

P.K.R. ARTS COLLEGE FOR WOMEN

(Accredited with 'A' Grade by NAAC)

Autonomous Institution-Affiliated to Bharathiar University

Gobichettipalayam-638 476

DEPARTMENT OF MATHEMATICS

BACHELOR OF SCIENCE IN MATHEMATICS



SYLLABUS

**SCHOLASTIC COURSES
AND
CO-SCHOLASTIC COURSES**

For all the candidates admitted from the Academic Year

2023-2024 and onwards

Under CBCS PATTERN

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 - *B.B.A.*
 - *B.Sc. Computer science*
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 - *B.Com (Professional Accounting)*
 - *B.Sc. Physics*
 - *B.Sc. (Artificial Intelligence and Machine Learning)*
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No: 21, Pariyur Road, Gobichettipalayam-638 476.

MEETING OF BOARD OF STUDIES IN MATHEMATICS

PROGRAMME: B.Sc. Mathematics

Date: 06.07.2023

Time: 10.00 A.M.

AGENDA

1. Confirm the minutes of the sixth meeting of the Board of studies held on 23.07.2022.
2. Approve the action taken on the resolutions passed in the previous meeting of the academic council held on 30.07.2022.
3. Approve the change of pattern of Examinations with Internal 25 marks and External 75 marks in lieu of 50: 50 respectively for the academic year 2023-2024 and onwards.
4. Approve the removal / Scrap of minimum pass mark in the continuous internal assessment for the academic year 2023-2024 and onwards.
5. Approve the ratification of Language courses (Tamil – I , Tamil – II, Tamil – III, Tamil – IV, English – I, English – II, English – III, English – IV) in the respective Semester - I, II, III and IV for the academic year 2023-2024 and onwards.
6. Approve the language courses like Tamil are also to be given additional language courses in their opted language in the first four semesters like Tamil language for the academic year 2023-2024 and onwards.
7. Approve the inclusion of Naan Mudhalvan Courses in the curriculum as skill enhancement courses and Part II English – II added with Effective English for all UG programmes for the academic year 2023-2024 and onwards.
8. Ratify the changes of External Examinations pattern into Internal Examinations pattern for Foundation Courses, Ability Enhancement, Non- Major Elective and Skill Enhancement Course for the academic year 2023-2024 and onwards.
9. Approve the ratification of Tamil – III, English – III in semester III, and Tamil – IV, English – IV in Semester IV for the batch 2022 -2023 only with additional language inclusion III and IV.
10. Approve the inclusion of Naan Mudhalvan Courses as skill enhancement courses in semester III and Semester IV for the batch 2022-2023 only.

11. Ratify the change of External Examination pattern into Internal Examination Pattern for Ability Enhancement Courses, Non- Major Elective and Skill Enhancement Course for the students admitted in 2022-2023 only.
12. Ratify the removal / inclusion / modification/ introduction in the course Structure, Course schemes and the scheme of Examinations (if any) (along with mapping of CO's and PO's statements) for the students admitted in either UG/PG Programmes for the academic years 2021 -2022, 2022-2023 (UG Programmes) & 2022 - 2023 (PG Programmes).
13. Approve the rules and regulations for the students admitted in the programme B.Sc Mathematics from 2023 – 2024 and onwards.
14. Consider and recommend the revision of the minor changes such as shifting of courses in the programmes and the modifications in their courses.
15. Recommend fresh panel of members for QP setting and panel of Examiners of UG and PG programmes for theory and practical examinations and Central Valuation.
16. Any other matter.

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DEPARTMENT OF MATHEMATICS

MEMBERS IN BOARD OF STUDIES

Academic Year: 2023-2024

S.No	CATEGORIES	NAME & DESIGNATION	SIGNATURE
1	Chairperson	Ms.R.Jayalakshmi, Head, Department of Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9486640983 Mail ID : jaipranikaa@gmail.com	
2	University Nominee	Dr.K.K.Mythili, Associate Professor and Head, Department of Mathematics CA, Vellalar College for Women(AUTONOMOUS), Thindal, Erode -12. Mobile : 9443523525 Mail ID: mathsmyth@gmail.com	

3	Subject Expert-1	Dr. A.K.Abdul Hakeem, Associate Professor, Department of Mathematics, Sri Ramakrishna Mission Vidhyalaya College of Arts and Science, Coimbatore – 641 048. Mobile: 9442401998, 9486078612 Mail ID: drabdulmaths@gmail.com	
4	Subject Expert-2	Dr.P.Karthikeyan, Assistant Professor, Department of Mathematics, Sri Vasavi College, Erode – 638 316. Mobile: 6381777633. E – mail ID: pkarthisvc@gmail.com	
5	Industry Representative	Ms.A.C.Uvashalini, PeopleSoft Associate, Kovaion Consulting Private Ltd, Bangalore. Mobile: 9790352523 Mail ID: uvamaths19@gmail.com	
6	PG Meritorious Alumnus	Dr. B.Usha, Assistant Professor(Sr.G), Department of Mathematics, Kongu Engineering College, Perundurai - 638060. Mobile: 9965013796 Mail ID: usha_b.sh@kongu.edu	

7	Ex Officio Member	Ms. S.A.Dhanalakshmi, Controller of Examinations, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile:9842420006 Mail ID:dhanagobu@gmail.com	
8	Member-1	Ms. M.Kasthuri, Associate Professor and Head, Department of Mathematics, P.K.R. Arts College for Women, Gobichettipalayam - – 638476. Mobile : 9443951244 Mail ID:joevarshini@gmail.com	
9	Member-2	Ms. L.Priya, Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9994048302 Mail ID: prival@pkrarts.org	
10	Member-3	Ms. A.Poornima, Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9894199372 Mail ID:poornima.mphil@gmail.com	
11	Member-4	Ms. K.Mynavathi Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9487824246 Mail ID:mynakrishna09@gmail.com	

VISION AND MISSION OF THE COLLEGE

VISION

To make a centre of excellence in higher education by imparting value based quality education to rural women, to empower and make them economically independent, and socially committed to the task of building a strong nation.

MISSION

Empowering the rural women by inculcating the core values of truth and righteousness and by ensuring quality in the teaching-learning process along with co-curricular and extra-curricular activities for their economic independence, social commitment and national development.

VISION AND MISSION OF THE DEPARTMENT

VISION

Creating a congenial environment to learn mathematical designs and to use mathematical knowledge for problem solving.

MISSION

To motivate the students to upgrade their interests in contemporary mathematical techniques and to enable them to acquire the required knowledge to strengthen their analytical skills.

GOALS AND OBJECTIVES

- The college had been founded by the tillers of the soil, aimed at providing access to higher education for women students of the rural areas, who do not have the facilities of their urban
- To provide them to serve society with the motive of establishing an egalitarian system.
- To provide opportunities to develop the overall personality of the counterparts.
- To provide quality education to empower the rural women.
- To impart value based education and prepare the women students to uphold the rich cultural heritage and secular ideals of the nation.
- To awaken the social consciousness among students and motivate students and thus enabling them to face challenges in the competitive global scenario.

CORE VALUES OF THE INSTITUTION

- Education
- Enlightenment
- Discipline
- Service

PROGRAMME EDUCATIONAL OBJECTIVES

1. To provide value-based quality education with theoretical and applied skills for rural women.
2. To facilitate personality development opportunities for students to face life's challenges in today's competitive scenario.
3. To empower rural women and make them economically independent through employability and entrepreneurship.
4. To awaken social consciousness of the students through community engagement for active contribution to the society.
5. To equip the students to become morally, ethically and socially responsible for building a strong nation.

GRADUATE ATTRIBUTES

1. Disciplinary knowledge.
2. Communication skills.
3. Critical thinking, problem solving and analytical reasoning.
4. Research skills and reflective thinking.
5. Teamwork and Leadership skills for interpersonal competence.
6. Continuous autonomous learning and digital literacy.
7. Social consciousness with concern for environment.

PROGRAMME OUTCOMES

1. **Disciplinary knowledge:** Demonstrate critical and systematic proficiency about the breadth and depth of the basic and emerging trends in the arts and science streams appropriate to the programme.
2. **Communication skills:** Communicate ideas clearly and effectively through verbal and non-verbal forms to specialist and non-specialist audiences with professionalism and multi-disciplinary approach.
3. **Critical thinking, problem solving and analytical reasoning:** Apply appropriate knowledge and skills to identify, formulate, critically analyse and substantially conclude with simple solutions to problems.
4. **Research skills and reflective thinking:** Explore real-time scenarios, analyse and interpret data and information, articulate and support findings with evidences incorporating economic and business practices to reach valid conclusion.
5. **Teamwork and Leadership skills for interpersonal competence:** Ability to interact, communicate and collaborate in a trans-disciplinary context.
6. **Continuous autonomous learning and digital literacy:** Ability to find, evaluate and compose clear information for self-directed learning through conventional and digital media.
7. **Social consciousness with concern for environment:** Capability to synthesise the economic, legal, social, environment, health, safety and cultural dimensions of the society with moral and ethical reasoning and promote equity through sustainable development practices.

PROGRAMME SPECIFIC OUTCOMES

On successful Completion of **B.Sc. Mathematics Programme**, the students would have

1. possess knowledge of fundamental and abstract concepts of Mathematics and apply them in various fields
2. express Mathematical thoughts with appropriate justifications through Mathematical logic and reasoning
3. apply analytical and logical skills to develop various Mathematical Models and solve Mathematical problems
4. exhibit the Mathematical skills and expertise in the field of research and developments
5. collaborate effectively in teams and enhanced the leadership skill.
6. solve real life problems by using mathematical techniques and become lifelong learners for their professional development
7. analyze environmental hazards and gender equity issues with social consciousness and moral ethics.

B.SC MATHEMATICS – PROGRAMME STRUCTURE



P.K.R ARTS COLLEGE FOR WOMEN (Autonomous)
Gobichettipalayam-638476

DEPARTMENT OF MATHEMATICS

Scholastic Courses: B.SC MATHEMATICS – PROGRAMME STRUCTURE

CBCS Pattern: 2023-2024

Category	Component	No. of Courses	Credit(s) / Course	Total Credits	Proposed Semester
Part – I	Tamil/Hindi/French/Kannada/Malayalam/Sanskrit	4	3	12	I – IV
Part – II	English	4	3	12	I – IV
	*****	1	1	1	II
Part - III	Core Courses (Core Theory /Core Allied Practical/ Core Allied/ Elective/Open Elective)	14/1/4/3 /1	62/3/16/10 /2	93	I-VI/I-II/I-IV/V-VI/V
	Mini Project	1	1	1	To be done in Summer Vacation of Semester IV, ESE in Semester V
Part –IV	A. Foundation Courses: i. Environmental Studies	1	2	4	I
	ii. Yoga and Ethics	1	2		II
	B. Ability Enhancement Courses: i. Information Security	1	2	4	III
	ii. Consumer Rights	1	2		IV
	C. Skill Enhancement Courses: i. Internet Basics and Office Automation Tools – Practical / Naan Mudhalvan Course	1	2	6	IV
ii. Life Skills	1	2	V		
iii. Latex Practical/ Naan Mudhalvan Course	1	2	VI		
D. Non-Major Elective: i. Indian Women and Society / Advanced Tamil	1	2	2	III	

Part –V	A. Proficiency Enhancement				
	i. Financial Mathematics (Self Study)	1	2	5	V
	B. Competency Enhancement:				
	i. NSS/YRC/RRC/CCC/PHY.EDU/OTH ERS	1	1		Sem I to VI Sem I to VI
	ii. Professional Grooming	1	1		Sem I to VI
iii. Students Social Activity	1	1			

Total Marks : 3700 Total Credits : 140



P.K.R. ARTS COLLEGE FOR WOMEN (Autonomous),
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BACHELOR OF SCIENCE - MATHEMATICS

Programme Scheme and Scheme of Examinations

(For students admitted from 2023-2024 & onwards)

(For branches offering Part-I and Part-II for four semesters)

Scholastic Courses:

Category/Part	Component	Course Code	Title of the Course	Hrs/ week	Exam hrs	CIA	ESE	Total marks	Credits
SEMESTER - I									
I	Language : I	23LTU01/ 23LHU01/ 23LFU01/ 23LKU01/ 23LMU01/ 23LSU01	Tamil - I/ Hindi - I/ French - I/ Kannada - I/ Malayalam - I/ Sanskrit-I	4	3	25	75	100	3
II	English: I	23LEU01	English - I	4	3	25	75	100	3
III	Core : I	23MAU01	Classical Algebra	6	3	25	75	100	4
III	Core : II	23MAU02	Differential Calculus	6	3	25	75	100	4
III	Core : III Allied : I	23MAU03	Physics - I	5	3	25	75	100	4
III	****	****	Physics Practical	3	-	-	-	-	-
IV	Foundation : I	23FCU01	Environmental studies (Curriculum as recommended by UGC)	2	3	50	--	50	2
			TOTAL	30				550	20
SEMESTER - II									

I	Language : II	23LTU02/ 23LHU02/ 23LFU02/ 23LKU02/ 23LMU02/ 23LSU02	Tamil- II/ Hindi-II/ French II/ Kannada-II/ Malayalam-II/ Sanskrit-II	4	3	25	75	100	3
II	English : II	23LEU02	English: II	4	3	25	50	75	3
		23LEEU02	Effective English	2	-	25	-	25	1
III	Core : IV	23MAU04	Analytical Geometry	5	3	25	75	100	4
III	Core : V	23MAU05	Integral Calculus	5	3	25	75	100	4
III	Core : VI Allied : I	23MAU06	Physics – II	5	3	25	75	100	4
III	Core : VII Allied Practical: I	23MAU07	Physics Practical	3	3	40	60	100	3
IV	Foundation : II	23FCU02	Yoga and Ethics	2	3	50	--	50	2
			TOTAL	30				650	24
SEMESTER - III									
I	Language : III	23LTU03/ 23LHU03/ 23LFU03/ 23LKU03/ 23LMU03/ 23LSU03	Tamil- III/ Hindi-III/ French-III/ Kannada-III/ Malayalam-III/ Sanskrit-III	4	3	25	75	100	3
II	English : III	23LEU03	English: III	4	3	25	75	100	3
III	Core : VIII	23MAU08	Differential Equations and Laplace Transforms	6	3	25	75	100	4
III	Core : IX	23MAU09	Trigonometry, Vector Calculus and Fourier Series	6	3	25	75	100	4
III	Core : X Allied : II	23MAU10	Statistics - I	6	3	25	75	100	4
IV	Ability Enhancement : I	23AEU01	Information Security	2	3	50	-	50	2
IV	Non- Major Elective	23NMU01A/ 23NMU01B	Indian Women and Society/ Advanced Tamil	2	3	50	-	50	2

			TOTAL	30				600	22
SEMESTER - IV									
I	Language : IV	23LTU04/ 23LHU04/ 23LFU04/ 23LKU04/ 23LMU04/ 23LSU04	Tamil- IV/ Hindi-IV/ French-IV/ Kannada-IV/ Malayalam-IV/ Sanskrit-IV	4	3	25	75	100	3
II	English : IV	23LEU04	English: IV	4	3	25	75	100	3
III	Core : XI	23MAU11	Mechanics	6	3	25	75	100	4
III	Core : XII	23MAU12	Numerical Methods	5	3	25	75	100	4
III	Core : XIII Allied : II	23MAU13	Statistics - II	6	3	25	75	100	4
IV	Skill Enhancement : I	23SEMAU01 / 23SEU01	Internet Basics and Office Automation Tools - Practical / Naan Mudhalvan	3	3	50	-	50	2
IV	Ability Enhancement : II	23AEU02	Consumer Rights (Curriculum as recommended by UGC)	2	3	50	-	50	2
			TOTAL	30				600	22
SEMESTER - V									
III	Core : XIV	23MAU14	Abstract Algebra	6	3	25	75	100	5
III	Core : XV	23MAU15	Real Analysis - I	6	3	25	75	100	5
III	Core : XVI	23MAU16	Complex Analysis - I	6	3	25	75	100	5
III	Core : XVII	23MAU17A/ 23MAU17B/ 23MAU17C	Institutional Training/ Article ship Training/ Mini Project	--	3	100	--	100	1
III	Core : XVIII (Open Elective)	***	Opted by the students offered by other departments	4	3	25	75	100	2
III	Core : XIX Elective : I	23MAU18A/ 23MAU18B	Operations Research – I/ Applied Algebra - I	5	3	25	75	100	4

