Curriculum & Syllabus

B.Sc., Mathematics

REGULATION 2022

Applicable for students admitted during

Academic Year 2022-2023 Only

Based on Outcome Based Education

B.Sc. (Mathematics) Curriculum & Syllabus
REGULATION – 2022
SEMESTER – I

Category	Code	Course Name	L	T	P	SS	H	C
Part – I	XGT101	Tamil – I	3	0	0	0	3	3
Part – II	XGE102	English – I	3	0	0	0	3	3
Core -1	XMT103	Differential Calculus and Trigonometry	3	1	0	0	4	4
Core -2	XMT104	Analytical geometry 3-D and Integral Calculus	3	1	0	0	4	4
Allied -1	XPG105	Physics – I	3	1	0	0	4	4
	XPG106	Physics Practical - I	0	0	4	0	4	2
UMAN - 1	XUM001	Human Ethics, Values, Rights and Gender Equality	1	0	0	1	1	1
		Total	**16**	**3**	**4**	**1**	**23**	**21**

SEMESTER II								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Part – I	XGT201	Tamil – II	3	0	0	0	3	3
Part – II	XGE202	English – II	3	0	0	0	3	3
Core-3	XMT203	Classical Algebra	3	1	0	0	4	4
Core-4	XMT204	Sequences and Series	3	1	0	0	4	4
Allied -2	XPG205	Physics – II	3	1	0	0	4	4
	XPG206	Physics Practical - II	0	0	4	0	4	2
SEC -1	XMT207	Skill Based Elective Course - 1	2	0	0	0	2	2
UMAN - 2	XUM002	Environmental Studies	1	0	0	1	1	1
		Field Visit/Industrial Visit	0	0	0	0	0	2
		Total	**18**	**3**	**4**	**1**	**25**	**25**

SEMESTER III								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -5	XMT301	Differential Equations and Laplace Transforms	3	1	0	0	4	4
Core -6	XMT302	Vector Calculus, Fourier Series and Fourier Transforms	3	1	0	0	4	4
Allied -3	XMT303	Mathematical Statistics - 1	3	1	0	0	4	4
	XMT304	Mathematical Statistics Practical –1	0	0	4	0	4	2
GE - 1		Open Elective- I	3	0	0	0	3	3
SEC - 2	XMT305	Skill Based Elective Course –2	2	0	0	0	2	2
UMAN -3	XUM003	Disaster Management	1	0	0	1	1	1
		Total	**15**	**3**	**4**	**1**	**22**	**20**

SEMESTER IV								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core –7	XMT401	Abstract Algebra	3	1	0	0	4	4
Core -8	XMT402	Mechanics	3	1	0	0	4	4
Allied - 4	XMT403	Mathematical Statistics – 2	3	1	0	0	4	4
	XMT404	Mathematical Statistics Practical – 2	0	0	4	0	4	2
GE- 2		Open Elective- 2	3	0	0	0	3	3
SEC – 3	XMT405	Skill Based Elective Course –3	2	0	0	0	2	2
UMAN - 4	XUM004	Introduction to Entrepreneurship Development	1	0	0	1	1	1
		Total	**15**	**3**	**4**	**1**	**22**	**20**

SEMESTER V								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -9	XMT501	Real Analysis	3	1	0	0	4	4
Core-10	XMT502	Discrete Mathematics	3	1	0	0	4	4
DSE – 1	XMT503	Discipline Specific Elective - 1	4	1	0	0	5	5
DSE–2	XMT504	Discipline Specific Elective - 2	4	1	0	0	5	5
GE -3		Open Elective- 3	3	0	0	0	3	3
NME	XMT505	Fundamentals of Data Science & R Programming	1	1	0	0	2	2
SEC–4	XMT506	Skill Based Elective Course –4	2	0	0	0	2	2
IPT	XMT507	IPT	0	0	0	0	0	4
		Total	**20**	**5**	**0**	**0**	**25**	**29**

SEMESTER VI								
Category	**Code**	**Course Name**	**L**	**T**	**P**	**SS**	**H**	**C**
Core -11	XMT601	Complex Analysis	3	1	0	0	4	4
Core -12	XMT602	Operations Research	3	1	0	0	4	4
DSE - 3	XMT603	Discipline Specific Elective - 3	4	1	0	0	5	5
DSE - 4	XMT604	Discipline Specific Elective - 4	4	1	0	0	5	5
Project	XMT605	Project	1	4	0	1	5	6
UMAN - 5	XUM005	Cyber Security	1	0	0	1	1	1
		Total	**16**	**8**	**0**	**2**	**24**	**25**

Note: Total Credit: 140 Extension Activity (EA) – 2 credits

L – Lecture **T – Tutorial** **P – Practical**
SS – Self Study **H – Hours** **C – Credits**

LIST OF SKILL BASED ELECTIVE COURSES

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

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSES

Semester – V

DSE – 1 (Any one of the following)

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

DSE – 2 (Any one of the following)

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

Semester – VI

DSE – 3 (Any one of the following)

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

DSE – 4 (Any one of the following)

