines.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	Explain finite automata and regular expressions	Cognitive	Understanding
CO 2	Construct NFA to DFA and minimization DFA	Cognitive	Applying
CO 3	Determine Parse Trees and normal forms of Context Free Grammars	Cognitive	Evaluating
CO 4	Analyze the Equivalence of PDA's and CFG's	Cognitive	Analyzing
CO 5	Determine the Pumping Lemma for Context-free Languages	Cognitive	Evaluating

UNIT I	**Finite Automata and Regular Expressions**	**9 + 3**

Finite state systems- Deterministic Finite state Automata- Non deterministic Finite Automata- Finite Automata with Epsilon-Transitions – Regular Expressions- Finite Automata and Regular Expressions.

UNIT 2	**Properties of Regular Languages**	**9 + 3**

The Pumping Lemma for Regular Languages – Application of the Pumping Lemma – Closure Properties of Regular Languages – Reversal – Homomorphism – Decision properties of Regular Languages – Converting NFA's to DFA'S – Minimization of DFA's.

UNIT 3	**Context Free Grammars and Languages**	**9 + 3**

Context Free Grammars – Parse Trees – Normal forms for Context Free Grammars – Chomsky Normal Form – Greibach Normal Form.

UNIT 4	**Pushdown Automata**	**9 + 3**

Definition – The languages of a PDA – Equivalence of PDA's and CFG's – Deterministic Pushdown Automata.

UNIT 5	**Properties of Context-Free Languages**	**9 + 3**

The Pumping Lemma for Context-free Languages – Closure Properties of Context- Free Languages – Decision properties of CFL's.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. John. E. Hopcraft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education, 2013.

References:

1. A Salomaa, Formal Languages, Academic press, New York, 1973
2. John C. Martin, Introduction to Languages and theory of Computations (2ndEdn), Tata – McGraw Hill company Ltd., New Delhi, 1997.

Website and e-Learning Source: NPTEL Courses and MOOC Courses.

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	3	2	3	3	3	3	3	3	2
CO 4	3	3	3	1	2	3	3	3	3	3	1
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	15	14	12	5	9	14	14	14	15	14	5
SCALED VALUE	3	3	3	1	2	3	3	3	3	3	1
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

SEMESTER II

Course Name			ADVANCED ALGEBRA	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	Basic knowledge from C Language

Objective:

The main objectives of this course are: To study field extension, roots of polynomials, Galois Theory, finite fields, division rings, solvability by radicals and to develop computational skill in abstract algebra.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Explain** basic properties of Extension Fields and Transcendence.	Cognitive	Understanding
CO 2	**Solve** polynomial equations by radicals along with the understanding of ruler and compass constructions.	Cognitive	Applying
CO 3	**Explain** the basic aspects of elements of Galois theory.	Cognitive	Understanding
CO 4	**Summarize**Wedderburn's theorem on finite division rings.	Cognitive	Understanding
CO 5	**Demonstrate** the basic mathematical ideas for theorem of Frobenius and square theorem.	Cognitive	Understanding

UNIT I		**12 + 3**
Extension fields – Transcendence of e.		
UNIT 2		**12 + 3**
Roots or Polynomials. - More about roots.		
UNIT 3		**12 + 3**
Elements of Galois theory.		
UNIT 4		**12 + 3**
Finite fields - Wedderburn's theorem on finite division rings.		
UNIT 5		**12 + 3**
Solvability by radicals - A theorem of Frobenius - Integral Quaternions and the Four- Square theorem. Galios groups over theradicals.		

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. I.N. Herstein.TopicsinAlgebra (IIEdition)WileyEastern Limited,NewDelhi,1975.

Unit	Chapter	Sections
I	5	Section 5.1 and 5.2
II	5	Sections5.3 and 5.5
III	5	Section5.6
IV	7	Sections7.1and7.2(Theorem7.2.1only)
V	5 7	Section5.7(omitLemma5.7.1, Lemma5.7.2andTheorem5.7.1) Sections7.3 and7.4

References:

1. M.Artin,Algebra,PrenticeHallofIndia,1991.
2. P.B.Bhattacharya,S.K.Jain,andS.R.Nagpaul,BasicAbstractAlgebra(II Edition)Cambridge UniversityPress, 1997. (Indian Edition)
3. I.S.LutherandI.B.S.Passi,Algebra,Vol.I–Groups(1996);Vol.IIRings,NarosaPublishingHouse,

NewDelhi, 1999
4. D.S.Malik,J.N.MordesonandM.K.Sen,FundamentalofAbstractAlgebra,McGrawHill(International Edition), NewYork. 1997.
5. N.Jacobson, BasicAlgebra,Vol. I&II HindustanPublishingCompany,NewDelhi.