IV	Skill Enhancement : II	23SEU02	Life Skills (Jeevan Kaushal) (Curriculum as recommended by UGC)	3	3	50	-	50	2
V	Proficiency Enhancement	23PEMAU01	Financial Mathematics (Self Study)	--	3	--	100	100	2
			TOTAL	30				750	26
SEMESTER - VI									
III	Core : XX	23MAU19	Linear Algebra	6	3	25	75	100	5
III	Core : XXI	23MAU20	Real Analysis - II	6	3	25	75	100	5
III	Core : XXII	23MAU21	Complex Analysis - II	6	3	25	75	100	5
III	Core : XXIII Elective : II	23MAU22A/ 23MAU22B	Operations Research – II/ Applied Algebra - II	5	3	25	75	100	3
III	Core : XIV Elective : III	23MAU23A/ 23MAU23B	Graph Theory/ Fuzzy Mathematics	4	3	25	75	100	3
IV	Skill Enhancement : III	23SEMAU03 / 23SEU03	Latex - Practical / Naan Mudhalvan	3	3	50	-	50	2
			TOTAL	30				550	23
V	Competency Enhancement		NSS/YRC/RRC/CCC/PHY.EDU/ Others			SEMESTER I – VI			1
			Professional Grooming			SEMESTER I – VI			1
			Students Social activity (Related to the Curriculum)			SEMESTER I –VI			1

Total Marks: 3700 & Total credits: 140

LIST OF ELECTIVE COURSES

S. No	CORE ELECTIVE	COURSE CODE	COURSE	Weekly Contact Hours	Credits
1	Core Elective – I	23MAU18A/ 23MAU18B	Operations Research – I / Applied Algebra– I	5	4/3
2	Core Elective – II	23MAU22A/ 23MAU22B	Operations Research – II / Applied Algebra– II	5	3
3	Core Elective – III	23MAU23A/ 23MAU23B	Graph Theory/ Fuzzy Mathematics	4	3

LIST OF ALLIED COURSES

S. No	COURSE CODE	COURSE	Weekly Contact Hours	Credits
1	23MAU03	Physics – I	5	4
2	23MAU06	Physics – II	5	4
3	23MAU07	Physics Practical	3	3
4	23MAU10	Statistics –I	6	4
5	23MAU13	Statistics –II	6	4

LIST OF SKILL BASED COURSES

S. NO	COURSE CODE	COURSE	Weekly Contact Hrs	Credits
1	23SEMAU01/	Internet Basics and Office Automation Tools- Practical / Naan Mudhalvan	3	2
2	23SEU02	Life Skills (Soft skills/Entrepreneurship skills/Homepreneurship)	3	2
3	23SEUMA03/	LATEX - Practical / Naan Mudhalvan	3	2

LIST OF ABILITY ENHANCEMENT

S. NO	COURSE CODE	COURSE	Weekly Contact Hrs	Credits
1.	23AEU01	Information Security	2	2
2.	23AEU02	Consumer Rights	2	2

LIST OF NON-MAJOR ELECTIVE

S. NO	COURSE CODE	COURSE	Weekly Contact Hrs	Credits
1.	23NMU01A/ 23NMU01B	Indian Women and Society / Advanced Tamil	2	2

LIST OF PROFICIENCY ENHANCEMENT (Self Study)

S. NO	COURSE CODE	COURSE	Weekly Contact Hrs	Credits
1.	23SEU02	Financial Mathematics	--	2

LIST OF OPEN ELECTIVE COURSES

Course Code	Department	Course	Evaluation	Credits
	Department of English	English for Effective Communication	Both CIA and ESE	2
	Department of Tamil	திறன் மேம்பாட்டுக் கல்வி		
	Department of Physics	Physics in day to day life		
	Department of Computer Science	1) Basics of Computer Technology		

		2) Internet For Everyone 3) Machine Learning		
	Department of Commerce	1) Basics of Accounting 2) Human Resource Management 3) E- Advertising		
	Department of Management	Start-up Business		

II. CO-SCHOLASTIC COURSES:

a) VALUE ADDED COURSES:

Semester	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam		
					Theory	Practical	Total
Course to be taught after regular hours							
Value Added Course I							
Semester I		Vedic Mathematics	2	-	-	-	-
Semester II			2	3	50	50	100
Value Added Course II							
Semester III		Professional English for Physical Science	2	-	-	-	-
Semester IV			2	3	50	50	100
Value Added Course III							
Semester V		Numerical Aptitude	2	-	-	-	-

Semester VI			2	3	50	50	100
TOTAL							300

b) CERTIFICATE COURSE

Semester	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam		
					Theory	Practical	Total
Course to be taught after regular hours							
Certificate Course							
Semester III		MATLAB	2	-	-	-	-
Semester IV			2	3	50	50	100

c) COURSES WITH CREDIT TRANSFERABILITY

d) ADD-ON COURSES

Category	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam
					Total
ADD-ON COURSE - I		Functional English (Offered by the Department of English)	2	3	100
ADD-ON COURSE - II		Yoga and meditation (Offered by the Department of Tamil)	2	3	100

e) EXTRA CREDIT COURSES (Self-study courses)

1. Courses offered by parent department for ALL STUDENTS OF THE PROGRAMME

2. Courses offered by parent department for ADVANCED LEARNERS OF THE PROGRAMME
3. Courses offered in a department under PART-III for STUDENTS OF OTHER PROGRAMMES – Inter-disciplinary courses
4. Credit transferability for Disciplinary / Inter-disciplinary / Trans-disciplinary / General courses offered in UGC SWAYAM MOOCS
5. Comprehension Courses

List of courses offered for ADVANCED LEARNERS ONLY (Self-study)

Course Code	Department	Courses offered for ADVANCED LEARNERS ONLY
	Department of Mathematics	1) Numerical Techniques 2) Matrix Theory 3) Group Theory 4) Programming in C

SYLLABUS

(For students admitted from 2023-2024 & onwards)

SEMESTER - I

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - I	23MAU01	CLASSICAL ALGEBRA	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	25	75	100

Preamble

To enable the students to learn about the convergence and divergence of the series and to find the roots for the different types of the equations.

Course Outcomes

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

S.NO	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the concepts of Binomial, Exponential, Logarithmic series, Convergence and Divergence of series, multiple roots of an equation.	K ₁
CO2	express the summation of series, Theory of equations, Convergence and Divergence of series.	K ₂
CO3	apply Binomial, Exponential, Logarithmic series for finding summation of series, different types of methods to find convergence and divergence of series and the roots of an equation.	K ₃
CO4	analyze the Binomial, Exponential, Logarithmic, convergence and divergence of series and roots of an equation.	K ₄
CO5	evaluate the multiple roots and summation of series the problems by using different types of methods.	K ₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	3	3	3	1	1	1
CO5	3	3	3	3	1	1	1
Total	39	33	33	33	11	11	11
Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.29	2.10	2.27	2.49	1.44	1.43	1.82

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: BINOMIAL AND EXPONENTIAL THEOREMS (10 Hours)

Binomial theorem (statement only)- Application of the Binomial theorem to the summation of series - Exponential theorems (statement only) - Summation of series.

UNIT II: LOGARITHMIC SERIES (10 Hours)

Logarithmic series theorem - Statement and proof - Immediate application to summation and approximation only.

UNIT III: CONVERGENCE AND DIVERGENCE OF SERIES (10 Hours)

Convergence and divergence of series –Definitions -Comparison tests-Cauchy’s condensation test - De Alembert’s test-Cauchy’s root test - Raabe’s test -Absolute convergence.

UNIT IV: THEORY OF EQUATIONS (10 Hours)

Roots of an equation-Relations between the roots and coefficients-Transformations of equations- Reciprocal equations.

UNIT V: THEORY OF EQUATIONS (cont...)

(8 Hours)

Descartes's rule of signs -Rolle's Theorem - Multiple roots - Horner's method.

TEXT BOOK

Manicavachagom Pillay, T.K., Natarajan.T, Ganapathy.K.S. (2017)– “Algebra Volume - I”, publishedby: Divya Subramanian for Ananda book Depot, Chennai.

UNIT	CHAPTER	PAGE NUMBER
I	3	143-152
	4	188-207
II	4	213-230
III	2	41-89
IV	6	282-303, 318-327
V	6	351-362, 376-382

REFERENCE BOOK

1. Kandasamy.P. Thilagavathy .K (2004) –“Mathematics for B.Sc. Branch I -Vol. I.
S. Chand and Company Ltd, New Delhi.

WEB REFERENCES:

1. <http://www.jjernigan.com/172/ConvergenceDivergenceNotes.pdf>
2. http://home.iitk.ac.in/~psraj/mth101/lecture_notes/Lecture11-13.pdf
3. <https://maths4uem.files.wordpress.com/2015/09/1028-infinite-series.pdf>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - II	23MAU02	DIFFERENTIAL CALCULUS	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	25	75	100

Preamble

To enable the students to learn and gain knowledge about differentiation.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	remember all the formulae in differentiation	K ₁
CO2	explain the differentiation of derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K ₂
CO3	apply various differential formulae for solving successive differentiation, maxima and minima, partial differentiation and curvature	K ₃
CO4	analyze the properties of derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K ₄
CO5	evaluate the two variable and three variable functions by using derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	22	22	8
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	2.88	2.86	1.32

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: DERIVATIVES

(12 Hours)

Introduction – Derivative of a constant function – Algebra of derivatives – Derivative of $y = x^n$ - Derivative of $y = e^x$ - Derivative of $y = a^x$ - Derivative of $y = \log_e x$ - Derivative of Trigonometric functions – Derivatives of inverse Trigonometric functions – Derivative of hyperbolic functions – Derivative of inverse hyperbolic functions – Derivative of parametric function – Differentiation of implicit function – Logarithm differentiation – Differentiation of infinite series.

UNIT II: SUCCESSIVE DIFFERENTIATION

(12 Hours)

Definition – n^{th} derivatives of some standard functions – Determination of n^{th} derivative of rational functions – The derivatives of the products of the powers of sines and cosines – Leibnitz's theorem.

UNIT III: MAXIMA AND MINIMA (12 Hours)

Maxima and Minima values of a function – A necessary condition for extreme values – Sufficient condition for extreme values – Use of second order derivatives – Application to problems.

UNIT IV: PARTIAL DIFFERENTIATION (12 Hours)

Introduction – Functions of two variables – Functions of three or more variables – Neighbourhood of a point (a,b) – Continuity of a function of two variables – Limit of a function of two variables – Partial derivatives – Geometrical representation of a function of two variables – Homogenous function – Total differentials – Differentiation of composite function – Change of variables – Differentiation of implicit function.

UNIT V: CURVATURE (12 Hours)

Curvature – Radius of curvature in Cartesian and Polar coordinates – Centre of curvature – Evolutes & Involutives.

TEXT BOOK

- 1) Mohanty R.K (2014) – “Differential Calculus” – ANMOL Publications pvt ltd.
- 2) Narayanan.S. and Manicavachasam Pillai.T.K (2017) – “Calculus vol 1”- Viswanathan Publishers.

TEXT BOOK	UNIT	CHAPTER	PAGE NUMBER
Book 1	Unit - I	Chapter 4	Page: 82 - 125
Book 1	Unit – II	Chapter 5	Page: 129 - 160
Book 1	Unit –III	Chapter 8	Page: 241 – 265
Book 1	Unit -IV	Chapter 10	Page: 288-323
Book 2	Unit – V	Chapter 7	Page: 281-316

REFERENCE BOOK

Kandasamy. P & Thilagavathy (2004) - “Mathematics for B.Sc. –Vol I and. II”, S.Chand and Co.

WEB REFERENCES:

<https://youtu.be/KijGLjxKlsY>

<https://youtu.be/mzj25fNxobc>

<https://www.slideshare.net/lohit91/maxima-minima>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	FOUNDATION - I	23FCU01	ENVIRONMENTAL STUDIES	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
First	I	50	-	50

Preamble

To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioural pattern in society that is based on creating sustainable lifestyle

COURSE OUTCOMES

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

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Define environment, ecosystem, biodiversity, environmental pollution and social issues.	K1
CO2	Explain the natural resources, types of ecosystem, geographical classification of India, causes of environmental pollution and the problems related to the society.	K2
CO3	Identify the information related to environment and the resources to protect it.	K3
CO4	Analyze the classification of natural resources, energy flow in the ecosystem, threats to biodiversity, disaster management and the role of information technology in environment and human health.	K4
CO5	Assess the environmental issues with a focus on sustainability.	K5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PSO	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3

CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	1.18	0.91	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

Unit I

4 Hours

Multidisciplinary Nature of Environmental Studies:

Environment:Definition, Components, Segments and Types. **Natural Resources:**Meaning, Components: (1. **Forest**-Meaning, Importance and Types 2. **Water**- Meaning, Types and Problems 3. **Mineral**- Meaning and Classification 4.**Food**-Meaning and Problems 5.**Energy**- Meaning, Forms and Types 6.**Land**- Meaning, Structure and Functions, Components), **Classification:** Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources.

Unit II

5 Hours

Ecosystems – Definition, Features, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in the Ecosystem (Water,Carbon,Nitrogen,Oxygen and Energy), Food Chains, Food Webs and Ecological Pyramids

Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem

- Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

Unit III

5 Hours

Biodiversity and its Conservation-Introduction – Definition – Genetic, Species and Ecosystem Diversity, Biogeographical Classification of India -Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value- Biodiversity at Global, National and Local Levels- India as a Mega-Diversity Nation- Hot-Spots of Biodiversity- Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts- Endangered and Endemic Species of India Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity.

Unit IV

5 Hours

Environmental Pollution: Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise, Thermal Pollutions and Nuclear Hazards. **Solid Waste Management:** Meaning, Causes, effects and control measures of urban and industrial wastes. **Disaster Management:** Meaning, Types of Disasters: floods, earthquake, cyclone and landslides. **Environmental Ethics:** Issues and possible solutions- Climate change, global warming, acid rain, ozone layer depletion, nuclear - accidents and holocaust. Consumerism and waste products, Public Awareness.

Unit V

5 Hours

Social Issues and the Environment: From Unsustainable to Sustainable development- Urban problems related to energy- Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns. **Human Population and the Environment:** Population growth and distribution- Population explosion – Family Welfare Programme-Environment and human health- HIV/AIDS- Role of Information Technology in Environment and human health- Medical transcription and bio-informatics.

REFERENCE

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,
10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p

11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural
12. History Society, Bombay (R)
13. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
14. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws, Himalaya Pub. House, Delhi 284 p.
15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
17. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
18. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
19. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
20. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
21. Survey of the Environment, The Hindu (M)
22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

SEMESTER – II

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
Part – II	English:II		Effective English	24	1

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	25	--	25

PREAMBLE

To enhance the four skills of language in the students.