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

NOTES ON CREDIT DISTRIBUTION AND COMPARISION WITH UGC LOCF GUIDELINES

B.Sc. Mathematics Credit distribution

S. No.	Type of Subject	Numbers	Total Credit (PMIST)	Credits As per UGC norms
1	AECC	02	6	08
2	Core Course (Theory & Lab)	21	78	84
3	DSE (Theory & Lab)	04	20	24
4	SEC-4	04	08	08
5	GE	03	09	24
6	UMAN	05	05	-
7	LAN	02	06	-
8	NME	01	02	
9	IPT	01	04	-
10	Field Visit	01	02	
11.	EA *		02	-
	Total	**43**	**142**	**148**

Parts	Category of Courses	No of Courses ×Credits	Semesters						Total Credits	UGC Credits	Deviation %	Total Marks
			I	II	III	IV	V	VI				
Part – I	Tamil – I / Foundational Tamil – I and Tamil – II / Foundational Tamil – II	2 x 3	3	3					**6**	**-**	**-**	**200**
Part – II	English I and English II	2 x 3	3	3					**6**	**8**	**-2**	**200**
Part – III	Core	12 x 4	8	8	8	8	8	8	**48**	**84**	**-6**	**1200**
Part – III	Allied Theory	4 x 4	4	4	4	4			**16**			**400**
	Allied Practical	4 x 2	2	2	2	2			**8**			**400**
Part – III	SEC: Skill Based Elective Course	4 x 2		2	2	2	2		**8**	**8**	**-**	**400**
Part – III	DSE: Discipline Specific Elective	4 x 5					10	10	**20**	**24**	**-4**	**400**
Part – IV	GE: Open Elective	3 x 3			3	3	3		**9**	**24**	**-15**	**300**
Part – IV	IPT: Internship Programme Training	1 x 4					4		**4**	**-**	**+4**	**100**
Part – IV	UMAN1: Human Ethics, Values, Rights, and Gender Equality UMAN2: Environmental Studies UMAN3: Disaster Management UMAN4: Introduction to Entrepreneurship Development UMAN5: Cyber Security	5 x 1	1	1	1	1		1	**5**	**-**	**+5**	**400**
Part – III	Project	1 x 6						6	**6**	**-**		**100**
Part – IV	Field Visit	1 x 2		2					**2**	**-**	**+2**	**100**
Part – IV	Non Major Elective	1 x 2					2		**2**	**-**	**+2**	**100**
Part – V	Extension Activity	1 x 2						2	**2**	**-**	**+2**	**100**
	Total		**21**	**25**	**20**	**20**	**29**	**27**	**142**	**148**	**-6**	**4400**

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

COURSE OUTCOMES		DOMAIN	LEVEL
After the completion of the course, students will be able to			
CO1	*Recognize* (அடையாளம் காணுதல்) பல்வேறு அறிஞர் பெருமக்களின் தொண்டுகளைத் தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO2	*Choose* (தெரிவு செய்தல்) பன்முகப் பரிமாணங்களின் கவிதைகளை இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO3	*Describe* (விளக்குதல்) தமிழ் மகளிரின் உரையாடல் சிறப்புச் செய்திகளை உணர்தல்.	Cognitive	Understand
CO4	*Apply* (விளக்குதல்) பல்வேறு கலைத்துறைச் சார்ந்த பிரிவுகள், மண்ணின் பாடல்கள் குறித்துத் தெளிவு பெறல்.	Cognitive	Apply
CO5	*Analyze* (பகுத்தல்) சிறுகதைகளின் தோற்றம் மற்றும் வளர்ச்சி நிலை நாடகங்கள் - கவிதை குறித்துத் தெளிவு பெறுதல்.	Cognitive	Analyze
அலகு-1	**தமிழ் அறிஞர்களும் தமிழ்த்தொண்டும்**		9
பாரதியார், பாரதிதாசன், நாமக்கல் கவிஞர், சி.இலக்குவனார், உ.வே.சாமிநாத அய்யர், தெ.பொ.மீனாட்சி சுந்தரம், கவிமணி தேசியவிநாயகம் பிள்ளை தொடர்பான செய்திகள், சிறந்த தொடர்கள், சிறப்புப் பெயர்கள்.			
அலகு-2	**கவிதைகள் (மரபுக்கவிதை, புதுக்கவிதை)**		9
மரபுக்கவிதை : முடியரசன், வாணிதாசன், சுரதா, கண்ணதாசன், உடுமலை நாராயண கவி, பட்டுக்கோட்டை கல்யாண சுந்தரம், மருதகாசி தொடர்பான செய்திகள். புதுக்கவிதை : ந.பிச்சமூர்த்தி, சி.சு.செல்லப்பா, மு.மேத்தா, ஈரோடு தமிழன்பன், அப்துல் ரகுமான், ஞானக்கூத்தன், ஆலந்தூர் மோகனரங்கன் தொடர்பான செய்திகள்.			
அலகு-3	**உரையாடல்கள், தமிழ் மகளிரின் சிறப்பு**		9
ஜி.யு.போப் மற்றும் வீரமாமுனிவரின் தமிழ்ப்பணி, பெரியார், அண்ணா, முத்துராமலிங்கத்தேவர், அம்பேத்கர், காமராசர், மா.பொ.சிவஞானம், காயிதே மில்லத் சமுதாயத் தொண்டு. அன்னி பெசண்ட் அம்மையார், மூவாலூர் ராமாமிர்தம்மாள், டாக்டர் முத்துலட்சுமி ரெட்டி, வேலுநாச்சியார், வள்ளியம்மை, ராணி மங்கம்மாள் சிறப்பு.			
அலகு-4	**நாட்டுப்புறப்பாடல்**		9
தாலாட்டுப்பாடல், தொழில் பாடல், ஒப்பாரிப் பாடல்.			
அலகு-5	**இலக்கிய வரலாறு**		9
உரைநடை, சிறுகதை, நாடகம், கவிதைகள்.			