Website and e-Learning Source

1. http://mathforum.org,
2. http://ocw.mit.edu/ocwweb/Mathematics
3. http://www.opensource.org,
4. www.algebra.com

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	2	1	0	0	2	2	2	3	2	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	11	6	0	1	11	11	11	15	11	0
SCALED VALUE	**3**	**3**	**2**	**0**	**1**	**3**	**3**	**3**	**3**	**3**	**0**
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			YMA202	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Basics laws of arithmetic - Geometric representation of complex numbers - Differentiation and Integration – A mixture of geometric feeling and computational skill.

Objective:

Making students to know

*Complex analysis, in particular the theory of conformal mappings, has many physical applications and is also used throughout analytic number theory.

*In modern times, it has become very popular through a new boost from complex dynamics and the pictures of fractals produced by iterating holomorphic functions.

*Another important application of complex analysis is in string theory which studies conformal invariants in quantum field theory.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Demonstrate** the basic concept of line integrals, rectifiable arcs with examples and prove Cauchy's theorems.	Cognitive	Understanding
CO 2	**Demonstrate** the homology in complex plain and prove residue theorem.	Cognitive	Understanding
CO 3	**Explain** the canonical products and gamma functions with examples.	Cognitive	Understanding
CO 4	**Illustrate** the use of the reflection principle and prove Riemann mapping theorem.	Cognitive	Understanding
CO 5	**Explain** the general properties of elliptic functions.	Cognitive	Understanding

UNIT I	Complex Integration	12 + 3

Fundamental Theorems: Cauchy's Theorem for a Rectangle- Cauchy's Theorem in a Disk. Cauchy's Integral Formula: The Index of a point with respect to a closed curve – The Integral formula – Higher derivatives. Local Properties of analytical Functions:Removable Singularities- Taylors's Theorem – Zeros and poles – The local Mapping – The Maximum Principle.

UNIT 2	Complex Integration	12 + 3

The General form of Cauchy's Theorem: Chains and cycles- Simple Continuity - Homology - The General statement of Cauchy's Theorem - Proof of Cauchy's theorem - Locally exact differentials- Multilply connected regions - Residue theorem - The argument principle.

Evaluation of Definite Integrals and Harmonic Functions: Evaluation of definite integrals - Definition of Harmonic function and basic properties - Mean value property - Poisson formula.

UNIT 3	Series and Product Developments	12 + 3

Partial Fractions and Entire Functions: Partial fractions - Infinite products – Canonical products – Gamma Function- Jensen's formula – Hadamard's Theorem.Riemann Theta Function and Normal Families: Product development – Extension of ζ (s) to the whole plane – The zeros of zeta function – Equicontinuity – Normality and compactness – Arzela's theorem – Families of analytic functions – The Classical Definition.

UNIT 4	Conformal mappings	12 + 3

Riemann mapping Theorem: Statement and Proof – Boundary Behaviour – Use of the Reflection Principle. Conformal mappings of polygons: Behaviour at an angle – Schwarz- Christoffel formula – Mapping on a rectangle. Harmonic Functions: Functions with mean value property – Harnack's principle.

UNIT 5	Elliptic functions	12 + 3

Simply Periodic Functions : Representation by Exponentials-The Fourier Development - Functions of Finite Order.Doubly Periodic Functions:The Period Module-Unimodular Transformations - The Canonical Basis-General Properties of Elliptic Functions.WeierstrassTheory:TheWeierstrass $\wp$-function–Thefunctions ζ (s)and σ (s)–

Thedifferentialequation – The modular equation $\lambda(\tau)$ – TheConformalmappingby $\lambda(\tau)$.							
LECTURE	**60**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**60**

Text Book:

1. Lars F. Ahlfors, Complex Analysis, (3rd Edition) McGraw Hill Book Company, New York, 1979

References:

1. H.A. Presfly, Introduction to complex Analysis, Clarendon Press, ford, 1990.
2. J.B. Corway, Functions of one complex variables, Springer - Verlag, International student Edition, Narosa Publishing Co.
3. E. Hille, Analytic function Theory (2 vols.), Gonm& Co, 1959.
4. M.Heins, Complex function Theory, Academic Press, New York, 1968.