COURSE OUTCOME:

On the successful completion of the course, Students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Express confidently in English in the specific situations	K1
CO2	Understand and recognize the various styles and registers in English language.	K2
CO3	Exercise the effective oral presentation.	K3
CO4	Analyze and comprehend business letters and emails	K4
CO5	Verify the correct use of words	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	1	1	1
CO3	3	3	3	1	1	1	1
CO4	3	1	1	1	1	1	1
CO5	1	1	1	1	1	0	0
Total contribution of COs to POs Weightage	25	17	17	9	7	6	6
Weight Percentage of COs contribution to POs	1.3	1.1	1.4	0.9	1.2	1.2	1.5

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

COURSE CONTENT:

UNIT I: Speaking Skills (4 Hours)

1. Introducing
2. Making requests
3. Asking for advice

UNIT II (4 Hours)

1. Apologising
2. Asking for someone's opinion
3. Starting and Ending a conversation

UNIT III (4 Hours)

1. Unnecessary use of articles
2. Use of wrong tenses
3. Use of wrong words

UNIT IV (6 Hours)

1. Description of Current situations.
2. Making Telephone calls
3. Letter writing

UNIT V (6 Hours)

1. E-mail writing
2. Welcome address & Vote of Thanks
3. Agenda and Minutes

REFERENCE BOOKS:

- Spoken English for You Level 1 by Radhakrishna Pillai G, K.Rajeevan, Emerald Publishers, Chennai.
- Speak English Better by Dr.M.N.Sundararaman, Bhaarithi Academy, Tiruchirapalli.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE- IV	23MAU04	ANALYTICAL GEOMETRY	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	25	75	100

Preamble

To enable the students to learn and visualize the fundamental ideas about conic, Straight line, Sphere, cone, cylinder and conicoid.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions based on conic, Straight line, Sphere, cone, cylinder and conicoid.	K ₁
CO2	express the concepts of conic, Straight line, Sphere, cone, cylinder and conicoid.	K ₂
CO3	apply the various concepts of straight lines, conic, sphere, cone, cylinder and conicoid to determine the respective equations.	K ₃
CO4	analyze the concepts of two dimensional and three dimensional Analytical Geometry.	K ₄
CO5	evaluate the equation of a conic, sphere, cone, cylinder and shortest distance between two straight lines.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	3	3	3	3	3	3
CO5	3	3	3	3	1	1	1
Total Contribution of COs to POs	39	33	33	33	13	13	13
Weighted Percentage of COs contribution to POs	2.29	2.10	2.27	2.49	1.70	1.69	2.15

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: CONIC (10 Hours)

Polar coordinates equation of a conic - Directrix-Chord- Tangent-Normal- Simple problems.

UNIT II: STRAIGHT LINES (10 Hours)

Straight lines - Coplanarity of straight-line-Shortest distance (S.D) and equation of S.D between two lines-Simple problems.

UNIT III: SPHERE (10 Hours)

Sphere-Standard equation of sphere-Results based on the properties of a sphere-Tangent plane to a sphere- Equation of a circle.

UNIT IV: CONE AND CYLINDER (10 Hours)

Cone whose vertex is at the origin- Envelope cone of a sphere - Right circular cone-Equation of a cylinder- Right circular cylinder.

UNIT V: CONICOIDS (8 Hours)

Nature of a conicoid- Standard equation of central conicoid –Enveloping cone tangent

Plane- Condition for tangency – Director Sphere.

TEXT BOOKS

1. Manickavasagam Pillai.T. K. and Natarajan.T, (2016) - “Analytical Geometry of 2D” ,
S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai.
2. Manickavasagam Pillai.T. K. and Natarajan.T, (2016) - “Analytical Geometry of 3D” ,
S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai.

UNIT	BOOK	CHAPTER	PAGE NUMBER
Unit - I	Book - 1	Chapter 9	Page: 325-330 Results without proof and Page 331-363
Unit – II	Book –2	Chapter 3	Page: 46- 71
Unit – III	Book - 2	Chapter 4	Page: 92 – 110
Unit – IV	Book - 2	Chapter 5	Page: 115 – 138
Unit - V	Book - 2	Chapter 5	Page: 141 – 160

REFERENCE BOOK

Bali.N.P. (1991) – “Solid Geometry”, Laxmi Publications (P) Ltd.

WEB RESOURCES:

1. http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/
2. <http://egyankosh.ac.in/bitstream/123456789/11990/1/Unit-2.pdf>
3. https://en.wikipedia.org/wiki/Analytic_geometry

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
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PART III	CORE- V	23MAU05	INTEGRAL CALCULUS	60	4
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Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	25	75	100

Preamble

To enable the students to learn and gain knowledge about integration.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of Integration	K ₁
CO2	explain the integration of rational, irrational, trigonometric and Improper integrals	K ₂
CO3	apply various integral formulae to solve rational, irrational, trigonometric and Improper integrals	K ₃
CO4	analyze the properties of Methods of integration, integration of rational- irrational- trigonometric functions, Beta and Gama functions and convergence/divergence of integrals	K ₄
CO5	evaluate double and triple integrals by using Methods of integration, Integration of rational- irrational- trigonometric functions and Improper integrals.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PSO	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	3	3	3

CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total	45	45	39	39	22	22	8
Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	2.88	2.86	1.32

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: METHODS OF INTEGRATION

(12 Hours)

Methods of integration – Integration by substitution – Three important deduction of substitution – Six important integrals – Integration of some important forms – Integration by parts of a product – Extension of the rule of integration by parts.

UNIT II: INTEGRATION OF RATIONAL FUNCTION

(12 Hours)

Introduction – Linear non-repeated factors only in the denominator – Linear repeated factors only in the denominator – Quadratic non-repeated factors only in the denominator – Quadratic repeated factors only in the denominator – Integration without breaking into partial fraction – Integrand consisting of even power of x only – Integration of algebraic rational functions by substitution2 - Integration of algebraic rational functions of e^x .

UNIT III: INTEGRATION OF IRRATIONAL FUNCTIONS

(12 Hours)

Integration of rational function of $(ax+b)^{1/n}$ - Integrals of the type (i) $\int \sqrt{(ax^2 + bx + c)} dx$ (ii) $\int (px+q)\sqrt{(ax^2 + bx + c)} dx$ - Integrals of the type (i) $\int \frac{dx}{\sqrt{(ax^2 + bx + c)}}$ (ii) $\int \frac{px+q}{\sqrt{(ax^2 + bx + c)}} dx$ - Integration of $\int \frac{dx}{(px+q)\sqrt{(ax+b)}}$, $\int \frac{dx}{(px^2 + qx+r)\sqrt{(ax+b)}}$, $\int \frac{dx}{(px+q)\sqrt{(ax^2 + bx + c)}}$, $\int \frac{dx}{(px^2 + qx+r)\sqrt{(ax^2 + bx + c)}}$, $\int x^p (a + bx^n)^q dx$.

UNIT IV: INTEGRATION OF TRIGONOMETRIC FUNCTIONS (12 Hours)

Integration of $\sin^n x, n > 0$ – $\cos^n x, n > 0$ – $\tan^n x$ and $\cot^n x, n > 0$ – $\sec^n x, \operatorname{cosec}^n x, x > 0$ – $\sin^p x \cos^q x, p > 0, q > 0$ – Integration $\sin^p x \cos^q x$, when $p+q$ is a negative even integer.

UNIT V: IMPROPER INTEGRALS (12 Hours)

Beta and Gamma integrals-their properties, relation between them-Evaluation of multiple integrals using Beta and Gamma functions.

Introduction to Industry 4.0 – Needs – Reasons for Adopting Industry 4.0 – Definition – Goals and Design Principles – Technologies of Industry 4.0 - Skills required for Industry 4.0.

TEXT BOOK

- i) Mohanty R.K (2014) – “Integral Calculus” – ANMOL Publications Pvt ltd.
- ii) Narayanan.S. and Manicavachasam Pillai.T.K (2017) – “Calculus vol 2”- Viswanathan Publishers.
- iii) P. Kaliraj, T. Devi – “Higher Education for Industry 4.0 and Transformation to Education 5.0”.

BOOK	UNIT	CHAPTER	PAGE NUMBER
Book I	Unit - I	Chapter 1	Page: 1 - 57
Book I	Unit – II	Chapter 2	Page: 59 - 81
Book I	Unit –III	Chapter 3	Page: 86 – 122
Book I	Unit -IV	Chapter 4	Page: 124-165
Book II	Unit – V	Chapter 7	Page: 278-300

REFERENCE BOOK

Kandasamy. P & Thilagavathy (2004) - “Mathematics for B.Sc. –Vol I and. II”, S.Chand and Co.

WEB REFERENCES:

1. <https://www.slideshare.net/FarzadJavidanrad/integral-calculus-43522803V>
2. <https://www.youtube.com/watch?v=o75AqTInKDU>
3. <https://www.youtube.com/watch?v=bzIrspIDYIs>
4. <https://hapticmedia.com/blog/industry-4.0/>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	FOUNDA TION - II	23FCU02	YOGA AND ETHICS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
First	II	50	-	50

Preamble

To enable the learners to acquire the knowledge on basic yogasanas and values and practice them in real life.

Course Outcomes

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

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recollect the basic terminologies in yoga and value education	K1
CO2	demonstrate the importance of yoga, mental exercises, principles of life and components of values.	K2
CO3	apply the techniques of dynamic & mental exercises and philosophical values in real life	K3
CO4	classify the different types of asanas, stages of mind, analysis of thought, ethical values and social values.	K4
CO5	evaluate how the yoga and value education make a person strong both physically and mentally	K5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	1	1	3
CO2	9	9	9	3	3	1	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	3	3	3	3

Total Contribution of COs to POs	45	45	45	15	13	11	15
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	1.13	1.70	1.43	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I YOGA AND HEALTH (5 Hours)

Theory:

Yoga-Meaning- Importance of Yoga – Pancha Koshas - Benefits of Yoga-General Guidelines.

Practice:

Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama & Kriya.

UNITII ART OF NURTURING THE MIND (5 Hours)

Theory:

Ten Stages of Mind-Mental Frequency – Methods for Concentration

Eradication of Worries- Benefits of Blessings- Greatness of Friendship- Individual Peace and World Peace

Practice: - Worksheet

UNIT III PHILOSOPHY AND PRINCIPLES OF LIFE (5 Hours)

Purpose and Philosophy of Life- Introspection – Analysis of Thought - Moralization of Desires- Neutralization of Anger.

Vigilance and Anti- Corruption- Redressal mechanism - Urban planning and Administration.

Practice - Worksheet

UNIT IV VALUE EDUCATION (Part-I) (5 Hours)

Ethical Values: Meaning – Need and Significance- Types - Value education – Aim of education and value education

Components of value education: Individual values – Self discipline, Self Confidence, Self Initiative, Empathy, Compassion, Forgiveness, Honesty, Sacrifice, Sincerity, Self-control, Tolerance and Courage.

Practice - Worksheet

UNIT V VALUE EDUCATION (Part-II) (4 Hours)

Family Values

Constitutional or National values – Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom and Fraternity.

Social values – Pity and probity, self control, universal brotherhood.

Professional values – Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Religious values – Tolerance, wisdom, character.

Practice - Worksheet

Reference Books:

- 1 Vethathiri Maharishi (2015), 'Yoga for human excellence'- Sri Vethathiri Publications.
2. Value Education for human excellence- study material by Bharathiar University.
3. Value Education - Study Material by P.K.R Arts College for Women.

SEMESTER - III

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - VIII	23MAU08	DIFFERENTIAL EQUATIONS AND	72	4

			LAPLACE TRANSFORMS		
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Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

To enable the students to learn the method of solving Differential Equations and Laplace Transforms.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of ordinary, partial, linear differential equations and Laplace transforms.	K₁
CO2	identify the solutions of ordinary, partial differential equations, Laplace and inverse Laplace transformations.	K₂
CO3	apply Clairaut's form, Laplace and inverse Laplace transforms, direct integration to solve Differential Equations.	K₃
CO4	analyze the difference between Laplace and inverse Laplace transforms, ordinary and partial differential equations.	K₄
CO5	evaluate the solutions for ordinary, partial, linear differential equations and Laplace transforms.	K₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	15	15	15
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	1.96	1.95	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: ORDINARY DIFFERENTIAL EQUATIONS (8 Hours)

Equations of First Order and of Degree Higher than one – Solvable for p , x , y –
Clairaut's Equation.

UNIT II: LINEAR DIFFERENTIAL EQUATIONS (10 Hours)

Finding the solution of second and higher order with constant coefficients with Right
Hand Side is of the form Ve^{ax} where V is a function of x .

UNIT III: PARTIAL DIFFERENTIAL EQUATIONS (10 Hours)

Formation of equations by eliminating arbitrary constants and arbitrary functions –
Solutions of P.D Equations – Solutions of Partial Differential Equations by direct integration
– Methods to solve the first order P.D. Equations in the standard forms - Lagrange's Linear
Equations.

UNIT IV: LAPLACE TRANSFORMS (10 Hours)

Definition – Laplace Transforms of standard functions – Linearity property – First
Shifting Theorem – Transform of $tf(t)$, $\frac{f(t)}{t}$.

UNIT V: INVERSE LAPLACE TRANSFORMS (10 Hours)

Inverse Laplace Transforms – Applications to solutions of First Order and Second Order Differential Equations with constant coefficients.

TEXTBOOK

Kandasamy. P, Thilagavathi. K (2004) “Mathematics for B.Sc. – Volume III”, S. Chand and Company Ltd, New Delhi.

UNIT	CHAPTER	PAGE NUMBER
Unit - I	Chapter 1	Page: 1-15
Unit – II	Chapter 2,4,5	Page: 16-40
Unit - III	Chapter 1	Page: 117 – 143, 150 – 162
Unit - IV	Chapter 1	Page: 187-201
Unit - V	Chapter 1	Page: 202-236

REFERENCE BOOK

Narayanan. S and Manicavachagam Pillai. T. K.(1996) - “Differential Equations”, S. Viswanathan (Printers and Publishers) Pvt. Ltd, Chennai.

WEB RESOURCES:

1. <http://www.nptelvideos.in/2012/11/mathematics-iii.html>
2. <https://www.digimat.in/nptel/courses/video/111108081/L02.html>
3. <https://www.ijsr.net/archive/v2i1/ijsron2013331.pdf>
4. https://www.whitman.edu/mathematics/calculus_online/chapter17.html

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - IX	23MAU09	TRIGONOMETRY, VECTOR CALCULUS AND	72	4

			FOURIER SERIES		
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Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

To enable the students to gain knowledge about expansion in series of trigonometric functions and its applications, vector field and Fourier series.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of cosines and sines of multiples of θ , logarithmic of complex quantity, scalar and vector fields, integration of vectors and periodic functions	K₁
CO2	illustrate the concepts of summation of series using binomial, exponential and logarithmic series theorem, differentiation of vectors, line integral and surface integral and Fourier series of periodicity 2π	K₂
CO3	apply C+iS method, Green's theorem, Gauss divergence theorem, Stoke's theorem and Half range series for finding summation of series and values of integrals.	K₃
CO4	analyze the relation between trigonometric series and hyperbolic series, Grogory's series and gradient, divergent, curl, also Gauss theorem and Stoke's theorem, even and odd function	K₄
CO5	evaluate the integrals using Gauss divergence theorem, Stoke's theorem and Fourier series of periodicity 2π using Dirichlet conditions	K₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	3	3	3	3
CO4	3	3	3	3	1	0	0
CO5	3	3	3	1	0	0	0
Total	39	33	33	25	10	9	9
Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.29	2.10	2.27	1.89	1.31	1.17	1.49

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: EXPANSION IN SERIES (12 Hours)

Expansion in Series – Expansion of $\cos^n \theta$, $\sin^n \theta$, in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$ and $\sin n\theta$ in powers of sines and cosines – Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in powers of θ .

UNIT II: SUMMATION OF SERIES (12 Hours)

Logarithm of complex quantities - Summation of series – $C + iS$ method of summation- Exponential series-Trigonometric and Hyperbolic series- Gregory's series.

UNIT III: DIFFERENTIATION OF VECTORS (12 Hours)

Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl.

UNIT IV: INTEGRATION OF VECTORS (12 Hours)

Integration of vectors – Line integral – Surface integral – Green's theorem in the plane – Gauss divergence theorem – Stokes theorem – (Statements only) - Verification of the above said theorems.

UNIT V:FOURIER SERIES

(12 Hours)

Periodic functions – Fourier series of periodicity 2π – Even and Odd functions - Half range series.