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

பாட நூல்கள்:

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

பார்வை நூல்கள்:

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

Table 1: Assessment Template

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

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

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

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

Text books

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

Course Name			Differential Calculus and Trigonometry	L	T	P	C
Course Code			XMT103	3	1	0	4
C	P	A		L	T	SS	H
4	0	0		3	1	0	4

Prerequisite	Higher Secondary level Mathematics

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

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

UNIT 1	Successive Differentiation	9+3

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

UNIT 2	Partial Differentiation, Maxima and minima of functions of two variables	9+3

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

UNIT 3	Envelopes, Curvature of Plane curve	9+3

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

UNIT 4	Expansions	9+3

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

UNIT 5	Hyperbolic Functions and Logarithms of Complex quantities	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1. Calculus Volume I, S. Narayanan and T.K. ManicavachagomPillay, S. Viswanathanpvt. Ltd., 2014.
   Unit I : Chapter III (All sections)

Unit II : Chapter VIII (Sections 1, 3, 4 & 5)
Unit III: Chapter X (All sections)

2. Trigonometry, Narayanan and T.K. Manicavachagom Pillay, S. Viswanathan pvt. Ltd., 2014.
Unit IV: Chapter III
Unit V: Chapter IV (All sections) & Chapter V (Section 5)

E-References

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

COs VS POs

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

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

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

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

Prerequisite	Higher Secondary level Mathematics

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

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

UNIT 1		9+3

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

UNIT 2		9+3

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

UNIT 3		9+3

Properties of definite integrals - Reduction formulae of the types:

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

UNIT 4		9+3

Beta and Gamma Functions: Definitions – Convergence of $\Gamma(n)$ – 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 Books

1. Analytical geometry: T.K. M. Pillai, 2015 (for Unit I & II)
2. Calculus Vol II : T.K. M. Pillai, 2015 (for Unit III, IV & V)
   Unit I : Chapter 2 (Sec: 1 – 7), Chapter 3 (Sec: 1 - 8)

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

References

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

E-References

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

COs vs POs

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

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

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

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

Prerequisite	Basic knowledge of physics concepts.

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

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

UNIT 1	**Elasticity**	9+3

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

UNIT 2	**Sound**	9+3

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

UNIT 3	**Thermal Physics**	9+3

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

UNIT 4	**Optics**	9+3

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

UNIT 5	**Atomic and Nuclear physics**	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

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

References

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

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

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

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

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

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

Course Name			Physics Practical - I	L	T	P	C
Course Code			XPG106	0	0	4	2
C	P	A		L	T	P	H
0.5	1	0.5		0	0	4	4

Prerequisite	Basic knowledge of physics concepts.

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

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

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

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

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

References

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

E-References

1. Amal Kumar Das, Department of Physics, IIT Kharagpur ,"Experimental Physics – II", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/115/105/115105120/
2. S. Srinivasan, Department of Electrical Engineering, IIT Madras, " Digital Circuits and Systems", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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	1

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 II GENDER 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, Thanthai Periyar and Phule to Women Empowerment.

UNIT III WOMEN 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 IV HUMAN 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 V GOOD 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).
7. Singh, B. P. Sehgal, (ed) Human Rights in India: Problems and Perspectives (New Delhi: Deep and Deep, 1999).
8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996)
9. Veeramani, K. (ed) Periyar Feminism, (Periyar Maniammai University, Vallam, Thanjavur: 2010).
10. Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p
11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
12. Weblink of Transparency International: https://www.transparency.org/
13. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india

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		

Course Code	XGT201	L	T	P	C
Course Name	தமிழ்-II	3	0	0	3
Prerequisite		L	T	P	H
C:P:A	3:0:0	3	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
After the completion of the course, students will be able to			
CO1	Recognize (அடையாளம் காணுதல்) பல்வேறு இலக்கணக் குறிப்புகள், கலைச்சொல்லாக்க உத்திகள் போன்றவற்றைச் தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO2	Choose (தெரிவு செய்தல்) வடமொழிக் வேர்ச்சொற்கள், ஒலி வேறுபாடறிந்து, பழந்தமிழ் இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.	Cognitive	Remember
CO3	Describe (விளக்குதல்) திருக்குறள் மூலம் அறச் செய்திகளை உணர்தல்.	Cognitive	Understand
CO4	Apply (விளக்குதல்) பல்வேறு அலுவல் சார்ந்த கடிதப் பிரிவுகள், குறித்துத் தெளிவு பெறல்.	Cognitive	Apply
CO5	Analyze (பகுத்தல்) கலைகளின் தோற்றம் மற்றும் வளர்ச்சிநிலை சமுதாயப் பங்கு குறித்துத் தெளிவு பெறுதல்.	Cognitive	Analyze