Website and e-Learning Source

https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	2	1	0	0	2	2	2	3	2	0
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	10	5	0	0	10	10	10	15	10	0
SCALED VALUE	**3**	**2**	**1**	**0**	**0**	**2**	**2**	**2**	**3**	**2**	**0**
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	The only prerequisite is a good course in Calculus.

Objective:

The students can be able to

1. Describe real world system using Partial Differential Equations.
2. Identify, analyse, and subsequently solve physical situations whose behavior can be described by Partial Differential Equations.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Recall** the basic concept of first order P.D.E and classification of integrals with examples.	Cognitive	Remembering
CO 2	**Explain** the origin of second order P.D.E with examples.	Cognitive	Understanding
CO 3	**Apply** the concept of Laplace equation to solve boundary value problems.	Cognitive	Applying
CO 4	**Classify** wave equation with examples.	Cognitive	Analyzing
CO 5	**Appraise** the elementary solution of diffusion equation.	Cognitive	Evaluating

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS OF THE FIRST ORDER	12 + 3

Partial Differential Equations – Origins of First Order Differential Equations – Cauchy's Problem for first order equations – Linear Equations of the first order – Nonlinear partial differential equations of the first order – Cauchy's method ofcharacteristics – Compatible system of First order Equations – Solutions satisfying Given Condition, Jacobi's method.

UNIT 2	PARTIALDIFFERENTIALEQUATIONSOFTHE2nd ORDER	12 + 3

The Origin of Second Order Equations – Linear partial Differential Equations with constant coefficients – Equations with variable coefficients – Separation of variables – The method of Integral Transforms – Non – linear equations of the second order.

UNIT 3	LAPLACE'S EQUATION	12 + 3

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

UNIT 4	THE WAVE EQUATION	12 + 3

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	12 + 3

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. K. Sankara Rao, Introduction to Partial Differential Equations, Second edition – Prentice – Hall of India, New Delhi 2006

References:

1. Ian Sneddon – Elements of Partial Differential Equations – McGraw Hill International Book Company, New Delhi, 1983
2. M.D. Raisinghania Advanced Differential Equations S. Chand and Company Ltd., New Delhi, 2001
3. J.N. Sharma & K. Singh Partial Differential Equations for Engineers & Scientists, Narosa Publishing House, 2001
4. R. Dennemeyer, Introduction to Partial Differential Equations and Boundary value Problems, McGraw Hill Book Company, New York, 1968.

Website and e-Learning Source: ;https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	2	1	0	0	0	1	1	1	2	1	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	3	1	2	3	3	3	3	3	1
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	14	12	9	3	6	12	12	12	14	12	3
SCALED VALUE	**3**	**3**	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name Course Code			ADVANCED NUMERICAL METHODS YMA204	L 4	T 1	P 0	C 5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

PREREQUISITE	Knowledge about Number system, polynomials and matrices.

Objective:

The objective of this course is to develop Numerical computational skills and to study their applications. This course focuses on the topics Interpolation by polynomials, the solution of nonlinear equations, Numerical differentiation and Numerical Integration.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Apply** the mean value theorem for derivatives and integrals to find specified point and verify this point lies inside the given integral.	Cognitive	Applying
CO 2	**Evaluate** up to cubic polynomials using appropriate methods.	Cognitive	Evaluating
CO 3	**Analyze** the solution of nonlinear equations by the appropriate methods.	Cognitive	Analyzing
CO 4	**Examine** the triangular factorization is unique.	Cognitive	Analyzing
CO 5	**Estimate** the value of the given integrals using appropriate methods.	Cognitive	Evaluating

UNIT I	Number Systems and Errors	12 + 3

The Representation of Integers -The Representation of Fractions - Floating point arithmetic- Loss of Significance and Error Propagation – Computational Methods for error estimation-Some comments on convergence of sequences-Some mathematical preliminaries.