TEXT BOOK:

Kandasamy. P, Thilagavathi. K - “Mathematics for B.Sc. Branch I”, Volume I, II (2104) and Volume IV (2105), S.Chand and Company Ltd, New Delhi.

UNIT	VOLUME	CHAPTER	PAGE NUMBER
I	I	2	122 – 139
II	II	1	242 – 247
		2	248 – 276
III	IV	1	1-7
		2	8-23
IV	IV	3	24 – 92
V	IV	1	93-145

REFERENCE BOOKS:

1. Manichavasagam Pillai T.K and Narayanan S. (2112) -“Trigonometry”, Viswanathan Publishers and Printers Pvt. Ltd.
2. Manichavasagam Pillai T.K and Narayanan S., Hanumantha Rao (2111) – “Ancillary Mathematics”, Volume II, Viswanathan Publishers and Printers Pvt. Ltd.

WEB RESOURCES:

1. <https://mathworld.wolfram.com/FourierSeries.html>
2. [https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Vector_Calculus_\(Corral\)/04%3A_Line_and_Surface_Integrals/4.06%3A_Gradient_Divergence_Curl_and_Laplacian](https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Vector_Calculus_(Corral)/04%3A_Line_and_Surface_Integrals/4.06%3A_Gradient_Divergence_Curl_and_Laplacian)
3. <https://youtu.be/Gk70xiGQlw8>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – X ALLIED -	23MAU10	STATISTICS - I	72	4

	II				
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Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	25	75	100

Preamble

To enable the students to understand mathematical aspects of statistics

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions of random variable, mathematical expectation, transformation of variable, measures of central tendency, correlation and regression analysis.	K ₁
CO2	explain the concepts of random variable, mathematical expectation, transformation of variable, measures of central tendency, correlation and regression analysis.	K ₂
CO3	interpret the concepts of random variable, mathematical expectation, transformation of variable, measures of central tendency, correlation and regression analysis.	K ₃
CO4	analyze the properties of mathematical expectation, transformation of variable, relationship among mean, median, mode, correlation coefficient and regression equation.	K ₄
CO5	evaluate the problems based on one and two dimensional probability mass and density functions, measures of central tendency, correlation and predict the regression equation.	K ₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to POs	45	45	39	39	15	15	15
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	1.96	1.95	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I : RANDOM VARIABLES

(12 Hours)

Random variables - Discrete and continuous random variables - Distribution function - Properties - Probability mass function, probability density function - Simple problems.

UNIT II : MATHEMATICAL EXPECTATION

(12 Hours)

Mathematical expectation- Addition and multiplication theorems on expectations - Moment generating function, cumulants, characteristic function and their properties.

UNIT III : TWO DIMENSIONAL RANDOM VARIABLES

(12 Hours)

Introduction – joint probability mass function – twodimensional distribution function – marginal distribution function – joint density, marginal density function – conditional distribution function- conditional probability density function -independence of random variables - Transformation of random variables (one and two dimensional only)- Tchebychev’s inequality.

UNIT IV: MEASURES OF CENTRAL TENDENCY (13 Hours)

Measures of Central Tendency- arithmetic mean, median, mode, geometric mean, harmonic mean for individual observations, discrete and continuous series.

UNIT V: CORRELATION AND REGRESSION ANALYSIS (11 Hours)

CORRELATION: Meaning - Definition –Scatter diagram, Karl Pearson’s co-efficient of correlation, Spearman’s Rank correlation, advantages and limitations of correlation.

REGRESSION ANALYSIS: Difference between correlation and regression – method of forming the regression equations.

TEXT BOOK:

1. Guptha, S.C & Kapoor, V.K.,(2017) “Fundamentals of Mathematical statistics”, Sultan Chand & Sons, New Delhi.

UNIT	CHAPTER	SECTION	PAGE
I	V	5.1 – 5.4	5.1 – 5.19
II	VI, VII	6.1 – 6.5, 7.1 – 7.3	6.1 – 6.10, 7.1 – 7.14
III	V, VII	5.5 – 5.7, 7.5	5.32-5.60, 7.24 – 7.26

2. Navnitham. PA. (2012) - “Business Mathematics and Statistics”, Jai publishers, Trichy.

UNIT	CHAPTER	PAGE
IV	7	159,162-175,196-219,212-227,251-260
V	12,13	503-523, 540-553

REFERENCE BOOKS

1. Guptha, C.B and Vijay Guptha., (2008) “Introduction to Statistical methods”, Vikas Publishing house Pvt, Ltd.
2. Guptha, S.P. (2014), “Statistical methods”, Sultan Chand & Sons.

WEB REFERENCES:

1. [https://stats.libretexts.org/Bookshelves/Introductory_Statistics/Book%3A_Introductory_Statistics_\(Shafer_and_Zhang\)/00%3A_Front_Matter/03%3A_Table_of_Contents](https://stats.libretexts.org/Bookshelves/Introductory_Statistics/Book%3A_Introductory_Statistics_(Shafer_and_Zhang)/00%3A_Front_Matter/03%3A_Table_of_Contents)
2. <https://en.wikipedia.org/wiki/Statistics>
3. <https://dailymedicos.com/application-of-statistics-in-the-medical-field/>

4. <https://study.com/academy/lesson/application-of-statistics-in-daily-life.html>
5. <https://study.com/academy/lesson/application-of-statistics-in-business.html>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	ABILITY ENHANC EMENT	23AEU01	INFORMATION SECURITY	24	2

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Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	50	-	50

Preamble

To learn about the basics of Information Security.

Course Outcomes

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

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the fundamental concepts of Information Security, Risk and Security policies	K1
CO2	Discuss the concepts of Risks, vulnerabilities, ethical and privacy issues	K2
CO3	Apply the ideas in security planning and construct the policies	K3
CO4	Categorizethe Privacy, Ethical Issues, Laws, Software Issues and Crimes	K4
CO5	Summarize Cryptography, cipher text and threats in information security	K5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	1	1
Total Contribution of COs to	45	45	45	45	27	16	19

POs							
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	3.53	2.08	3.15

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT: I Introduction to Information Security (5 Hours)

Information Security: Principles, Concepts and Definitions - The need for Information Security - Benefits of Information Security. The Security Problem in Computing: The Meaning of Computer Security - Computer Criminals.

UNIT: II Information Risk (4 Hours)

Information Risk: Threats and Vulnerabilities of Information Systems – Introduction to Risk Management. Information Security Management Policy, Standards and Procedures.

UNIT: III Security Planning (5 Hours)

Administering Security: Security Planning - Security Planning Team Members - Assuring Commitment to a Security Plan - Business Continuity Plan - Incident Response Plan - Organizational Security Policies, Physical Security.

UNIT: IV Privacy and Ethical Issues in Information Security (5 Hours)

Legal Privacy and Ethical Issues in Information Security: Protecting Programs and Data - Information and the Law - Rights of Employees and Employers - Software Failures - Computer Crime - Ethical Issues in Information Security.

UNIT: V Cryptography (5 Hours)

Cryptography: Introduction to Cryptography -What is Cryptography – Plain Text – Cipher Text – Substitution Ciphers - Transposition Ciphers.

TEXT BOOK:

1. SumitraKisan and D.ChandrasekharRao, Information Security Lecture Notes, Department of Computer Science and Engineering & Information Technology, Veer SurendraSai University of Technology (Formerly UCE, Burla) Burla, Sambalpur, Odisha.

REFERENCE BOOK:

1. Andy Taylor (Editor), David Alexander, Amanda Finch & David Sutton, Information Security Management Principles An ISEB Certificate, The British Computer Society, 2008.

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	NON-MAJOR ELECTIVE	23NMU01A	INDIAN WOMEN AND SOCIETY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	III	50	-	50

Preamble

To familiarize students with the specific cultural contexts of women in India

Course Outcomes

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

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO1	know women status in Indian society as an academic discipline	K1
CO2	interpret the various roles of women, challenges and issues faced by them in the society	K2
CO3	find out solutions to their legal issues and protect themselves from the violence against women emphasize on women entrepreneurship for their empowerment	K3
CO4	critically analyze the lifestyle and challenges of women	K4
CO5	discuss the importance of women health and issues related to women in general	K5

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	0	0	0
CO2	9	9	9	9	3	0	3
CO3	9	9	9	9	9	9	9
CO4	3	3	3	9	9	9	9
CO5	3	3	1	1	1	9	9
Total Contribution of COs to POs	33	33	31	37	22	27	30
Weighted Percentage	1.94	2.10	2.14	2.79	2.88	3.51	4.97

of COs contribution to POs							
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT: I Historical Background (5 Hours)

History of Women’s status from Vedic times, Women’s participation in India’s Pre and Post Independence movement and Economic Independence, fundamental rights and importance of women in Modern Society

UNIT: II Role of Women (Challenges & Remedies) (5 Hours)

Women in Family, Agriculture, Education, Business, Media, Defense, Research and Development, Sports, Civil Services, Banking Services, Social Work, Politics and Law

UNIT: III Women and Health (5 Hours)

Women and health issues, Malnutrition, Factors leading to anemia, Reproductive maternal health and Infant mortality, Stress

UNIT: IV Issues of Women (5 Hours)

Women’s issues, Dowry Related Harassment and Dowry Deaths, Gender based violence against women, Sexual harassment, Loopholes in Practice to control women issues

UNIT: V Women Empowerment (4 Hours)

Meaning, objectives, Problems and Issues of Women Empowerment, Factors leading to Women Empowerment, Role and Organization of National Commission for Women, Central and State Social Welfare Board for Women Empowerment, Reality of women empowerment in the era of globalization

Reference Books

S.No	Authors	Title	Publishers	Year of Publication
1	Mala Khullar	Writing the Women’s Movement: A Reader	Zubaan	2005
2	IAWS	The State and the Women’s Movement in India	IAWS, Delhi	1994
3	Kosambi, Meera	Crossing Thresholds:	Permanent Black	2007

		Feminist Essays in Social History		
4	TRowbotham, Sheila	Hidden from History: Women's Oppression and the Fightagainst It	Pluto Press, London	1975
5	Susheela Mehta	Revolution and the Status of Women	Metropolitan Bookco.pvt ltd, New Delhi	1989

SEMESTER - IV

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XI	23MAU11	MECHANICS	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	25	75	100

Preamble

To enable the students to gain the knowledge about parallel forces, resultant forces, coplanar forces, projectiles, impact on a fixed surface, central orbits.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the concepts of fundamental laws, moments, coplanar forces, projectiles and equations of motion of central orbits.	K ₁
CO2	explain the different types of laws, forces, radial and transverse components of orbits, height, time and range of a projectile, direct and oblique impact.	K ₂
CO3	apply the principles of static equilibrium, projectiles, conservation of momentum, reduction of forces to solve simple real life problems.	K ₃
CO4	analyze the equilibrium of a particle, projectiles, radial and transverse components of orbits and impact of elastic bodies.	K ₄
CO5	evaluate two fold problems in central orbits, magnitude and resultant of the forces, before and after impact velocities, range on an inclined plane.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3

CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	1	1	1
Total Contribution of COs to POs	45	45	45	45	13	13	13
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	1.70	1.69	2.15

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: FORCES ACTING AT A POINT AND MOMENTS (10 Hours)

Parallelogram law-triangle law –Converse of Triangle Law-Polygon Law of Forces- Lami’s Theorem - Parallel Forces – Moments- Varignon’s Theorem of moments- Generalized theorem of moments

UNIT II: COPLANAR FORCES (10 Hours)

Coplanar forces acting on a rigid body- Theorem on three co-planar forces- Reduction of coplanar forces- Equation to the line of action of the resultant.

UNIT III: PROJECTILES (10 Hours)

Path of a projectile-Greatest height-Time of flight-Range on an inclined plane through the point of projection-Maximum range.

UNIT IV: CENTRAL ORBITS (10 Hours)

Radial and transverse components of velocity and acceleration - Differential equation of central orbit - Pedal equations- Two-fold problems in central orbits

UNIT V : IMPACT ON A FIXED SURFACE (8 Hours)

Fundamental laws of impact: Newton’s Experimental Law-Principle of conservation of Momentum -Impact on a smooth fixed plane

IMPACT OF SMOOTH ELASTIC SPHERES

Direct impact of two smooth spheres – Oblique impact of two smooth spheres - Loss of kinetic energy due to impact of two smooth spheres.

TEXT BOOK

1. Venkataraman M.K., (2005) – “Statics”, Eleventh edition, Agasthiar Publications, Trichy.
2. Venkataraman.M.K., (2014) –“Dynamics”, 16th edition, Agasthiar Publications, Trichy.

Unit	Chapter	Page
I	2 , 3	06-26, 52-75
II	5 6	98 & 99 143-167
III	6	139-160, 172-182
IV	11	356-359, 371-383
V	8	215-228, 232-241, 244-248

REFERENCE BOOKS

1. Dharmapadam A.V. (2011) –“Statics” , S.Viswanathan Printers and Publishing Pvt., Ltd.
2. Duraipandian. P. and Laxmi Duraipandian(1988) –“ Mechanics” , S.Chand and Company Ltd, Ram Nagar, New Delhi -55.
3. Prof.Khanna.M.L.(1995) –“ Statics” , Fifteenth edition, Jai Prakash Nath & Co., Meerut.
4. Dharamapadam.A.V.(2011) – “Dynamics”, S.Viswanathan Printers and Publishers Pvt., Ltd, Chennai.
5. Naryanamurthi.M. &Nagaratnam.N (2008)-“Dynamics”, National Publishers, New Delhi.

WEB RESOURCES:

1. <https://www.askiitians.com/iit-jee-physics/mechanics/motion-of-projectile.aspx>
2. <https://youtu.be/Shm1diiyrPY>
3. [https://en.wikipedia.org/wiki/Dynamics_\(mechanics\)](https://en.wikipedia.org/wiki/Dynamics_(mechanics))

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XII	23MAU12	NUMERICAL METHODS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	25	75	100

Preamble

To enable the students to learn and gain knowledge about linear algebraic and transcendental equations, system of linear equations, Finite differences, Interpolation and Numerical Differentiation.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of linear algebraic and transcendental equations, simultaneous equations, Finite differences, Interpolation and Numerical Differentiation.	K ₁
CO2	explain the procedure in finding the roots and values of an equation and the various difference tables to get the unknown values.	K ₂
CO3	apply various methods to solve the Algebraic, Transcendental, Simultaneous equations and using the difference table to get the unknown values.	K ₃
CO4	compare the various methods involved in solving Simultaneous equations and different kinds of difference operators	K ₄
CO5	evaluate the problems by using Bisection method, iterative method, Newton-Raphson method, direct and indirect method and Newton's formula.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	3	3	3	3
CO5	9	3	3	3	3	3	3
Total	45	39	39	33	33	33	33
Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	2.48	2.69	2.49	4.31	4.29	5.46

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

**UNIT I: THE SOLUTION OF NUMERICAL ALGEBRAIC AND
TRANSCENDENTAL EQUATIONS**

(10 Hours)

Introduction – The Bisection Method – Method of Successive Approximations or the Iteration Method –Newton’s Iteration Method or Newton-Raphson Method - Convergence condition of Newton-Raphson Method – Order of Convergence of Newton-Raphson Method.

UNIT II: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS

(10 Hours)

Introduction – Gauss Elimination Method – Gauss Jordan Method – Method of Triangularisation - Iterative Methods – Gauss Jacobi Method of Iteration – Gauss-Seidal Method of Iteration.

UNIT III: FINITE DIFFERENCES (10 Hours)

Introduction – First Differences – Higher Differences – Difference Tables – Forward Differences - Backward Differences –Central Differences- Properties of the operator Δ – Differences of a Polynomial – The Operator E –Relationship between the Operators.

UNIT IV: INTERPOLATION (10 Hours)

Introduction – Linear Interpolation - Gregory – Newton Forward Interpolation Formula - Gregory –Newton Backward Interpolation Formula . Divided Differences– Properties of Divided Differences – Newton’s interpolation formula for unequal intervals.