அலகு-1	**இலக்கணம்**	9
பொருத்துதல்: பொருத்தமான பொருளைத் தேர்வு செய்தல், புகழ் பெற்ற நூல் மற்றும் நூலாசிரியர், தொடரால் குறிக்கப்பெறும் சான்றோர், அடைமொழியால் குறிக்கப்பெறும் நூல்கள். பிரித்து எழுதுக: எதிர்ச்சொல்லை எடுத்து எழுதுக, பொருந்தாச் சொல்லைக் கண்டறிதல், பிழைத் திருத்தம், சந்திப்பிழையை நீக்குதல், ஒருமை பன்மை பிழைகளை நீக்குதல், மரபுப் பிழைகள் - வழூஉச்சொல் - பிறமொழிச் சொற்களை நீக்குதல்.		
அலகு-2	**வேர்ச்சொல் அறிதல்**	9
ஆங்கிலச் சொல்லுக்கு நேரான தமிழ்ச் சொல்லை அறிதல் - ஒலி வேறுபாடறிந்து சரியான பொருளை அறிதல், ஒரெழுத்து ஒருமொழிக்குரிய பொருளைக் கண்டறிதல் - வேர்ச்சொல் வினைமுற்று–வினையெச்சம் - தொழிற்பெயர், அகர வரிசைப்படுத்துதல்.		
அலகு-3	**இலக்கியம்**	9
திருக்குறள் தொடர்பான செய்திகள் மேற்கோள்கள் தொடரை நிரப்புதல், அன்பு, பண்பு, கல்வி, கேள்வி, அறிவு, அடக்கம், ஒழுக்கம், பொறை, நட்பு, கேள்வி, அறிவு - வாய்மை, காலம், ஊக்கமுடைமை, இன்னா செய்யாமை. அறநூல்கள்: நாலடியார், நான்மணிக்கடிகை, பழமொழி, திரிகடுகம், இன்னா நாற்பது பாடல்கள் தொடர்பான செய்திகள்		
அலகு-4	**பயன்பாட்டுத்தமிழ்**	9
அலுவல்கள் கடிதம், ஆசிரியர் கடிதம், நூலாக்கப் பணி, மெய்ப்புத் திருத்தல், விளம்பரத் தமிழ்		
அலகு-5	**பல்வேறு கலைகளில் கல்விச் சிந்தனை**	9
மொழியியல் கல்வி, சமுதாயக் கல்வி, சேய்மைக் கல்வி, இக்காலக் கல்வி, கலை அறிவியல் என்பனவற்றின் விளக்கங்கள்		

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

பாட நூல்கள்

1. கா.பட்டாபிராமன், மொழிப் பயணம்பாடு, நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்., 41,பி., சிட்கோ இண்டஸ்ட்ரியல் எஸ்டேட், அம்பத்தூர், சென்னை.

2. முனைவர் கா.செல்வகுமார், (தொ.) 2022. துரைகோ பதிப்பகம், அரும்பாக்கம், சென்னை - 106.
3. முனைவர் ந.லெனின், மார்ச் - 2016, முகில் தமிழ் இலக்கிய இலக்கண வினா-விடைகள், பிருந்தா பதிப்பகம், தஞ்சாவூர் - 5.
4. முனைவர் இராஜா வரதராஜா - பயன்முறைத் தமிழ் - ஜுன் 2015, சிவகுரு பதிப்பகம், 7/40, கிழக்குச் செட்டித்தெரு, பரங்கிமலை, சென்னை - 16

பார்வை நூல்கள்:

1. முனைவர் இராஜ.வரதராஜா - பயன்முறைத் தமிழ்
2. டாக்டர் வா.செ.குழந்தைசாமி - அறிவியல் தமிழ் - ஜுன் 2006 (ஏழாம் பதிப்பு) –பாரதி பதிப்பகம் - 126/108, உஸ்மான் சாலை, தி.நகர், சென்னை - 17.
3. முனைவர் கோ.பெரியண்ணன் - அடிப்படை எளிய தமிழ் இலக்கணம் - 2003 –வனிதா பதிப்பகம், 11- நானா தெரு, பாண்டி பஜார், தி.நகர், சென்னை - 17.

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

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

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

Textbooks

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO2	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO3	1	0	0	0	0	0	1	0	1	0	0	0	0	0
CO4	2	0	0	0	0	0	1	0	1	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scaled Value	2	0	0	0	0	0	2	0	1	0	0	0	0	0
	1	0	0	0	0	0	1	0	1	0	0	0	0	0

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

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

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

Prerequisite	Basic knowledge of Polynomials, logarithmic functions.

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

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

UNIT 1	MATRICES	9+3

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

UNIT 2	THEORY OF EQUATIONS	9+3

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

UNIT 3	TRANSFORMATION OF EQUATIONS	9+3

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

UNIT 4	BINOMIAL THEOREM	9+3

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

UNIT 5	EXPONENTIAL AND LOGARITHMIC SERIES	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

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

References

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

E-References

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

COs vs POs

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

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

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

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

Prerequisite	Basic knowledge of numbers.