UNIT 2	Interpolation by polynomials	12 + 3

Polynomial forms- Existence and Uniqueness of the Interpolating polynomial-The divided difference table- The error of the interpolating polynomial-Interpolation in a function table based on equally spaced points.

UNIT 3	The solution of nonlinear equations	12 + 3

A survey of iterative methods-Fixed point iteration-Polynomial Equations: Real Roots-Complex roots and Muller's Method.

UNIT 4	Matrices and Systems of Linear equations	12 + 3

The solution of linear systems by elimination-The pivoting strategy - The triangular factorization.

UNIT 5	Differentiation and Integration	12 + 3

Numerical differentiation- Numerical Integration: Some basic rules-Composite rules.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Book:

1. Elementary Numerical Analysis-An algorithmic approach by Samuel D. Conte and Carlde Boor, Sections 1.1 to 1.7, 2.1 to 2.3, 2.5, 2.6, 3.1, 3.3, 3.6, 3.7, 4.2 to 4.4, 7.1, 7.2 and 7.4. March 2018.

Reference:

1. Azmysackleh et al, Classical and modern Numerical Analysis, CRC Press,Copyright 2009.

Website and e-Learning Source; https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	3	2	3	3	3	3	3	3	2
CO 3	3	3	3	1	2	3	3	3	3	3	1
CO 4	3	3	3	1	2	3	3	3	3	3	1
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	15	15	14	6	11	15	15	15	15	15	6
SCALED VALUE	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name			RESOURCE MANAGEMENT TECHNIQUES	L	T	P	C
Course Code			YMA2E1A	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Basic knowledge about linear programming problems.

Objective:

1. To introduce basic optimization techniques in order to get best results from a set of several possible solutions of different problems like unconstrained and constrained problems etc.
2. To teach the formulation of real-world phenomena from its physical considerations and implementation of optimization algorithms for solving these problems.
3. To equip the knowledge of various types of queuing problem

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Identify** the optimal allocation using sequencing problems.	Cognitive	Applying
CO 2	**Apply** Dynamic programme to find the solution of L.P.P. by programming.	Cognitive	Applying
CO 3	**Apply** Replacement policy to find the solutions.	Cognitive	Applying
CO 4	**Analyze** various types of queuing problems with suitable simple problems.	Cognitive	Analyzing
CO 5	**Compare** the solutions of problems on deterministicmodels and probabilistic models in inventory theory.	Cognitive	Applying

UNIT I	**Sequencing Problems**	**9 + 3**

Optimal sequence algorithm – njobs and two machines – n jobs and m machines – solved problems – twojob and m machines.

UNIT 2	**Dynamic Programming**	**9 + 3**

Introduction - Recursive relationship – Dynamic programming algorithms – solved problems – Solution of L.P.P. by Dynamic programming.

UNIT 3	**Replacement Theory**	**9 + 3**

Introduction – Replacement policy for equipment which deteriorates gradually – Replacement of items that fail suddenly – Problems in mortality and staffing – Solved problems.

UNIT 4	**Queuing Theory**	**9 + 3**

Introduction – Classification of Queues – Queuing Problems -(M/M/1): (∞/FCFS) – (M/M/1): (N/FCFS) – (M/M/C): (∞/FCFS) – (M/M/C): (N/FCFS) – solved problems of the above types.

UNIT 5	**Inventory Control**	**9 + 3**

Introduction–Deterministic models–Purchasing problem with no shortages – Production problems with no shortages – Purchasing problem with shortages–Production problems with short a ges –EOQsystemofordering– Purchaseproblemwithpricebreaks–Probabilisticmodels – solved problems.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. Problem in operations Research, PK Gupta & Man Mohan, Fourteenth Edition,SultanChand &Sons, New Delhi, 2014.