UNIT V: NUMERICAL DIFFERENTIATION (8 Hours)

Introduction – Newton’s Forward difference Formula –Newton’s Backward difference Formula -Derivative using Stirling’s Formula– Maxima and Minima Functions.

TEXT BOOK:

Dr.Venkataraman.M.K.(2013) – “Numerical Methods in Science and Technology”,
The National Publishing Company, Chennai.

UNIT	CHAPTER	PAGE NUMBER
I	3	81– 90 97-105
II	4	113 – 120, 126 – 130, 140 – 146
III	5	153 – 165,177 – 184
IV	6	193 –202, 244 – 253.
V	9	265-274, 277-278

REFERENCE BOOK:

Kandasamy. P, Thilagavathi. K and Gunavathi. K (2010) - “Numerical methods” – S.
Chand and Company Ltd, New Delhi.

WEB REFERENCES:

1. <https://brilliant.org/wiki/newton-raphson-method/>
2. <https://www.geeksforgeeks.org/newton-forward-backward-interpolation/>
3. <https://youtu.be/v7kapVuoWhY>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XIII ALLIED - II	23MAU13	STATISTICS - II	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	25	75	100

Preamble

To enable the students to understand mathematical aspects of applied statistics

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions and notations of probability distributions, estimation, sampling, confidence limit, test of hypothesis and test of significance.	K ₁
CO2	identify the concepts of probability distributions, estimation, sampling, confidence limit, test of hypothesis and test of significance.	K ₂
CO3	classify the distribution, method of estimation, types of error and sampling.	K ₃
CO4	examine the problems based on probability distributions, estimation, test of hypothesis.	K ₄
CO5	evaluate the various types of distributions, estimation, limits, errors and significance.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3

CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to POs	45	45	39	39	15	15	15
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	1.96	1.95	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I : PROBABILITY DISTRIBUTIONS

(13 Hours)

Binomial distribution- properties of Binomial distribution- fitting of Binomial distribution-Poisson distribution- role of Poisson distribution-fitting a Poisson distribution-Normal distribution- relation among Binomial, Poisson and Normal distributions-properties of Normal distribution.

UNIT II : ESTIMATION

(12 Hours)

Concept of population, sample, statistics, parameter - Point estimation - Concept of point estimation - Consistency, unbiasedness, efficiency - Sufficiency – Cramer Rao inequality - Simple problems.

UNIT III: METHODS OF ESTIMATION AND TEST OF HYPOTHESIS

(12 Hours)

Methods of estimation – method of minimum variance-method of moments-method of least square.

Type-I error and II errors - Power test – Neymann-Pearson Lemma - Concept of most powerful test (statements and results only).

UNIT IV: TEST OF SIGNIFICANCE

(13 Hours)

Standard error - Large sample: single proportion - difference proportion – single mean – difference mean. Small sample : application of t and F distributions - Simple problems.

UNIT V: SAMPLING

(10 Hours)

Sampling - Simple random sampling, stratified random sampling and systematic sampling - Estimation of mean, total and their standard errors. Sampling and non sampling errors (concepts only).

Introduction to Industry 4.0 – Application of statistical tools in industry 4.0

1. Find out the correlation coefficient for the variables, age(years) and systolic blood pressure (mmHg) in man

Age	56	42	60	50	54	49	39	62	65	70	40	53	35	38	39	37	70	75	65	64
Bp	160	130	125	135	145	115	140	120	140	160	126	145	118	120	123	138	160	163	145	146

2. The following data gives the hemoglobin level (gm %) in a group of 15 women students studying in a college. Test whether the hemoglobin level in the young women is significantly lower than the average level of 13 gm% expected for women population. Infer whether the women in the age group are having the tendency towards anemia.

case	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hb(gm%)	10	12	11	10	9	8	12	10	11	9	10	12	11	9	10

3. Calculate Correlation & Regression using R software.

4. Estimate the T-Test using R software.

TEXT BOOK:

1. S.P.Gupta,(2004) 33rd revised edition-” Statistical methods”, Sultan chand & Sons.

UNIT	CHAPTER	SECTION	PAGE
I	II	-	809,813,817-824,826-848

2. Guptha, S.C & Kapoor, V.K.,(2017) - “Fundamentals of Mathematical statistics”,Sultan chand & Sons.

UNIT	CHAPTER	SECTION	PAGE
II	XVII	17.1 – 17.3	17.1- 17.20
III	XVII, XVIII	17.6, 18.1 – 18.5,	17.30 – 17.46, 18.2 – 18.10
IV	XIV,XVI	14.4 – 14.8, 16.3, 16.6	14.6 – 14.23, 14.25 – 14.36, 16.12 – 16.16, 16.36 – 16.39

3. P.N.Arora, Sumeet Arora, S.Arora (2013) 4th edition, “Comprehensive statistical methods”, S.Chand & company pvt. Ltd

UNIT	CHAPTER	SECTION	PAGE
V	XV	15.1-15.8	15.1-15.6

REFERENCE BOOKS

1. Gupta C.B and Vijay Gupta (2008) "Introduction to Statistical methods", Vikas publishing house pvt Ltd .
2. Gupta S.P.(2014) "Statistical methods", Sultan Chand & Sons.

WEB REFERENCES:

1. <https://blog.flexis.com/6-important-industry-4.0-statistics-to-know>
2. <https://www.youtube.com/watch?v=owSLEGPV38E>
3. <https://dailymedicos.com/application-of-statistics-in-the-medical-field/>
4. <https://study.com/academy/lesson/application-of-statistics-in-daily-life.html>
5. <https://study.com/academy/lesson/application-of-statistics-in-business.html>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	SKILL ENHANCEMENT	23SEMAU 01	INTERNET BASICS AND OFFICE AUTOMATION	24	2

	-I		TOOLS - PRACTICAL		
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Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	50	-	50

Preamble

To enable the students to learn and gain knowledge about internet basics and MS Office

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand to work on gmail account, websites and MS Office	K₁
CO2	Visualize various websites and presentations	K₂
CO3	Apply different formats in documents, excel sheets, presentations and all the options in gmail account	K₃
CO4	Examine the programs based on gmail account, websites and MS Office	K₄
CO5	Create a Gmail account, a document, a spread sheet and a presentation slide	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	3	1
CO5	9	9	9	9	3	3	1
Total Contribution	45	45	45	45	33	33	22

of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	4.31	4.29	3.64

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

LIST OF PROGRAMS

All the following listed programs have to be executed and recorded.

1. Open your Gmail account and do the following: Compose and send a mail, Attach a file, Forward a mail and reply for a mail
2. Open your Gmail account and do the following: Download the attached document of a mail received, upload your resume in anyone job portal and send a mail to large number of recipients using cc and bcc options
3. To open and read newspaper sites, TV program schedules using search engine. Also to verify a university/college detail by opening their websites
4. Prepare a document with different font styles, font sizes, paragraph formatting, header and footer
5. Insert a table to do Data entry, Alignment, Inserting and deleting rows and columns and change of table format
6. Create a new document using templates
7. Insert various charts for some data entry in spread sheet
8. To do manipulation in the students mark list (Total, Average, Result and Rank)
9. Create a presentation slide for any mathematics subject and apply animation
10. Create a presentation slide and use hyperlink

WEB REFERENCES:

1. <https://youtu.be/4vRazeA4UMc>
2. https://youtu.be/0vFLJM_UN14
3. https://youtu.be/WJe_oYa3itE

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	ABILITY ENHANC	23AEU02	CONSUMER RIGHTS	24	2

	ELEMENT -II				
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Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
Second	IV	50	-	50

Preamble

This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.

Course Outcomes

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

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Memorize the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K1
CO2	Explain the Consumer Protection Law in India	K2
CO3	Impart sound practical grounding about the practice of consumer law and the procedure followed	K3
CO4	Evaluate the regulations and legal actions that helps to protect consumers	K4
CO5	Analyse the knowledge and skills needed for a career in this field	K5

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	1
CO2	9	9	9	9	1	0	1
CO3	9	9	9	3	3	1	1
CO4	9	3	1	1	3	3	3
CO5	9	1	3	0	9	9	9
Total	45	31	31	22	17	13	15

Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	1.97	2.14	1.66	2.22	1.69	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT: I Conceptual Framework (8 Hours)

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. **Experiencing and Voicing Dissatisfaction:** Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

UNIT: II The Consumer Protection Law in India (8 Hours)

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT: III Grievance Redressal Mechanism under the Indian Consumer Protection Law (8 Hours)

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement

of order, Appeal; Offences and penalties. **Leading Cases decided under Consumer Protection law by Supreme Court/National Commission:** Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT: IV Role of Industry Regulators in Consumer Protection (6 Hours)

- i. Banking: RBI and Banking Ombudsman
- ii. Insurance: IRDA and Insurance Ombudsman
- iii. Telecommunication: TRAI
- iv. Food Products: FSSAI
- v. Electricity Supply: Electricity Regulatory Commission
- vi. Real Estate Regulatory Authority

UNIT: V Contemporary Issues in Consumer Affairs (6 Hours)

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs*, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure*, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). *Consumer Protection in India: Issues and Concerns*, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), *Consumer is King*, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book,

9. ebook, www.consumeraffairs.nic.in

10. *The Consumer Protection Act, 1986 and its later versions.* www.bis.org

Articles

1. Misra Suresh, (Aug 2017) “Is the Indian Consumer Protected? One India One People.
2. Raman Mittal, Sonkar Sumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal of Consumer Policy.
3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.
4. Kapoor Sheetal (2013) “Banking and the Consumer” Akademos (ISSN 2231-0584)
5. Bhatt K. N., Misra Suresh and Chadah Sapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.
6. Kapoor Sheetal (2010) “Advertising-An Essential Part of Consumer’s Life-Its Legal and Ethical Aspects”, Consumer Protection and Trade Practices Journal, October 2010.
7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.

Periodicals

1. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
2. Recent issues of magazines: International Journal on consumer law and practice, National Law School of India University, Bengaluru
3. ‘Consumer Voice’, Published by VOICE Society, New Delhi.

WEB REFERENCES:

www.ncdrc.nic.in

www.consumeraffairs.nic.in

www.iso.org.

www.bis.org.in

www.consumereducation.in

www.consumervoice.in

www.fssai.gov.in

www.cercindia.org

SEMESTER - V

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART	CORE -	23MAU14	ABSTRACT	72	5

III	XIV		ALGEBRA		
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Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To enable the students to learn and gain knowledge about Sets, Groups and Rings.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definition and basic ideas of Sets, Mappings, Groups, Rings and Ideals.	K₁
CO2	interpret the basic concepts of Abstract Algebra.	K₂
CO3	apply theoretical ideas of set theory and group theory for solving the simple problems .	K₄
CO4	analyze the various theorems and lemmas for groups and Rings .	K₃
CO5	evaluate the simple problems of set theory ,Group theory and ring theory.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	1	1	1
Total	45	45	39	39	17	17	16

Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	2.22	2.21	2.65

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: SETS AND GROUPS (12 Hours)

Sets – Mappings – The integers.

Groups: Abelian group, Symmetric group Definitions and Examples – Basic properties.

UNIT II: SUB GROUPS (15 Hours)

Subgroups – Cyclic subgroup - Index of a group – Order of an element – Fermat theorem - A Counting Principle - Normal Subgroups and Quotient Groups.

UNIT III: HOMOMORPHISMS OF GROUPS (15 Hours)

Homomorphisms – Cauchy’s theorem for Abelian groups – Sylow’s theorem for Abelian groups Automorphisms – Inner automorphism - Cayley’s theorem, permutation groups.

UNIT IV: RINGS (15 Hours)

Rings: Definition and Examples –Some Special Classes of Rings – Commutative ring – Field – Integral domain - Homomorphisms of Rings.

UNIT V: IDEALS AND QUOTIENT RINGS (15 Hours)

Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of Quotients of an Integral Domain.

TEXT BOOK

Herstein.I.N (2014)—“Topics in Algebra”, 2nd edition, John Wiley & Sons, New York

UNIT	CHAPTER	SECTION
I	1,2	1.1-1.3, 2.1-2.3
II	2	2.4-2.6

III	2	2.7-2.10
IV	3	3.1-3.3
V	3	3.4-3.6

REFERENCE BOOKS

1. Fraleigh John .B (1986) - “An First course in Abstract Algebra”, Narosa Publishing House ,New Delhi Madras Bombay Calcutta.
2. Arumugam and Issac A.T (2003) - “Scitech Publishing (India) Pvt Ltd.
3. Vasishtha A.R (1994 – 95) - “Modern Algebra”, Krishna Prakashan Mandir, Meerut.

WEB REFERENCES:

<https://www.youtube.com/watch?v=maACVONq5IU>

<https://www.youtube.com/watch?v=BVf5FFIbaaQ>

<https://www.youtube.com/watch?v=KCSZ4QhOw0I>

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjkt->

[bSjpfzAhV63jgGHSgfAGsQFnoECAyQAQ&url=https%3A%2F%2Fwww.slideshare.net%2FYuriyMaturin%2Fabstract-algebra-58750320&usq=AOvVaw0SOjw-8D-gD_ZB6FM2ekVH](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjkt-bSjpfzAhV63jgGHSgfAGsQFnoECAyQAQ&url=https%3A%2F%2Fwww.slideshare.net%2FYuriyMaturin%2Fabstract-algebra-58750320&usq=AOvVaw0SOjw-8D-gD_ZB6FM2ekVH)

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XV	23MAU15	REAL ANALYSIS - I	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To enable the students to learn and gain knowledge about Real number system and Point set topology.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of upper bounds, lower bounds, countable sets, uncountable sets, open sets, closed sets and metric space.	K ₁
CO2	Explain the concepts of upper bounds, lower bounds, countable sets, uncountable sets, open sets, closed sets and metric space.	K ₂
CO3	Apply the concepts of limits for a vector – valued functions, finite and infinite sets for countable and uncountable sets, adherent points, accumulation points, interior points in open and closed sets.	K ₃
CO4	Analyze the concepts of countable sets, uncountable sets, open sets, closed sets, adherent points and accumulation points.	K ₄
CO5	Verify the concepts of upper bounds, lower bounds, supremum, infimum for real number system, relations, functions, Open balls, open sets, Closed sets, Adherent points, Accumulation points.	K ₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	1	3	1	3	0
CO2	9	9	1	3	1	3	0
CO3	9	9	9	9	1	9	0
CO4	9	9	9	9	1	9	0
CO5	9	9	9	9	1	9	0
Total Contribution of COs to POs	45	45	29	33	5	33	0
Weighted Percentage of COs contribution to POs	2.64	2.86	2.00	2.49	0.65	4.29	0.00

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: THE REAL AND COMPLEX NUMBER SYSTEMS

(15 Hours)

The Real and Complex number systems : Introduction - The field axioms, the order axioms – Integers –The unique Factorization theorem for integers –Rational numbers –Irrational numbers –Upper bounds, maximum Elements, least upper bound –The completeness axiom – Some properties of the supremum – The Archimedian property of the real number system – Absolute values and the triangle inequality –The Cauchy-Schwarz inequality .

UNIT II: BASIC NOTIONS OF SET THEORY

(15 Hours)

Basic notions of set theory : Introduction - Relations and functions - Further terminology concerning functions –One –one functions and inverses –Composite functions –Sequences – Similar sets-Finite and infinite sets –Countable and uncountable sets –Uncountability of the real number system –Set algebra - Countable collection of countable sets.

UNIT III: ELEMENTS OF POINT SET TOPOLOGY (15 Hours)

Elements of point set topology: Introduction - Euclidean space \mathbb{R}^n –Open balls and open sets in \mathbb{R}^n . The structure of open Sets in \mathbb{R}^1 –Closed sets - Adherent points- Accumulation points - closed sets and adherent points -The Bolzano Weierstrass theorem – The Cantor intersection Theorem.