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

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

UNIT 1	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
CO 1	3	3	3	3	3	1	2	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	3	3	1	2	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	15	15	13	11	15	5	5	5	5
SCALED VALUE	3	3	3	3	3	1	1	1	1

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

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

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

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

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

UNIT I	ELECTRICITY	9+3

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

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

UNIT II	MAGNETISM	9+3

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

UNIT III	SEMICONDUCTOR	9+3

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

UNIT IV	NUMBER SYSTEM AND LOGIC GATES	9+3

Number System: Decimal – Binary – Octal – Hexadecimal Number Systems – Binary Arithmetic Operations – Addition – Subtraction – Multiplication – Division – 1's Complement – 2's Complement Binary Operation.

Logic Gates: Basic Logic Gates AND, OR, NOT, NAND, NOR, XOR, X – NOR – Universal Building Blocks.

UNIT V	BOOLEAN ALGEBRA AND KARNAUGH MAPS	9+3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

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

References

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

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

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

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

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

Lecture	0	Tutorial	0	Practical	30	Total	30

Text Books

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

References

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

E – References

1. Amal Kumar Das, Department of Physics, IIT Kharagpur ,"Experimental Physics – II", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/115/105/115105120/
2. S. Srinivasan, Department of Electrical Engineering, IIT Madras, " Digital Circuits and Systems", National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/courses/117/106/117106086/

COs vs POs

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

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

1-5 →1, 6-10 →2, 11-15 →3

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

Prerequisite	Basic mathematical knowledge.

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

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

UNIT 1		6
Numbers, H.C.F. &L.C.M of Numbers.		
UNIT 2		**6**
Decimal Fractions, Simplification		
UNIT 3		**6**
Square Roots & Cube Roots, Average.		
UNIT 4		**6**
Problems on Numbers, Problems on Ages.		
UNIT 5		**6**
Surds & Indices, Percentage.		

Lecture	30	Tutorial	0	Practical	0	Total	30

Text Book

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

References

1. Banking awareness by SangramKeshari Rout and SoumyaRanjanBehera, B.K. Publications Pvt. Ltd.; Second edition (2014).

2. UGC-CSIR NET/SET by Dr. Pawan Sharma and Anshuman, Arihant Publication.
3. Fast Track Objective Arithmetic by Rajesh Verma, ArihantPublication, Edition 2012.

E-References

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

COs vs POs

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

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

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

		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**	**1**

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*** the modern 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 - II ECOSYSTEMS 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 – III ENVIRONMENTAL 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 –IV SOCIAL 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 –V HUMAN 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**	**SELF STUDY**	**TOTAL**
15	**0**	**-------**	**15**	**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	PO9
CO 1	3	3	3	2	3	1	1	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	2	3	1	1	1	1
CO 5	3	3	3	2	3	1	1	1	1
TOTAL	15	15	14	9	15	5	4	5	5
SCALED VALUE	3	3	3	2	3	1	1	1	1

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Vector Calculus, Fourier Series and Fourier Transforms	L	T	P	C
Course Code			XMT302	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	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	**Find** the gradient, divergence and curl of a vector	Cognitive	Remembering
CO2	**Solve** the vector point function using Gauss, Stokes and Green's theorem	Cognitive	Applying
CO3	**Construct** the Full range and half range Fourier series of a given function	Cognitive	Applying
CO4	Find the Fourier series of the function for the interval $(0, 2l)$, $(0, l)$ and using Harmonic Analysis	Cognitive	Applying
CO5	**Make Use of** properties of Fourier Transforms to construct the Fourier transform of a function	Cognitive	Applying

UNIT 1	VECTOR DIFFERENTIATION	9+3

Differentiation of vectors – Gradient, Divergence and Curl.

UNIT 2	VECTOR INTEGRATION	9+3

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

UNIT 3	FOURIER SERIES	9+3

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

UNIT 4	FOURIER SERIES	9+3

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

UNIT 5	FOURIER TRANSFORMS	9+3

Definition – Integral Transforms – Properties of Fourier Transforms – Parseval's identity – Infinite Fourier cosine and sine transform.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

1. P. Kandasamyand K. Thilagavathy, Mathematics Volume IV: Vector Calculus, Fourier series and Fourier Transforms,S. Chand&Company Ltd,New Delhi, 2004.
Unit I : Vector Calculus: Pages 1 – 23.

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

References

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

E-References

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 →1, 6-10→2, 11-15→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 (11^{th} 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 →1, 6-10→2, 11-15→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 →1, 6-10→2, 11-15→3

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

Prerequisite	Basic higher secondary level mathematical knowledge.

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

	Course Outcomes	Domain	Level
CO1	**Apply** the basic concepts of profit and loss, ratio & proportion to 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 &cisterns to 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 →1, 6-10→2, 11-15→3

Course Name			DISASTER MANAGEMENT	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	**Understandin**g the concepts of application of types Of disaster preparedness	Cognitive	Apply
CO2	**Infer** the end conditions &**Discuss** the failures due to disaster.	Cognitive	Analyze
CO3	**Understanding** of importance of seismic waves occurring globally	Cognitive	Analyze
CO4	**Estimate** Disaster and mitigation problems.	Cognitive	Apply
CO5	Keen **knowledge** one essentials of risk reduction	Cognitive	Apply

UNIT 1	INTRODUCTION	3

Introduction–DisasterpreparednessGoalsandobjectivesofISDRProgramme-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–constitutionoftriggermechanism–riskreductionbyeducation–disaster Information network–risk reduction by public awareness.