Unit	Chapter	Pages
I	Chapter 17	383 – 399
II	Chapter18	409 – 428
III	Chapter24	619 – 630
IV	Chapter22	535 – 556

V	Chapter23	571 – 600

References:

1. OperationsResearch–AnIntroduction–H.A.Taha–PrenticeHallPublication.
2. OperationsResearch–S.D.Sharma–KedarnathRamnath&Co.,
3. OperationsResearch –PK.GuptaandD.S.Hira –SultanChand&Sons.
4. OperationsResearch– PathakH.K,PradeepKJoshiandSharma.C,ShreeShikshaSahityaPrakashan, Meerut, Second edition,2022.

Website and e-Learning Source

1. http://www.drps.ed.ac.uk/18-19/dpt/cxmath11194.htm[TheUniversityofEdinburgh]
2. maths.cam.ac.uk/undergrad/files/schedules.pdf[UniversityofCambridge]

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	3	1	2	3	3	3	3	3	1
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	**15**	**15**	**11**	**1**	**6**	**15**	**15**	**15**	**15**	**15**	**1**
SCALED VALUE	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**1**
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name Course Code			DATA SCIENCE USING R PROGRAMMING YMA2E1B	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4
PREREQUISITE			Knowledge about basic computer programming commands and operators.				

Objective:

1. Learn Fundamentals of R.
2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
3. Cover the basics of statistical data analysis with examples.
4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	**Explain** the basics of R.	Cognitive	Understanding
CO 2	**Apply** the R Data Types Vectors, Lists, Matrices, Arrays, Factors, Data Frame.	Cognitive	Applying
CO 3	**Make use** of R-Function, R Strings R Matrices, and R Arrays.	Cognitive	Applying
CO 4	**Make use** of CSV File and Excel Loading and handling Data in R.	Cognitive	Applying
CO 5	**Determine** measures of central tendency and dispersion.	Cognitive	Evaluating

UNIT I — **9 + 3**

Introduction to R What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), packageDescription(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

UNIT 2 — **9 + 3**

R Data Types Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

UNIT 3 — **9 + 3**

R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, Subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors.

UNIT 4 — **9 + 3**

Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim (), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() –

Merging Data frames merge() – Melting and Casting data melt(), cast().Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

UNIT 5		**9 + 3**

Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.

LECTURE	**45**	**TUTORIAL**	**15**	**PRACTICAL**	**0**	**TOTAL**	**60**

Text Book:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.

References:

1. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

Website and e-Learning Source

1. https://www.tutorialspoint.com/r/r_tutorial.pdf

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	3	2	3	3	3	3	3	3	2
TOTAL	15	14	10	2	6	14	14	15	15	14	2
SCALED VALUE	3	3	2	1	2	3	3	3	3	3	1

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

1-5→1, 6-10→2, 11-15→3

Course Name Course Code			PYTHON FOR MATHEMATICS YMA2E1C	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Basic Computer Knowledge

Objective:

1. introduce a useful scripting language
2. learn how to work with various data formats within Python
3. teach how to use lists, tuples and dictionaries in Python programs

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	Explain the overview of python.	Cognitive	Understanding
CO 2	Make use of Control Statements & Functions.	Cognitive	Applying
CO 3	Explain Strings and Lists.	Cognitive	Understanding
CO 4	Create Graphs with Matplotlib – Plotting with Formulas.	Cognitive	Creating
CO 5	Describe Data with Statistics and Algebra and Symbolic Math with SymPy.	Cognitive	Understanding

UNIT I	**Introduction to Python**	9 + 3

Introduction – Python Overview – Getting Started with Python –Comments – Python Identifiers – Reserved Keywords – Variables – Standard Data Types-Operators: Types of Operators - Statement and Expressions – String Operations.

UNIT 2	**Control Statements & Functions**	9 + 3

Iteration While Statement – Input from Keyboard. Function's introduction – Built-in Functions – Composition of Functions – User defined Functions - Parameters and Arguments –Function Calls- The return statement – Python Recursive Functions.

UNIT 3	**Strings and Lists**	9 + 3

Introduction about Strings and Lists- Strings - Lists. Tuples and Dictionaries: Tuples – Dictionaries.

UNIT 4	**Visualizing Data with Graphs**	9 + 3

Understanding the Cartesian Coordinate Plane – Working with List and Tuples – Creating Graphs with Matplotlib – Plotting with Formulas.