UNIT IV: ELEMENTS OF POINT SET TOPOLOGY (15 Hours)

Covering –Lindelof covering theorem –the Heine Borel covering theorem – Compactness in \mathbb{R}^n –Metric Spaces –Point set topology in metric spaces –Compact subsets of a metric space – Boundary of a set.

UNIT V: LIMITS (12 Hours)

Limits: Introduction - Convergent sequences in a metric space –Cauchy sequences – Complete metric Spaces. Limit of a function - Limit of a vector valued functions.

TEXTBOOK

APOSTOL.T.M – (2002) “Mathematical Analysis”, 2nd edition, 20th Reprint., Addison-Wisely, Narosa Publishing Company, Chennai.

UNIT	CHAPTER	SECTION
I	1	1.1-1.3, 1.6-1.12, 1.14, 1.18, 1.19
II	2	2.1, 2.5-2.15.
III	3	3.1-3.9.
IV	3	3.10-3.16
V	4	4.1- 4.5, 4.7.

REFERENCE BOOKS

1. Goldberg.R.R –(1990), “Methods of Real Analysis”, NY, John Wiley, New York.
2. Simmons.G.F – (1963), “Introduction to Topology and Modern Analysis”, McGraw – Hill, New York.

WEB REFERENCES:

1. <https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/>
2. <https://www.jirka.org/ra/>
3. <https://www.macalester.edu/aratra/>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XVI	23MAU16	COMPLEX ANALYSIS – I	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To enable the students to learn complex functions, mappings and complex integration.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of complex functions, power series, simple mappings and complex integration.	K ₁
CO2	explain the differentiability and analyticity of complex functions, properties of complex function, convergence of power series, conformal mapping and contour integrals.	K ₂
CO3	apply the theorem and results to solve a variety of problems arising in analytic function.	K ₃
CO4	analyze the linear transformations, conditions for differentiability, conformal mapping and convergence of power series.	K ₄

CO5	evaluate integrals of analytic functions and the effect of various transformations and mappings.	K₅
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K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	1
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	9	3	1	1	0
Total Contribution of COs to POs	45	45	45	39	11	11	6
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	2.94	1.44	1.43	0.99

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: COMPLEX NUMBER SYSTEM

(12 Hours)

Complex number –Field of Complex numbers – Conjugation –Absolute value -Argument – Simple Mappings.

i) $w = z + \alpha$ ii) $w = az$ iii) $w = 1/z$ - invariance of cross-ratio under bilinear transformation – Definition of extended complex plane – Stereographic projection.

UNIT II: ANALYTIC FUNCTIONS

(15 Hours)

Limit of a function –Continuity –Differentiability – Analytical function defined in a region –
Necessary conditions for differentiability –Sufficient conditions for differentiability –

Cauchy-Riemann equation in polar coordinates –Complex function as a function of z and \bar{z}

UNIT III: POWER SERIES AND ELEMENTARY FUNCTIONS (15 Hours)

Absolute convergence –Circle of convergence –Analyticity of the sum of power series in the Circle of convergence (term differentiation of a series)

Exponential, Logarithmic, Trigonometric and Hyperbolic functions.

UNIT IV: ELEMENTARY AND CONFORMAL MAPPING (15 Hours)

Conjugate Harmonic functions: Definition and determination, Conformal Mapping:

Isogonal mapping –Conformal mapping-Mapping $z \rightarrow f(z)$, where f is analytic, particularly the

Mappings: $w = e^z$; $w = z^{1/2}$; $w = \sin z$, $w = \cos z$

UNIT V: COMPLEX INTEGRATION (15 Hours)

Simply and multiply connected regions in the complex plane. Integration of $f(z)$ from definition along a curve joining z_1 and z_2 . Proof of Cauchy's Theorem (using Goursat's lemma for a simply connected region). Cauchy's integral formula for higher derivatives (statement only)-Morera's theorem.

TEXT BOOK:

Duraipandian.P and Kayalal Pachaiyappa (2014), "Complex analysis", S.Chand & Company PVT.Ltd. New Delhi.

UNIT	CHAPTER	SECTION
I	1	1.1 to 1.3, 1.6 to 1.9
	2	2.1 , 2.6 to 2.10,
	7	7.1& 7.10
II	4	4.1 to 4.10
III	6	6.1 to 6.11
IV	6	6.12 to 6.13
	7	7.5 to 7.9
V	8	8.1 to 8.9& 8.13

REFERENCE BOOKS:

1. Pillai.T.K.M. & Narayanan.S (1997)"Complex Analysis ", S.Viswanathan pvt ltd – Chennai.
2. Sharma.J.N. (2116),"Complex Analysis", Krishan Prakashan Media – Meerut.

WEB REFERENCES:

<https://nptel.ac.in/courses/111/103/111103070/>

<https://nptel.ac.in/courses/111/107/111107056/>

<https://nptel.ac.in/courses/122/103/122103012/>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XVII	23MAU17 A/ 23MAU17 B/ 23MAU17 C	INSTITUTIONAL TRAINING/ARTICLE SHIP TRAINING/MINI PROJECT	-	1

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	100	-	100

Preamble

To enable the students to learn and gain knowledge about their principal areas of study.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts related to the project work	K ₁
CO2	illustrate the knowledge about their principal areas of project work	K ₂
CO3	applying the relative notions in the respective areas and finding the results	K ₃
CO4	analyzing results with the existing results	K ₄

CO5	interpreting the results with suitable examples	K₅
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K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	33	33	33
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	4.31	4.29	5.46

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XIX ELECTIVE - I	23MAU18A	OPERATIONS RESEARCH-I	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To enable the students to learn decision making problems based on deterministic and probabilistic models.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	outline the meaning, purpose and tools of Linear programming, Transportation, Assignment and Replacement models.	K ₁
CO2	explain the procedures for Linear programming, Transportation, Assignment and Replacement Theory.	K ₂
CO3	illustrate the methodologies to get the optimal solution and the period of replacement.	K ₃
CO4	measure the mathematical background of Linear programming, minimum Transportation cost, Assignment techniques and the mechanism behind	K ₄

	the sudden failure of systems.	
CO5	evaluate different situations after the solution of Linear programming, Transportation, Assignment and Replacement models.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.64	2.48	2.27	2.34	2.88	2.86	3.64

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: LINEAR PROGRAMMING PROBLEM (12 HOURS)

Introduction-Linear Programming Problem - Mathematical formulation of the problem–Illustrations on Mathematical formulation of LPP’s-Graphical method - Principles of Simplex method.

UNIT II:ARTIFICIAL VARIABLE TECHNIQUE (12 HOURS)

Use of Artificial Variables-Two phase method-Big M method

UNIT III: TRANSPORTATION PROBLEM (12 HOURS)

Solution of a Transportation problem-Finding an IBFS-Test for Optimality-MODI Method-Some Exceptional Cases.

UNIT IV: ASSIGNMENT PROBLEM

(12 HOURS)

Introduction-Mathematical Formulation of the Problem-Solution methods of Assignment Problem-Special Cases in Assignment Problem.

UNIT V: REPLACEMENT

(12 Hours)

Introduction - Replacement of equipment / assets that deteriorates gradually - Replacement of equipment that fails suddenly and problems.

Text Book:

Kantiswarup, P. K. Gupta, Man Mohan (2017) –“ Operations Research”, 18th Revised edition, S. Chand & Sons Education Publications, New Delhi,

UNIT	CHAPTER	PAGE
I	2	39-46
	3	65-78
	4	99-105
II	4	106-114
III	10	252-281
IV	11	295-311
V	18	477-495

REFERENCE BOOKS

1. DharaniVenkata Krishnan .S – “ Operations Research Principles and Problems”
Keerthi publishing house PVT Ltd.
2. Prem Kumar Gupta D. S. Hira – “Operations Research “ , S. Chand & Company
Ltd, Ram Nagar, New Delhi.

WEB REFERENCES:

https://www.youtube.com/watch?v=Hw2CP_4iK4U

<https://www.youtube.com/watch?v=vKVkOpNDZ2s>

<https://www.slideshare.net/mplad/two-phase-method-linear-programming>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE - XIX ELECTIVE - I	23MAU1 8B	APPLIED ALGEBRA - I	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	25	75	100

Preamble

To enable the students to learn and gain knowledge about the mathematical logic and algebraic structures, Lattices and Boolean Algebra.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of logical operations, relations and functions, graphs, lattices and Boolean functions.	K ₁
CO2	illustrate the properties of logical operations, relations and functions, graphs, lattices and Boolean functions.	K ₂
CO3	apply the various formulae to solve the rules of tautology, rules of inference, properties of functions, groups and Boolean algebra.	K ₃
CO4	examine the relation between tautology and	K ₄

	contradiction, Subgroup and normal Subgroup.	
CO5	evaluate the problems based on logical expressions, relations, functions and Boolean algebra.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.64	2.48	2.27	2.34	2.88	2.86	3.64

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: MATHEMATICAL LOGIC

(12 HOURS)

Connections well formed formulas – Tautology - Equivalence of Formulas - Tautological implications - Duality law - Normal forms.

UNIT II: THEORY OF INFERENCE

(12 HOURS)

Theory of inference - predicate calculus - Variables – Quantifiers - Free and bound Variables - Theory of inference of predicate calculus.

UNIT III: RELATIONS AND FUNCTIONS (12 HOURS)

Composition of relations - Composition of functions - Inverse functions - Hashing functions - Permutation function.

UNIT IV: ALGEBRA STRUCTURES (12 HOURS)

Semi groups - Free semi groups – Monoids – Groups - Cosets - Sets - Normal subgroups - Homomorphism.

UNIT V: LATTICES AND BOOLEAN ALGEBRA (12 HOURS)

Partial ordering - Poset – Lattices - Boolean algebra - Boolean functions - Theorems - Minimisation of Boolean functions.

TEXT BOOK

Veerarajan.T(2114) - “ Discrete Mathematics with Graph theory and Coimbinatorics”, McGraw Hill Education(India) Pvt. Ltd, New Delhi.

UNIT	CHAPTER	PAGE NUMBER
I	1	1-24
II	1	27-45
III	2, 4	66-68, 182-210,217
IV	5	232-242, 261-268
V	2	96-109, 114-117, 121-137

REFERENCE BOOK:

J.P Tremblay and R.P Manohar (1975)-“Discrete Mathematical Structures with applications to computer science”, Mc.Graw Hill.

WEB REFERENCES:

1. https://youtu.be/UM_i1Cs1Vzw
2. <https://youtu.be/fzd0Viu6Qx8>
3. <https://www.slideshare.net/rupalirana07/ch-2-lattice-boolean-algebra>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART - IV	SKILL ENHANCEMENT: II	23SEU02	LIFE SKILLS (Jeevan Kaushal)	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	50	-	50

PREAMBLE

To inculcate both personal and professional skills in the students in the areas of understanding of self and others, interpersonal skills, high performance teams, leadership potential, communication & presentation skills, techniques of problem solving, decision making, fostering creativity and innovation for personal and professional excellence, stress management, time management and conflict management and inculcation of human values.

COURSE OUTCOME:

After completion of the course, the learners will be able to:

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Identify the common communication problems, what good communication skills are and what they can do to improve their abilities	K1
CO2	Demonstrate communication through the digital media	K2
CO3	Prepare themselves to situations as an individual and as a team.	K3

CO4	Analyse various leadership models, strengths and abilities to create their leadership vision	K4
CO5	Appraise their potential as human beings and conduct themselves properly in the ways of the world.	K5

**K₁ – Remember; K₂ – Understand; K₃ – Apply; K₄ – Analyze;
K₅ – Evaluate; K₆ – Create.**

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	9	3	1	3	3	1
CO 2	1	9	3	1	3	9	1
CO 3	1	3	3	3	9	3	3
CO 4	1	3	3	3	9	9	3
CO 5	1	3	3	1	3	1	9
Total	7	27	15	9	27	25	17
Contribution of COs to POs							
Weighted Percentage of COs Contribution to POs	0.41	1.72	1.03	0.68	3.53	3.25	2.81

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: (8 Hours)

Communication Skills: Listening, Speaking, Reading, Writing and different modes of writing

UNIT – II: (7 Hours)

Digital Communication and Presentation Skills: Digital Literacy, Effective use of Social Media, Non-verbal communication, Presentation Skills

UNIT – III

(7 Hours)

Team Skills: Trust and Collaboration, Listening as a Team Skill, Brainstorming, Social and Cultural Etiquettes, Internal Communication

UNIT – IV

(7 Hours)

Leadership and Management Skills: Leadership Skills, Managerial Skills, Entrepreneurial Skills, Innovative Leadership and Design Thinking

UNIT – V

(7 Hours)

Universal Human Values:

Ethics and Integrity, Love & Compassion, Truth, Non-Violence, Righteousness, Peace, Service, Renunciation (Sacrifice)

TEXT BOOKS:

1. Sen Madhucchanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
2. Silvia P. J. (2007), How to Read a Lot, American Psychological Association, Washington DC
3. Sinek S. (2009). Start with Why: How Great Leaders Inspire Everyone to Take Action. Penguin
4. Kelly T., Kelly D. (2014). Creative Confidence: Unleashing the Creative Potential Within Us

REFERENCE BOOK:

1. Elkington, J., & Hartigan, P. (2008). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press

WEB REFERENCES:

- Developing Soft Skills and Personality
[:https://www.youtube.com/playlist?list=PLzf4HHIsQFwJZel_j2PUy0pwjVUgj7KIJ](https://www.youtube.com/playlist?list=PLzf4HHIsQFwJZel_j2PUy0pwjVUgj7KIJ)
- Course on Leadership - <https://nptel.ac.in/courses/122105021/9>
- <https://www.ugc.ac.in/e-book/SKILL%20ENG.pdf>
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - .
"A Leader Should Know How to Manage Failure" – www.youtube.com/watch?v=laGZaS4sdeU
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15

- How to Build Your Creative Confidence, Ted Talk by David Kelly -
https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART V	PROFICIENCY ENHANCEMENT	23PEMAU01	FINANCIAL MATHEMATICS (SELF STUDY)	-	2

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
Third	V	-	100	100

Preamble

To enable the students to gain the knowledge about simple interest and compound interest, Annuities, Mean Median, Mode, Transportation problem and Forecasting methods.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of simple interest and compound interest, Annuities, Mean Median, Mode, Transportation problem and Forecasting methods.	K ₁
CO2	explain the basic concepts of simple interest and compound interest, Annuities, Mean Median, Mode, Transportation problem and Forecasting methods.	K ₂
CO3	apply various formulae to solve the problems on simple interest and compound interest, Annuities, Mean Median, Mode, Transportation problem and Forecasting methods.	K ₃

CO4	analyze the relations between Mean Median, Mode and Forecasting methods	K₄
CO5	evaluate the problems on simple interest and compound interest, Annuities, Mean Median, Mode, Transportation problem and Forecasting methods.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	1	3	3
CO4	9	9	9	9	1	3	3
CO5	9	9	9	9	0	3	3
Total	45	45	45	45	8	27	15
Contribution of COs to POs							
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	1.05	3.51	2.48

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I : MATHEMATICS OF FINANCE

Simple Interest. -Compound Interest.

UNIT II : MATHEMATICS OF FINANCE

Annuities- Present value of annuities- Sinking Fund –Discounting

UNIT III : MEASURE OF CENTRAL TENDENCY

Mean Median, Mode, Geometric Mean and Harmonic Mean - Merits and demerits.

UNIT IV : TRANSPORTATION PROBLEM

Transportation problem – North West corner method- Least cost method – Vogel’s approximation method

UNIT V:FORECASTING

Forecasting methods- Moving averages- Weighted moving Averages-Exponential smoothing.

TEXT BOOKS

- 1.Navnitham. P.A.(2012) - “Business mathematics and statistics”, Jai publishers, Trichy.
2. Manmohan, P.K. Gupta, Kanthiswarup, S(2016) –“Operations Research”, Chand & sons.