UNIT 4	DEVELOPMENTPLANNING ONDISASTER	3

Implicationofdevelopmentplanning–Financialarrangements–Areasofimprovement–DisasterPreparedness-Communitybased 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.Siddhartha Gautam and K Leelakrisha Rao,"Disaster Management Programmes and Policies", Vista International PubHouse,2012

2. ArunKumar,"GlobalDisasterManagement",SBSPublishers,2008

References

1. " Encyclopedia of Disaster Management", Neha Publishers &Distributors, 2008
2. Pardeep Sahni, Madhavimalal go daandariya bandu, "DisasterriskreductioninSouthAsia",PHI, 2002
3. Amitasinvhal, "Understanding earthquake disasters "TMH,2010.
4. Pardeep Sahni, Alka Dhameja and Umamedury,"Disaster mitigation: Experiences and reflections",PHI, 2000

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

UNIT 2	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 - Differentialequationofcentralorbit-Pedalequationofcentralorbit-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,2004.
   Unit1: Chapters2,3,4
   Unit2: Chapters 5,7

2. M.K. Venkataraman,"Dynamics",AgasthiarPublications,Trichy,2004.
Unit3: Chapters3: section3.22, Chapter 4: Section4.3, Chapter 6
Unit4 : Chapter 8
Unit5:Chapter11

References

1. T.K.Manickavasagam Pillai,"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	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	3	2	3	1	1	1	1
CO 4	3	3	3	3	3	1	2	1	1
CO 5	3	3	3	3	3	1	2	1	1
TOTAL	**15**	**15**	**13**	**10**	**15**	**5**	**5**	**5**	**5**
SCALED 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	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	3	3	2	1	3	1	0	1	1
CO 2	3	3	2	1	3	1	0	1	1
CO 3	3	3	2	1	3	1	0	1	1
CO 4	3	3	2	1	3	1	0	1	1
CO 5	3	3	2	1	3	1	0	1	1
TOTAL	**15**	**15**	**10**	**5**	**15**	**5**	**0**	**5**	**5**
SCALED VALUE	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**1**	**1**

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite	Basic knowledge of random variables and distributions.

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

Course Outcomes		Domain	Level
CO1	**Explain** the concept of large samples and solve the related problems	Cognitive	Applying
CO2	**Solve** the problems by using χ^2 Distribution	Cognitive	Applying
CO3	**Solve** the problems by using t- 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 of analysis 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		L	T	P	H
2	0	0		2	0	0	2

Prerequisite	Basic mathematical knowledge.

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

Course Outcomes		Domain	Level
CO1	**Find** simple interest and compound interest of the given problems	Cognitive	Remembering
CO2	**Find** the area of the bounded region	Cognitive	Remembering
CO3	**Find** the volume and surface area of the given region	Cognitive	Remembering
CO4	**Find** the angle between the hour hand and minute hand of the clock	Cognitive	Remembering
CO5	**Find 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		0	0	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 Name			Real Analysis	L	T	P	C
Course Code			XMT501	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4

PREREQUISITE	Knowledge in the basic properties of real numbers

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

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

UNIT 1	Real numbers	9 + 3

The field axioms- Field Properties-Order in R- Absolute value- Completeness – Representation of Real numbers on a straight line – Intervals – Countable and Uncountable sets.

UNIT 2	Neighborhoods and limit points	9 + 3

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

UNIT 3	Limits and Continuity	9 + 3

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

UNIT 4	Derivatives	9 + 3

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

UNIT 5		9 + 3

Riemann Integration- Definition – Daurboux's theorem – conditions for integrability – properties of integrable functions – continuity and derivability of integral functions – Mean value theorems – the fundamental theorem of Calculus and the first mean value theorem.

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Books

1.M.K. Singhal and Asha Rani Singhal, "A first course in Real Analysis"., R. Chand & Co., June,1997 (Units I to IV).
2. Shanthi Narayan, "A Course of Mathematical Analysis", S. Chand& Co. 1995 (Unit-V).
Unit-I Chapter 1, Sec. 1.1 – 1.10

Unit-II Chapter 2 Sec 2.1 – 2.6
Unit-III Chapter 5 Sec 5.1 – 5.5
Unit – IV Chapter 6 Sec 6.1 – 6.5
Unit – V Chapter 6 Sec 6.2, 6.3 & 6.5 6.7 6.8, 6.9 of [2]

Reference

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

E-References

1. https://nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Discrete Mathematics	L	T	P	C
Course Code			XMT502	3	1	0	4
C	P	A		L	T	P	H
4	0	0		3	1	0	4
Prerequisite			Higher Secondary level Mathematics				

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

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

UNIT 1	9 + 3

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

UNIT 2	9 + 3

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

UNIT 3	9 + 3

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

UNIT 4	9 + 3

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

UNIT 5	9 + 3

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

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

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

Reference

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite	Knowledge In Higher Secondary Level Mathematics

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

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

UNIT 1	12 + 3

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

UNIT 2	12 + 3

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

UNIT 3	12 + 3

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

UNIT 4	12 + 3

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

UNIT 5	12 + 3

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

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

1. "Numerical Methods" (2001), P. Kandasamy, K. Thilagavathy, K. Gunavathy, S. Chand& Company Ltd., New Delhi.