UNIT 5	**Describing Data with Statistics and Algebra and Symbolic Math with SymPy**	9 + 3

Finding the Mean – Finding the Median – Finding the Mode and Creating a Frequency Table. Defining Symbols and Symbolic.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

Text Book:

1. E.Balagurusamy,"IntroductiontoComputingandProblem-SolvingUsing Python", McGraw-Hill Education (India) Private Limited, 1st edition(2017).

2. AmitSaha,"DoingMathwithPython",1stedition,nostarchpress.

Unit	Text Book	Chapter	Sections
I	1	3	3.1-3.11Pg.no.(36-64)
II	1	3 4	3.13-3.15Pg.no.(65-74) 4.1-4.8Pg.no.(82-98)
III	1	5 6	5.1-5.2Pg.no.(112-132) 6.1-6.2Pg.no.(148-166)
IV	2	2	Pg.no.(43-73)

V	2	3 4	Pg.no.(82-93) Pg.no.(117-139)

References:

1. FabioNelli," PythonDataAnalytics",Apress,SecondEdition. (2018)
2. H.P.Langtangen,"APrimeronScientificProgrammingwithPython",Secondedition,Springer, 2016.
3. Ashok NamdevKamthane, Amit Ashok Kamthane, "Programming and ProblemSolvingwithPython",McGraw-HillEducation(India)PrivateLimited,Seconedition(2017).
4. ThomasNield,"Essential MathforData Science", O'ReillyMedia (2022).

Website and e-Learning Source

1. https://fangohr.github.io/python/book/Introduction-to-Python-for-Computational-Science-and-Engineering.pdf
2. https://sites.google.com/a/aicte-india.org/swayamrepo/big-data-analytics-for-smart-grid
3. https://youtu.be/sbGO9l83Ewg
4. https://wesmckinney.com/book/plotting-and-visualization.html

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	2	1	0	0	2	2	2	3	2	0
CO 4	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	2	1	0	0	2	2	2	3	2	0
TOTAL	15	12	8	3	4	12	12	12	15	12	3
SCALED VALUE	3	3	2	1	1	3	3	3	3	3	1

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

1-5→1, 6-10→2, 11-15→3

Course Name Course Code			DATA ANALYSIS USING SPSS YMA2E2A	L 3	T 1	P 0	C 4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Probability and Statistics

Objective:

The objective of this course is to teach how to explore, analyze, and understand data and how the software SPSS (Statistical Package for the Social Sciences) is used.

	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 data using methods of correlation and regression in SPSS.	Cognitive	Applying

UNIT I	9 + 3

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 + 3

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 + 3

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 + 3

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 + 3

Correlation: Karl Pearson's coefficient of Correlation – Spearman's Rank correlation – Simple linear Regression using SPSS with interpretation.

LECTURE	45	TUTORIAL	15	PRACTICAL	0	TOTAL	60

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:

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

Website and e-Learning Source : ; https://nptel.ac.in

COs VS POs											
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	15	13	8	0	3	13	13	13	15	13	0
SCALED VALUE	3	**3**	**2**	0	1	3	3	3	3	3	0
0 - No Relation, 1 – Low Relation, 2- Medium Relation, 3- High Relation											
1-5→1, 6-10→2, 11-15→3											

Course Name			NUMERICAL METHODS PRACTICAL USING MAT LAB	L	T	P	C
Course Code			YMA2E2B	2	0	2	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Working knowledge of some basic application software (Excel). Basic knowledge of computer programming and an understanding of matrix and linear algebra are highly beneficial.

Objective:

1. Understanding the MATLAB environment
2. Being able to do simple calculations using MATLAB
3. Being able to carry out simple numerical computations and analyses using MATLAB

COURSE OUTCOMES		DOMAIN	LEVEL
CO 1	Understand the main features of the MATLAB development environment.	Cognitive, Psychomotor Affective	Understanding Guided Response Responding
CO 2	Use the MATLAB GUI effectively.	Cognitive Psychomotor	Understanding Guided Response Responding
CO 3	Design simple algorithms to solve problems.	Cognitive Psychomotor Affective	Applying Guided Response Responding
CO 4	Write simple programs in MATLAB to solve scientific and mathematical problems.	Cognitive Psychomotor Affective	Applying Guided Response Responding
CO 5	Graphical representations and tips for designing and implementing MATLAB code.	Cognitive Psychomotor Affective	Applying Guided Response Responding

THEORY **30**

MATLAB basics, The MATLAB environment, Basic computer programming Variables and constants, operators and simple calculations, Formulas and functions, MATLAB toolboxes, Matrix and linear algebra review, Vectors and matrices in MATLAB, Matrix operations and functions in MATLAB Reading and writing data, file handling, Personalized functions, Toolbox structure, MATLAB graphic functions.