UNIT	BOOK	CHAPTER	PAGE
I	I Part-I	2	43-64
II	I Part-I	2	65-88
III	I Part-II	7	159-270
IV	II	10	247-258
V	II	31	915-923

REFERENCE BOOKS

1. Gupta. S.P.(2016-17) - “Statistical Methods”, Sultan Chand & Sons, New Delhi.
2. Guptha ,C.B and Vijay Guptha (1988) - “Introduction to Statistical methods”.
3. 1. Hamdy A Taha (2002) – “Operations Research”, 7thedition, Pearson Education.

SEMESTER – VI

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XX	23MAU19	LINEAR ALGEBRA	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to learn and gain knowledge about linear algebra and linear transformations.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions and preliminaries in Vector space, Basis, Dual spaces, Inner product spaces.	K₁
CO2	explain the basic concepts of Linear Algebra	K₂
CO3	apply conceptual ideas of Linear Algebra in simple problems.	K₃
CO4	analyze the theorems and inequalities on linear functions and linear functional .	K₄

CO5	evaluate the characterization of linear vectors, linear transformations and linear functional.	K₅
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K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	1	1	1
Total Contribution of COs to POs	45	45	39	39	17	17	17
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	2.22	2.21	2.81

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: VECTOR SPACES AND SUBSPACES

(15 Hours)

Group-Field-External and Internal compositions-Linear Algebra-
Definition-Subspaces-Linear Combination-Linear Span-Linear Sum-Internal Direct Sum-
Complementary Subspaces-Disjoint Spaces-External Direct Sum-Quotient Space-Elementary
Properties-Theorems related to vector spaces, Subspaces and Linear Span

UNIT II: LINEAR DEPENDENCE OF VECTORS AND BASIS (15 Hours)

Vector-Zero vector -Operation on vector –Vectors in C^n and R^n -Linearly dependent and Linearly independent-Basic theorems regarding linear dependent of vectors-Cauchy Schwarz’s inequality-Minkowski’s inequality.

Basis–Finitely generated spaces-Dimension co-ordinates-Existence theorem–Replacement theorem-Invariance of number of elements in a basis-Extension theorem-Theorems related to basis and dimension.

UNIT III: LINEAR TRASFORMATIONS (15 Hours)

Trasformations-Onto and into maps-One –one and many-one maps-Products of functions-Linear transformation-Isomorphisms-Kernal and range space of a linear map-Nulity and rank-Singular and non-singular transformation-linear operator-Invertible operator-Some theorems.

UNIT IV:LINEAR FUCTIONALS AND THE DUAL SPACE (15 Hours)

Linear functional and its examples-Dual space- Dual basis-Reflexivity-Annihilator-Transpose of a linear map-Theorems.

UNIT V:INNER PRODUCT SPACES (12 Hours)

Inner product-Norm-orthogonality-orthogonal and orthonormal sets-Angle between two vetors-Adjoint operator-Complete orthonormal set-Symmetric operator-T-invariant-Theorem and solved examples-Bessel’s inequality-Grahm Schmidt orthogonalization process.

Industry 4.0 – Foundations for Data Science Machine Learning.

1. <https://youtu.be/5qj8krSCezw>
2. <https://youtu.be/wyoS89J3ap4>

TEXT BOOK

Gupta.K. P.(1988) “Linear algebra”, Pragathi Prakashan Publishers , Meerut India limited.

UNIT	CHAPTER	PAGE NUMBER
I	2	6-26
II	3,4	48-57 , 73-91
III	5	111-136
IV	7	207- 232
V	10	273-296

REFERENCE BOOKS

1. Herstein, I.N. (2014) — “Topics in Algebra”, Second Edition, John Wiley & Sons, New York.
2. Sharama S.D - “Linear algebra” Kedarnath ramnath Publishers, Meerut.
3. Vasishtha A.R. (1994 – 95) — “Modern Algebra”, Krishna Prakashan Mandir, Meerut.

WEB REFERENCES:

1. <https://youtu.be/t5ckUuSsWe4>
2. <https://www.youtube.com/watch?v=ozwodzD5bJM>
3. <https://www.youtube.com/watch?v=j3YpNG1oBMo>

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXI	23MAU20	REAL ANALYSIS II	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to learn and gain knowledge about Continuity, Derivatives and Functions of Bounded variation.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of continuous functions, uniform continuous functions, connectedness,	K ₁

	derivatives and monotonic functions.	
CO2	explain the concepts of continuous functions, uniform continuous functions, connectedness, derivatives and monotonic functions.	K₂
CO3	Apply the concepts of monotonic functions for the functions of bounded variations, total variations, Continuity and inverse images of open or closed sets.	K₃
CO4	Analyze the concepts of continuity, uniform continuity, bounded variations, total variations.	K₄
CO5	Evaluate the problems based on Chain Rule, Rolles Theorem, Mean Value Theorem and Fixed Point Theorem.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	1	3	1	3	0
CO2	9	9	1	3	1	3	0
CO3	9	9	9	9	1	9	0
CO4	9	9	9	9	1	9	0
CO5	9	9	9	9	1	9	0
Total Contribution of COs to POs	45	45	29	33	5	33	0
Weighted Percentage of COs	2.64	2.86	2.00	2.49	0.65	4.29	0.00

contribution to POs							
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: CONTINUITY (15 Hours)

Continuous functions –Continuity of composite functions– Examples of continuous functions
- Continuity and inverse images of open or closed sets – Functions continuous on compact sets.

UNIT II: CONTINUITY (12 Hours)

Connectedness –Components of a metric space – Uniform continuity : Uniform continuity and compact sets –Fixed point theorem for contractions – Monotonic functions.

UNIT III: DERIVATIVES (15 Hours)

Introduction - Definition of derivative –Derivatives and continuity –Algebra of derivatives – the chain rule —Rolle’s theorem –The mean value theorem for derivatives – Intermediate value theorem for derivatives - Taylor’s formula with remainder.

UNIT IV: FUNCTIONS OF BOUNDED VARIATION (15 Hours)

Introduction -Properties of monotonic functions –Functions of bounded variation –Total Variation –Additive properties of total variation - Total variation on $[a, x]$ as a function of x – Functions of bounded variation expressed as the difference of increasing functions.

UNIT V: RIEMANN – STIELTJES INTEGRAL (15 Hours)

The Riemann - Stieltjes integral : Introduction –Notation –The definition of Riemann – Stieltjes integral –Linear properties –Integration by parts –Change of variable in a Riemann – Stieltjes integral –Reduction to a Riemann integral.

TEXTBOOK

Apostol T.M – (2002) “Mathematical Analysis”, 2nd edition, 20th Reprint., Addison-Wisely, Narosa Publishing Company, Chennai.

UNIT	CHAPTER	SECTION
I	4	4.8 - 4.9, 4.11 - 4.13
II	4	4.16 , 4.17, 4.19 - 4.21,4.23.

III	5	5.1 - 5.5, 5.9 - 5.12.
IV	6	6.1- 6.7.
V	7	7.1 - 7.7

REFERENCE BOOKS

1. Goldberg.R.R –(1990), “Methods of Real Analysis”, NY, John Wiley, New York.
2. Simmons.G.F – (1963), “Introduction to Topology and Modern Analysis”, McGraw – Hill, New York.

WEB REFERENCES:

1. <http://assets.press.princeton.edu>
2. <https://mathcs.org/analysis/reals>
3. <https://bookstore.ams.org>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXII	23MAU21	COMPLEX ANALYSIS – II	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to learn the immediate consequence of Cauchy’s theorem, analytic and meromorphic functions and contour integration.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the results of Cauchy's theorem, Taylor's and Laurent's series, singularities, residues and meromorphic function.	K₁
CO2	describe the results based on Cauchy's theorem, singularities, residues and meromorphic function.	K₂
CO3	examine the singularities, poles and residues of complex function, types of real definite integrals.	K₃
CO4	analyze the Taylor's and Laurent's expansion, behavior of a function at an isolated singularity and zeros and poles of meromorphic function.	K₄
CO5	evaluate the series expansion and roots of analytic functions and the real definite integrals.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	9	3	3	1
CO3	9	9	9	9	3	3	1
CO4	9	9	9	3	1	1	1
CO5	9	9	9	3	1	0	0
Total Contribution of COs to POs	45	45	45	33	11	10	4

Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	2.49	1.44	1.30	0.66
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I :RESULTS BASED ON CAUCHY’S THEOREM(I) (15 Hours)

Zeros of a function -Cauchy’s Inequality – Liouville’s theorem –Fundamental theorem of algebra –Maximum modulus theorem –Gauss mean value theorem –Gauss mean value theorem for a harmonic function on a circle .

UNIT II:RESULTS BASED ON CAUCHY’S THEOREM (II) (15 Hours)

Taylor’s series –Laurent’s series .

UNIT III:SINGULARITIES AND RESIDUES (15 Hours)

Singular point - Isolated singularities (Removable Singularity, pole and essential singularity) –Residues –Residue theorem.

UNIT IV:REAL DEFINITE INTEGRALS (15 Hours)

Evaluation using the calculus of residues – Integration on the unit circle –Integral with $-\infty$ and $+\infty$ as lower and upper limits with the following integrals:

- i) $P(x)/Q(x)$ where the degree of $Q(x)$ exceeds that of $P(x)$ at least by 2.
- ii) $(\sin ax) \cdot f(x)$, $(\cos ax) \cdot f(x)$, where $a > 0$ and $f(z) \rightarrow 0$ as $z \rightarrow \infty$ and $f(z)$ does not have a pole on the real axis.
- iii) $f(x)$ where $f(z)$ has a finite number of poles on the real axis.

Integral of the type $\int_x^{a-1} \frac{x}{1+x} dx$; $0 < a < 1$;

UNIT V:MEROMORPHIC FUNCTIONS (12 Hours)

Theorem on number of zeros minus number of poles –Principle of argument: Rouché’s theorem – Theorem that a function which is meromorphic in the extended plane is a rational function.

TEXT BOOK:

Duraipandian.P and Kayalal Pachaiyappa(2114), “Complex Analysis”, S.Chand and Company pvt.ltd, New Delhi.

UNIT	CHAPTER	SECTION
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I	8	8.10, 8.11
II	9	9.1 to 9.3, 9.13.
III	9	9.5 to 9.12, 9.13.
	10	10.1, 10.2 and 10.4.
IV	10	10.3 and 10.4.
V	11	11.1to 11.3 (Omit theorems 11.5 and 11.6)

REFERENCE BOOKS:

1. Pillai.T.K.M. & Narayanan.S (1997) ” Complex Analysis “, S.Viswanathan pvt ltd – Chennai.
- 2.Sharma.J.N. (2116), ”Complex Analysis”, Krishan Prakashan Media – Meerut.

WEB REFERENCES:

- <https://nptel.ac.in/courses/111/103/111103070/>
- <https://nptel.ac.in/courses/111/106/111106094/>
- <https://nptel.ac.in/courses/122/103/122103012/>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXIII ELECTIVE - II	23MAU22 A	OPERATIONS RESEARCH-II	60	3

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to understand various mathematical applications in industries-
Decision making for real time environment.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts, models and statements of Integer programming, Sequencing, Dynamic Programming, level of information and NLPP	K ₁
CO2	express the procedures and steps for Integer programming, Sequencing, Dynamic Programming, Information theory and NLPP	K ₂
CO3	examine the pure integer values, order of jobs, optimal solution and the level of information transmission	K ₃
CO4	inspect the Kuhn-Tucker conditions, optimality and the time to complete the jobs	K ₄
CO5	measure the mathematical arguments in a logical manner, Dynamic programming model and its applications in industry	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22

Weighted Percentage of COs contribution to POs	2.64	2.48	2.27	2.34	2.88	2.86	3.64
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT-I: INTEGER PROGRAMMING PROBLEM (14 Hours)

Introduction –pure and mixed IPP – Gomory’s all IPP method – Fractional cutmethod – All integer LPP- Mixd integer LPP.

UNIT-II:SEQUENCING PROBLEMS (12 Hours)

Introduction-Problem of sequencing - Basic terms used in sequencing- Processing n-jobs through 2 machines - Processing n –jobs through k machines - Processing 2 jobs through k machines (Problems only).

UNIT-III: DYNAMIC PROGRAMMING PROBLEM (10 Hours)

Dynamic Programming Problem – Recursive equation approach – D.P.P Algorithm – Solution of L.P.P by D.P.P.

UNIT-IV:NON-LINEAR PROGRAMMING PROBLEMS (12 Hours)

Formulating Non-linear Programming Problems – General NLPP – Lagrange multiplier – Hessian bordered Matrix – Kuhn Tucker Condition – Problems.

UNIT-V: INFORMATION THEORY (12 Hours)

Introduction – A measure of information – Entropy – the expected information – some properties of entropy functions – Joint and conditional entropies.

TEXT BOOK:

Kandiswarup, P. K. Gupta, Man Mohan (2017) –“ Operations Research”,18th Revised edition, S. Chand & Sons Education Publications, New Delhi.

UNIT	CHAPTER	PAGE
I	7	177 – 188
II	12	327-341
III	13	347-353
IV	27	823-840

		894 & 895 901 - 903
V	30	885 – 890

REFERENCE BOOKS:

1. DharaniVenkata Krishnan .S – “ Operations Research Principles and Problems”
Keerthi publishing house PVT Ltd.
- 2.Prem Kumar Gupta D. S. Hira – “Operations Research “ , S. Chand & Company
Ltd, Ram Nagar, New Delhi.

WEB REFERENCES:

https://www.youtube.com/watch?v=5_Xyp7NZVxU

<https://www.youtube.com/watch?v=EwcjyxuwUkI>

<https://www.slideshare.net/hakeemrehman/integer-programming-68158750>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXIII ELECTIVE - II	23MAU22B	APPLIED ALGEBRA -II	60	3

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to learn and gain knowledge about the Formal languages Automata Theory and Graph Theory .

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of grammars, operations, languages, graphs and trees.	K ₁
CO2	explain the concepts of grammars, operations, languages, graphs and trees.	K ₂
CO3	identify the different types of grammar in formal languages and graphs.	K ₃
CO4	analyze the problems based on directed and undirected graphs, formal languages and context free languages.	K ₄
CO5	evaluate the problems on regular expression, closure operations, context free languages, graphs and trees.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22

Weighted Percentage of COs contribution to POs	2.64	2.48	2.27	2.34	2.88	2.86	3.64
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT-I: FORMAL LANGUAGES AND AUTOMATA (15 HOURS)

Formal languages and Automata: Regular expressions - Types of grammar - Regular Grammar - Context free and sensitive grammars - Finite state automata.

UNIT-II: CLOSURE OPERATIONS (10 HOURS)

Closure operations

UNIT – III: CONTEXT FREE LANGUAGES (9 HOURS)

Context free languages

UNIT – IV:GRAPH THEORY (13 HOURS)

Graph Theory: Directed and undirected graphs - Paths - Reachability – Connectedness - Matric representation - Euler paths - Hamiltonian paths - Warshall’s Algorithm.

UNIT – V:TREES (13 HOURS)

Trees - Binary trees simple theorems and applications.

TEXT BOOK

1.Veerarajan.T(2114) - “Discrete Mathematics with Graph theory and Combinatorics”, McGraw Hill Education(India) Pvt. Ltd, New Delhi.

2.Rani Sironmoney(1984)-“Formal Languages and Automata”,The Christian Literature Society, Madras 600 003.

BOOK	UNIT	CHAPTER	PAGE
1	I	8	448-460, 462-469
2	II	3	21-28
2	III	4	29-52

1	IV	7	366-394, 396-398
1	V	7	415-416, 418-426

REFERENCE BOOKS:

1.P. Tremblay and R.P Manohar (1975) -“Discrete Mathematical Structures with applications to computer science”, Mc.Graw Hill.