Unit I : Chapter: 3 (3.1.1 to 3.4.3), Pages: 69 - 96
Unit II : Chapter: 4 (4.1- 4.3 and 4.7 - 4.9), Pages: 112-126, 145-158
Unit III: Chapter: 6 (6.1-6.6), Pages: 209 – 225,
Chapter: 7 (7.1-7.4), Pages: 231 – 240,
Chapter: 8 (8.7 only), Pages: 271 - 276.
Unit IV:Chapter: 9 (9.1- 9.3, 9.6- 9.15), Pages: 281 - 317
Unit V :Chapter: 11 (11.1- 11.15), Pages: 348 - 393

References

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite Knowledge in Algebra

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

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

UNIT 1 **12 + 3**

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

UNIT 2 **12 + 3**

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

UNIT 3 **12 + 3**

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

UNIT 4 **12 + 3**

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

UNIT 5 **12 + 3**

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

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

1. Analytic Number Theory by Tom.M.Apostal, Springer Science & Buisness Media, 2013.
   Unit I Chapter 1 (1.1 - 1.8)
   Unit II Chapter 2 (2.1 - 2.7)

Unit III	Chapter 3 (2.8 – 2.15)
Unit IV	Chapter 5 (3.1- 3.5)
Unit V	Chapter 9 (5.1- 5.3)

References

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

E-References

http://nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite	Knowledge In Basic Mathematics

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

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

UNIT 1	Graphs and Subgraphs	12 + 3

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

UNIT 2	Degree sequences and connectedness	12 + 3

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

UNIT 3	Eulerian and Hamiltonian Graphs, Trees	12 + 3

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

UNIT 4	Matchings and Planarity	12 + 3

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

UNIT 5	Colourability	12 + 3

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

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

1. An invitation to Graph theory - Dr. S. Arumugam& S. Ramachandran,SCITECH publications (India) Pvt.Ltd., Chennai, 2006.
   Unit I : Chapter 2
   Unit II : Chapter 3 and 4

Unit III : Chapter 5 and 6
Unit IV : Chapter7 and 8
Unit V : Chapter 9

References

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

E-References

http://nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Mathematical Modeling	L	T	P	C
Course Code			XMT504	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5

Prerequisite	Basic knowledge of Algebra, Differentiation concepts.

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

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

UNIT 1	12 + 3

Simple situation requiring Mathematical modeling and technique-Classification of mathematical models-some characteristics of mathematical models-Modeling through Geometry-Modeling through Algebra-Modeling through Trigonometry-Modeling through Calculus-Limitations of Mathematical modeling.

UNIT 2	12 + 3

Mathematical Modeling through differential Equations-Linear Growth and Decay Models-Non-Linear Growth and Decay Models-Compartment Models-Modeling in Dynamics through Ordinary differential equations of first order- Mathematical modeling of Geometrical problems through ordinary differential equations of first order.

UNIT 3	12 + 3

Mathematical Modeling in Population Dynamics-Modeling of Epidemics through systems of Ordinary differential equations of first order-Compartment models through systems of ordinary differential equations-Modeling in Economics through systems of ordinary differential equations of first order**.**

UNIT 4	12 + 3

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

UNIT 5	12 + 3

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

Lecture	60	Tutorial	15	Practical	0	Total	75

Text book

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

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

References

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

E-References

http://nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

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

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

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

Lecture	15	Tutorial	15	Practical	0	Total	30

Text Book

1. Steven S. Skiena, "The Data Science Design Manual", Springer 2017.

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

References

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite	Basic mathematical knowledge

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

Course Outcomes		Domain	Level
CO1	**Explain** the basic concepts of Probability and True Discount and to solve problems	Cognitive	Applying
CO2	**Explain** the basic concepts of Banker's Discount, Heights & Distances and solve problems	Cognitive	Applying
CO3	**Explain** the basic concepts of odd man Out, Series and Patterns, Tabulation and to solve the problems	Cognitive	Applying
CO4	**Explain** the basic concepts of Bar Graphs Pie Charts and to solve the problems	Cognitive	Applying
CO5	**Explain** the basic concepts of Line Graphs and to solve the Problems	Cognitive	Applying

UNIT 1		6
Probability, True Discount.		
UNIT 2		**6**
Banker's Discount, Heights & Distances.		
UNIT 3		**6**
Odd man Out, Series and Patterns, Tabulation.		
UNIT 4		**6**
Bar Graphs Pie Charts		
UNIT 5		**6**
Line Graphs.		

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 →1, 6-10→2, 11-15→3

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

Prerequisite	Knowledge in Calculus

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

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

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

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

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

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

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

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

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

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

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

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

1. "Complex Analysis**"** by S. Arumugam, A. Thangapandi Isaac, A. Somasundaram, Scitech Publications, 2014.

   Unit I : Chapter 1 (Sec: 1.1), Pages: 1 – 2

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

References

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

E-References

http//nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

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

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

UNIT 1		**9 + 3**

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

UNIT 2		**9 + 3**

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

UNIT 3		**9 + 3**

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

UNIT 4		**9 + 3**

Transportation Problem and Assignment Problem.