EXPERIMENTS **30**

1. Study of Introduction to MATLAB
2. Study of basic matrix operations
3. To solve linear equation
4. Solution of Linear equations for Underdetermined and over determined cases.
5. Determination of Eigen values and Eigen vectors of a square matrix.
6. Solution of Difference Equations.
7. Solution of Difference Equations using Euler Method.
8. Solution of differential equation using 4th order Runge- Kutta method.
9. Determination of roots of a polynomial.
10. Determination of polynomial using method of Least Square Curve Fitting.
11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds

from the given data.

LECTURE	30	TUTORIAL	0	PRACTICAL	30	TOTAL	60

Text Book:

1. Amos Gilat 'MATLAB, An Introduction with Applications',3rd edition, Wiely publishers,2008
2.Stephen J. Chapman' MATLAB Programming for Engineers' 5th edition, Cengauge learninb,2016
3.Holly Moore 'MATLAB for Engineers', 5th edition, Pearson, 2012

References:

1 "IntroductionToMatlabforEngineeringStudents",DavidHoucqueNorthwestern University,(version 1.2, August 2005)
2. "GettingStartedwithMATLAB– AQuickIntroductionforScientistsandEngineers"by R.Pratap,OxfordUniversityPress,NewDelhi,2010.
3. "Introduction toMATLAB®forEngineers",WilliamJ.PalmIII,UniversityofRhodeIsland,Mc Graw Hill, ThirdEdition, 2011.

Website and e-Learning Source

1. https://nptel.ac.in/courses/122106033
2. https://www.youtube.com/watch?v=83S48Fs9WhY
3. https://archive.nptel.ac.in/courses/103/106/103106118/
4. https://www.youtube.com/watch?v=qpZUQTjFk6Q

COs VS POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	2	1	0	0	2	2	2	3	2	0
CO 2	3	2	1	0	0	2	2	2	3	2	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
CO 4	3	3	2	0	1	3	3	3	3	3	0
CO 5	3	3	2	0	1	3	3	3	3	3	0
TOTAL	15	14	8	0	3	14	14	14	15	14	0
SCALED VALUE	3	3	2	0	1	3	3	3	3	3	0

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

1-5→1, 6-10→2, 11-15→3

Course Name			DATA ANALYTICS PRACTICAL WITH PYTHON	L	T	P	C
Course Code			YMA2E2C	2	0	2	4
C	P	A		L	T	P	H
4	0	0		2	0	2	4

PREREQUISITE	Basic knowledge of programming, statistics & mathematics

Objective:

Learning Objectives

- Learn the implementation of basics of Python and text pre-processing
- Learn the implementation of classification and clustering algorithms
- Learn the implementation of visualization

	COURSE OUTCOMES	DOMAIN	LEVEL
CO 1	**Demonstrate** the basics of python for performing data analysis.	Cognitive	Apply
CO 2	**Demonstrate** the use of text preprocessing, regression.	Cognitive	Apply
CO 3	**Demonstrate** the use of classification algorithms.	Cognitive	Apply

UNIT I		9

Introduction to Data Understanding and Preprocessing Knowledge domains of Data Analysis, understanding structured and unstructured data, Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.

UNIT 2		12

Introduction to machine learning- Supervised and Unsupervised Learning, Model development using Linear Regression, Model Visualization, Prediction and Decision Making, Model Evaluation: Over-fitting, Under-fitting and Model Selection.

UNIT 3		9

Data Processing and Visualization Data Formatting, Exploratory Data Analysis, Filtering and hierarchical indexing using Pandas. Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps.

S. No.	List of Experiments	Course Outcome	30
1.	Write a program to Implement Text Pre-processing with TF-IDF	CO1	
2.	Write a program to Implement Linear and Logistics regression	CO1	
3.	Write a program to Implement Decision Tree Classification	CO2	
4.	Write a program to Implement Naïve Bayes Classification	CO2	
5.	Write a program to Implement Principal Component Analysis	CO2	
6.	Write a program to Implement K-Means Clustering	CO2	

7.	Introduction to Matplotlib, Seaborn Packages in Python	CO3

LECTURE	30	TUTORIAL	0	PRACTICAL	30	TOTAL	60

Text Books:

1. E. Balagurusamy, "Introduction to Computing and Problem-Solving using Python ", McGraw-Hill Education (India) Private Limited, 1st edition (2017).

2. Thomas Nield, "Essential Math for Data Science", O'Reilly Media (2022).

References:

1. Fabio Nelli," Python Data Analytics", A press, Second Edition.

2. H. P. Langtangen, "A Primer on Scientific Programming with Python", Second edition, Springer, 2016.

3. Ashok NamdevKamthane, , Amit Ashok Kamthane, "Programming and Problem Solving with Python", McGraw-Hill Education (India) Private Limited, Second edition (2017).

Website and e-Learning Source

1. https://www.packtpub.com/product/python-data-analytics-and-visualization/9781788290098

2. https://youtu.be/oCoQm7Ro_ME

3. https://in.docs.wps.com/module/common/loadPlatform/?sid=sIFmo8KshhLiAoAY

COs VS POs

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 1	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 2	3	3	2	0	1	3	3	3	3	3	0
CO 3	3	3	2	0	1	3	3	3	3	3	0
TOTAL	15	15	10	0	5	15	15	15	15	15	0
SCALED VALUE	3	3	**2**	0	1	3	3	3	3	3	0

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 Urysohnmetrizationtheoremand the Tietz extension theorem	Cognitive	Applying

UNIT 1	Topological Spaces	12+3

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

UNIT 2	Continuous Functions	12+3

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

UNIT 3	Connectedness	12+3

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

UNIT 4	Compactness	12+3

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

UNIT 5	Countability and Separation Axiom	12+3

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

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

COs VS POs

	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 **12+3**

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 **12+3**

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 **12+3**

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 **12+3**

Linear Integral Equations - Definition, Regularity conditions – special kind of kernels –eigen values and eigenfunctions – 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 **12+3**

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

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

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

REFERENCES

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

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		12+3
Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems.		
UNIT 2		**12+3**
Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.		
UNIT 3		**12+3**
Bounded Inverse Theorem – Spectrum of a Bounded Operator.		
UNIT 4		**12+3**
Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.		
UNIT 5		**12+3**
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

1. G.F.Simmons,“Introduction to Topology and Modern Analysis”,McGraw Hill International Book Company, New York, 1963.
2. W. Rudin, “Functional Analysis”, Tata McGraw-Hill Publishing Company, New Delhi, 1973.
3. E. Kreyszig, “Introductory Functional Analysis with Applications”, John Wiley & Sons, New York, 1978.

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

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	12+3

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	12+3

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	12+3

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	12+3

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	12+3

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

1. Do Carmo,"Geometry of curves and surfaces", Academic Press, 2017.
2. D.Somasundaram, "Differential Geometry", Narosa Publ. House, Chennai, 2005.
3. 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		12+3

Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauchy's Theorem for rectangle- Cauchy's Theorem for disc

UNIT 2		12+3

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		12+3

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		12+3

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		12+3

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**	9

Continuous Time Markov Chain, Examples, Transient Analysis, Occupancy Times, Limiting Behavior

UNIT 2	**Generalized Markov Models**	9

Renewal Process, Cumulative Process, Semi-Markov Process, Examples and Long-term Analysis.

UNIT 3	**Queueing Models**	9

Queueing Systems, Single-Station Queues, Birth and Death queues with Finite and Infinite Capacity.

UNIT 4	**Queueing Models (Contd)**	9

M/G/1 and G/M/1 Queues and Network of Queues.

UNIT 5	**Brownian Motion**	9

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

1. J. Medhi, Stochastic Processes, New Age, 2009.
2. 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

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**	9

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

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

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

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**

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**

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**

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**

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**

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							
3. Andy Field.(2011); Discovering Statistics Using SPSS, Sage Publications.							
4. 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**