UNIT 5		**9 + 3**

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

Lecture	45	Tutorial	15	Practical	0	Total	60

Text Book

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

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

Reference

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

E-References

http//nptel.ac.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

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

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

UNIT 1	**Fuzzy sets**	12+ 3

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

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

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

UNIT 3	**Fuzzy Logic**	12+ 3

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

UNIT 4	**Fuzzy Systems**	12+ 3

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

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

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

Individual decision making – Multiperson decision making – Multicriteria decision making – Multi stage decision making – Fuzzy ranking methods – Fuzzy linear programming – Applications in Civil Engineering, Mechanical Engineering, Industrial Engineering and Medicine.

LECTURE	60	TUTORIAL	15	PRACTICAL	0	TOTAL	75

Text Books

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

References

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

E-References

1.http://www.tezu.ernet.in/dmaths/programme/PhD-MathSc-syllabus_2013.pdf
[Cambridge *University]*

2. http://www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/environmental-engineering-cluster/syllabus/cive97035/
[Imperial College London]

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

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

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

UNIT 1	Industry 4.0	12+ 3

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

UNIT 2	Artificial Intelligence	12+ 3

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

UNIT 3	Big Data and IoT	12+ 3

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

UNIT 4	Applications and Tools of Industry 4.0	12+ 3

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

UNIT 5	Jobs 2030	12+ 3

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

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

Text Book

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

References

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

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

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

Prerequisite	Knowledge In Physics and Mathematics

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

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

UNIT 1	12+ 3

Celestial sphere – Diurnal motion

UNIT 2	12+ 3

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

UNIT 3	12+ 3

Twilight – Refraction

UNIT 4	12+ 3

Kepler's Laws

UNIT 5	12+ 3

Time: Equation of time – seasons – calendar

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

1. "Astronomy**"** by S. Kumaravelu and SusheelaKumaravelu, Agasthiyar Publication, 2013.
   Unit : Chapter II, Article 39 – 79
   Unit II : Chapter III (Sec: 3.1 – 3.5), Article 87 – 110
   Unit III : Chapter III (sec: 3.6), Chapter IV, Article 111 – 134
   Unit IV : Chapter VI, Article 146 – 165
   Unit V : Chapter VII, Article 166 – 179

References

1 "Astronomy" by G.V. Ramachandran. Mission Press, Palayamkottai, 1965
2. Textbook on Astronomy H. SubramaniAiyar, Publisher : National Book Trust (1970)

E-References

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

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Stochastic Processes	L	T	P	C
Course Code			XMT604	4	1	0	5
C	P	A		L	T	P	H
5	0	0		4	1	0	5
Prerequisite			Basic knowledge in probability theory and linear algebra including conditional expectation				

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

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

UNIT 1	12+ 3

Elements of Stochastic Processes-Two simple examples of Stochastic processes-Classification of general Stochastic processes – Markov Chains- Definitions – Examples of Markov Chain-Transition probability matrices of a Markov chain - classification of states of a Markov chain-Recurrence

UNIT 2	12+ 3

The basic limit theorem of Markov chains and applications-Discrete renewal equation-proof of theorem-Absorption probabilities - criteria for recurrence- A queuing Example.

UNIT 3	12+ 3

Classical Examples of continuous time Markov chains-General pure birth processes and Poisson processes-more about Poisson processes- A counter model-birth and death processes-Differential equations of birth and death processes-Examples of birth and death processes.

UNIT 4	12+ 3

Renewal processes- Definition of Renewal process and related concepts – Some examples of Renewal Processes – More on some special Renewal processes – Renewal equations and elementary Renewal theorem - The Renewal Theorem – Applications of Renewal theorem

UNIT 5	12+ 3

Martingales - Preliminary definitions and examples – Super martingales and Sub martingales- The optional sampling theorem.

Lecture	60	Tutorial	15	Practical	0	Total	75

Text Book

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

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

References

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

E-References

http//nptel.co.in

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3

Course Name			Cyber Security	L	T	P	C
Course Code			XUM005	1	0	0	1
C	P	A		L	T	SS	H
1	0	0		1	0	1	1

Prerequisite	Basic Programming knowledge and technical skills.

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

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

UNIT 1	INTRODUCTION	3+3

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

UNIT 2	CYBER SECURITY OBJECTIVES AND GUIDANCE	3+3

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

UNIT 3	CYBER SECURITY POLICY CATALOG	3+3

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

UNIT 4	CYBER SECURITY INITIATIVES AND IT ACT	3+3

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

UNIT 5	SECURITY PRACTICES	3+3

Guidelines to choose web browsers, Securing web browser, Antivirus, Email security ,Guidelines for setting up a Secure password ,Two–steps authentication ,Password Manager ,Wi–Fi Security ,Guidelines for social media security ,Tips and best practices for safer Social Networking.

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

Lecture	15	Tutorial	0	SS	15	Total	30

Text Books

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
3. Cyber Laws & Information Technology, Jothi Rathan, VijayRathan, Bhrath Pubishers,7th Edition January 2019.

References

1.Modern Cyber security Practices by Pascal Ackerman, BPB Publications,2020
2. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011
3. Rhodes–Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw–Hill, 2013.

E–References

1. https://www.coursera.org/specializations/cyber–security
2. www. nptel.ac.in
3. http://professional.mit.edu/programs/short–programs/applied–cybersecurityhttps://us.norton.com/internetsecurity–how–to–cyber–security–best–practices–for–employees.html
4. https://www.meity.gov.in/content/cyber–laws

COs vs POs

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

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

1-5 →1, 6-10→2, 11-15→3