2. J.K. Sharma (2105) - “Discrete Mathematics”, Second Edition, Macmillan India Ltd.

WEB REFERENCES:

1. <https://youtu.be/APRPT4KrzMA>
2. <https://youtu.be/sWsXBY19o8I>
3. <https://youtu.be/zeeDbFNFEeg>

CATEG ORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXIV ELECTIVE - III	23MAU23 A	GRAPH THEORY	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble :

To enable the students to learn and gain knowledge about Graph Theory.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall fundamentals of Graph Theory	K₁
CO2	demonstrate the concepts of graph theory	K₂
CO3	apply algorithms and procedures to solve the problems.	K₃
CO4	analyze the contexts in simple, directed, bipartite, planar, Eulerian and Hamiltonian graphs	K₄
CO5	evaluate the characterization of the graphs	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs contribution	2.64	2.86	2.69	2.94	1.31	1.30	1.66

to POs							
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Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: BASICS OF GRAPHS (12 Hours)

Graphs – Sub graphs – Degree of a vertex walks, paths and cycles in a Graphs – connectedness- cut vertex and cut edge.

UNIT II: EULERIAN, HAMILTONIAN AND BIPARTITE GRAPHS (12 Hours)

Euler and Hamiltonian Graphs – Algorithm for Eulerian circuits – Weighed graphs- Bipartite Graphs – Trees.

UNIT III: MATRICES AND VECTOR SPACES ASSOCIATED WITH GRAPHS

(12 Hours)

Matrix representation of a graph – Vector spaces associated with a graph – Cycle spaces and cut set space.

UNIT IV: PLANAR GRAPHS (12 Hours)

Planar graphs – Euler’s theorem on planar graphs – Characterization of planar graphs (no proof) of the difficult part of the characterization.

UNIT V: DIRECTED GRAPHS (12 Hours)

Directed graphs – Connectivity – Eulerian Digraphs – Tournaments.

TEXT BOOK

Choudum.S. A.(1987) “A First Course in Graph Theory”, Macmillan Publishers India limited.

UNIT	CHAPTER	SECTIONS
I	1	1.1- .7
II	2,3	2.1-2.4, 3.1&3.3
III	4	4.1- 4.4
IV	5	5.1, 5.2 & 5.5
V	7	7.1, 7.2, 7.4& 7.5

REFERENCE BOOKS

- 1.Narasimha Deo,(1995) –“Graph Theory”, Prentice Hall of India.
2. Harary(1988) –“Graph Theory”, Narosa Publishing HQCK.

WEB REFERENCES:

1. https://www.tutorialspoint.com/graph_theory/graph_theory_fundamentals.htm
2. https://www.tutorialspoint.com/graph_theory/graph_theory_traversability.htm
3. https://en.wikipedia.org/wiki/Planar_graph

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART III	CORE – XXIV ELECTIVE - III	23MAU23B	FUZZY MATHEMATICS	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	25	75	100

Preamble

To enable the students to learn the fuzzy set theory, fundamentals of fuzzy algebra.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of fuzzy algebra.	K ₁
CO2	Interpret the theoretical ideas of fuzzy algebra.	K ₂
CO3	apply the concepts of fuzzy subsets, fuzzy mappings,	K ₃

	fuzzy relations, fuzzy logic, fuzzy groups, fuzzy rings on simple problems.	
CO4	analyze fuzzy subgroup and Preimage of subgroupiod.	K₄
CO5	evaluate the features of fuzzy subsets, fuzzy mappings, fuzzy relations, fuzzy logic, fuzzy groups, fuzzy rings.	K₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	0
CO5	3	3	3	1	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs contribution to POs	2.64	2.86	2.69	2.94	1.31	1.30	1.66

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I:

(12 Hours)

Introduction – Fuzzy subsets – Lattices and Boolean algebras – L fuzzy sets – operations on fuzzy – α level sets – properties of fuzzy subsets.

UNIT II: (12 Hours)

Algebraic product and sum of two fuzzy subsets – properties satisfied by Addition and product – Cartesian product of fuzzy subsets.

UNIT III: (12 Hours)

Introduction – Algebra of fuzzy relations – logic – connectives.

UNIT IV: (12 Hours)

Some more connectives – Introduction – fuzzy subgroup – homomorphic image and preimage of subgroupoid.

UNIT V: (12 Hours)

Fuzzy invariant subgroups - fuzzy subrings.

TEXTBOOK

S. Nanda and N.R. Das Fuzzy Mathematical Concepts, Narosa Publishing House, New Delhi, 2010.

UNIT	CHAPTER	PAGE NUMBER
Unit - I	Chapter 1	Section : 1.1, 1.2, 1.4, 1.5, 1.7, 1.9, 1.10.
Unit – II	Chapter 1	Section : 1.11 – 1.13
Unit - III	Chapter 2	Section : 2.1 – 2.4
Unit - IV	Chapter 2 & 3	Section : 2.5 & 3.1 – 3.3
Unit - V	Chapter 3	Section : 3.4, 3.5

REFERENCE BOOK

1. M.Ganesh, Introduction to Fuzzy sets & Fuzzy logic, Prentice Hall of India Pvt. Ltd.,
2. John N. Mordeson and Premchand S. Nair, Fuzzy Mathematics, Springer verlong, 2001.

WEB REFERENCES:

1. <https://youtu.be/LUz-FbwPh3Q>
2. <https://youtu.be/IZWTduVCrf8>
3. https://en.wikipedia.org/wiki/Fuzzy_mathematics

CATEGORY	COURSE TYPE	COURSE CODE	COURSE TITLE	CONTACT HOURS	CREDIT
PART IV	SKILL ENHANCEMENT - III	23SEMAU03	LATEX - PRACTICAL	36	2

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
Third	VI	50	-	50

Preamble :

To enable the students to get experienced about Typesetting Latex

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Memorize the commands and environments provided in Latex	K ₁
CO2	Express the mathematical formulae, equations and tables	K ₂

CO3	Demonstrate various environments	K₃
CO4	Analyze different document types	K₄
CO5	Construct different types of documents and latex beamer presentation	K₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	3	5	3
CO5	9	9	9	9	3	3	1
Total Contribution of COs to POs	45	45	45	45	33	35	30
Weighted Percentage of COs contribution to POs	2.64	2.86	3.10	3.39	4.31	4.55	4.97

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

LIST OF PRACTICAL

1. Using LaTeX, type a document in different ways (Left, Right, Center, Justify)
2. Using LaTeX environment, type the following text
 - (a) Numbering 1
 - Bullet 1
 - Bullet 2

(b) Numbering 2

i. Type 3

3. Using LaTeX environment, type the following text

1 Modern Algebra

1.1 Group

1.1.1 Subgroup

1.2 Ring

1.2.1 Homomorphism

4. Using LaTeX, type your own Curriculum Vitae.

5. Create the following table using LATEX:

S.No.	Register Number	Name of the Student	Percentage of Marks	Rank
1	XXXXXX	XXXXXX	XXXXX	XXXX
2	XXXXXX	XXXXXXX	XXXX	XXXX
3	XXXXXX	XXXXXX	XXXX	XXXXX

6. Using LaTeX, generate the following formula:

$$a_0 + \frac{1}{a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \frac{1}{a_4}}}} + \begin{pmatrix} a & b \\ c & d \end{pmatrix} + \sum_{\alpha=0}^{\infty} (\beta^\alpha + \Gamma^\alpha)$$

7. Using LaTeX, type the following Case Statements.

$$(a) x_\lambda = \begin{cases} x & \text{if } \lambda \text{ is an eigen value;} \\ -x & \text{if } -\lambda \text{ is an eigen value;} \\ 0 & \text{otherwise.} \end{cases}$$

$$(b) |x| = \begin{cases} x & \text{if } x \geq 0; \\ -x & \text{if } x < 0; \\ 0 & \text{otherwise.} \end{cases}$$

8. Using LaTeX, type the following Matrices

$$(a) \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix}$$

$$(b) B = \begin{matrix} & d_1 & d_2 & d_3 \\ s_1 & (0.6,0.2) & (0.6,0.2) & (0.3,0.4) \\ s_2 & (0.3,0.5) & (0.2,0.6) & (0.7,0.2) \\ s_3 & (0.1,0.8) & (0.2,0.7) & (0.7,0.2) \\ s_4 & (0.4,0.5) & (0.7,0.2) & (0.3,0.4) \\ s_5 & (0.1,0.7) & (0.1,0.8) & (0.2,0.7) \end{matrix}$$

9. Using LaTeX, type the following complicated mathematical structures.

$$(a) \int_0^{\infty} e^{-\rho} \rho^{2l} [L_{n+l}^{2l+1}(\rho)]^2 \rho^2 d\rho = \frac{2n[(n+l)!]^3}{(n-l-1)!}$$

$$(b) \sqrt{\sqrt{n!+\sqrt{45}}} + \int_0^x \int_{\sqrt{\sqrt{16}}}^x \sqrt{\sqrt{e^x}} dx + \frac{d^2 y}{dx^2}$$

10. Create a frame environment with title LaTeX Beamer presentation and include author name, institute, current date and footnote.

11. Include few figures in documents.

12. Create reference using bibliography environment and cite the references in a document.

WEB REFERENCES:

1. <https://www.overleaf.com/>
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi76srznJfzAhUMb30KHbe-DmEQFnoECFIQAQ&url=https%3A%2F%2Fen.wikibooks.org%2Fwiki%2FLaTeX&usg=AOvVaw2ArcMcGRJVL_9QatNg6A1h
3. <http://www.docs.is.ed.ac.uk/skills/documents/3722/3722-2014.pdf>

**SYLLABUS FOR VALUE ADDED COURSES
OFFERED BY DEPARTMENT OF MATHEMATICS**

S.NO	CLASS	NAME OF THE COURSE
1	I – B.Sc MATHEMATICS	VEDIC MATHEMATICS
2	II – B.Sc MATHEMATICS	PROGRAMMING IN C
3	III – B.Sc MATHEMATICS	NUMERICAL APTITUDE

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS	CLASS
VALUE ADDED COURSE		VEDIC MATHEMATICS	40	I – B.Sc MATHEMATICS

Preamble

To enable the students to learn and gain knowledge about Vedic Mathematics

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of vedic Mathematics	K ₁
CO2	explain the concept of Vedic Mathematics in subtraction, multiplication, addition, divition, square and cube .	K ₂
CO3	apply the Sutras of Vedic Mathematics to compute subtraction, multiplication, addition,divition,square, cubic and Linear	K ₃

	Equations.	
CO4	analyze the traditional method and vedic method.	K₄
CO5	evaluate the problems on Vedic Mathematics in subtraction, multiplication, addition, division, square , cube and Linear Equations.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT: I

Introduction – Sutras of Vedic Mathematics – Advantages of using Vedic Mathematics – Applications of Vedic Mathematics in the Modern World- Simplification by Traditional Method versus Vedic method – Comparison between Traditional Method and Vedic method-. Sutra for finding Square of a number-Conversion of Vulgar Fraction into Decimal.

UNIT: II ADDITION AND MULTIPLICATION

Addition-Multiplication-Subtraction of a number from an aadhar — Multiplication of two numbers close to an aadhar (base)Method– Cases : I , II and III- Division by 9-All from 9 and the last from 10 (Subtraction) – Cases : I , II and III.

UNIT: III MULTIPLICATION AND DIVISION

Two – digit Multiplication without carry - Two – digit Multiplication with carry over – Three – digit Multiplication- Division-When the remainder is positive and negative-Multiplication by 12-Divisibility by 4-Multiplication-Division-“Antyayordasakepi” sutra.

UNIT: IV LINEAR EQUATION

Linear Equation – “Shunyan Samyasadhaye” sutra- Solving Simultaneous Linear Equations (Anurupye Shunyamanyat & Sankalana Vyavkalanabhyam).- Roots of a Quadratic Equation-Roots of Cubic Equations-Roots of a Quadratic Equation.

UNIT: V SQUARE AND CUBE

Square of a number –Cube of a number-Rational Expression-Square root-Cube root.

TEXT BOOK:

Sumita Bose -2017 “Vedic Mathematics”– V&S Publishers, New Delhi.

Unit - I	Page: 19-28
Unit – II	Page: 62-65,29-36
Unit –III	Page: 37-45,68-71,79-86,102-104
Unit –IV	Page: 46-61
Unit – V	Page: 98-101, 105-107, 118-125

REFERENCE BOOK:

1.H.K. Gupta -2014 “Vedic Mathematics”– BPI Publishers, New Delhi.

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS	CLASS
VALUE ADDED COURSE		PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCE	40	II – B.Sc MATHEMATICS

Preamble

To enable the students to learn language skills, critical thinking and communicative skills in professional contexts

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To develop the language skills of students by offering adequate practice in professional contexts.	K₃
CO2	To enhance the lexical, grammatical, socio-linguistic and communicative competence students.	K₂
CO3	To focus on developing students’ language skills and knowledge of domain specific registers.	K₄
CO4	To develop strategic competence that will help in	K₅

	efficient communication.	
CO5	To sharpen students' critical thinking skills and make students culturally aware of the target situation	K₄

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: COMMUNICATION

1. Listening: Listening to instructions
2. Speaking: Telephone etiquette and official phone conversations
3. Reading: Short passages (3 passages, one from each—Physics, Chemistry, Mathematics/Computer Science)
4. Writing: Letters and Emails in professional context
5. Grammar in Context: •Wh and Yes/No questions •Question tags •Imperatives
6. Vocabulary: Word formation
 - i) Creating antonyms using Prefixes
 - ii) Intensifying prefixes (E.g inflammable)
 - iii) Changing words using suffixes
 - A) Noun Endings
 - B) Adjective Endings
 - C) Verb Endings

UNIT II: DESCRIPTION

1. Listening: Listening to process description
2. Speaking: Role play Formal:
 - With faculty and mentors in academic environment
 - Workplace communication Informal:
 - With peers in academic environment
 - Workplace communication
3. Reading: Reading passages on products, equipment and gadgets
4. Writing: Writing sentence definitions (e.g. computer) and extended definitions (e.g. artificial intelligence) Picture Description—Description of Natural Phenomena (100 words)
5. Grammar in Context: Connectives and linkers. Vocabulary: Synonyms (register)- Compare & contrast expressions.

UNIT III: NEGOTIATION STRATEGIES

1. Listening: Listening to interviews of specialists / inventors in the field (Subject specific)
2. Speaking: Brainstorming (mind mapping). Small group discussions (subject-specific)
3. Reading: Longer Reading text. (Comprehensive passages)
4. Writing: Essay Writing (250 word essay on topics related to subject area, like pollution, use of pesticides in cultivation, merits and demerits of devices like mobile phones, merits and demerits of technology in development)
5. Grammar in Context:
 - Active voice & Passive voice
 - If conditional
 - Vocabulary: i) Collocations ii) Phrasal verbs

UNIT IV: PRESENTATION SKILLS

1. Listening: Listening to presentations, listening to lectures, watching documentaries (discovery / history channel videos with subtitles)
2. Speaking: Short speech. Making formal presentations (PPT)
3. Reading: Reading a written speech by eminent personalities in the relevant field / short poems / short biography.
4. Writing: Writing Recommendations Interpreting visuals-charts/ tables/flow diagrams
5. Grammar in Context: Modals Vocabulary: Single word substitution (register)

UNIT V: CRITICAL THINKING SKILLS

1. Listening: Listening to advertisements/news and brief documentary films (with subtitles)
2. Speaking: Problem-Solution Speeches (Brief speeches). E.g. Should the use of public transport be promoted to curb pollution?
3. Reading: Motivational stories on Professional Competence, Professional Ethics and Life Skills (subject-specific)
4. Writing: Studying problems and finding solutions (Essay in 210 words)
5. Grammar: Framing simple sentences
6. Vocabulary: Fixed expressions

SUGGESTED ACTIVITIES

UNIT I

1. Listening: Links for formal conversation can be given-Gap filling exercises-Multiple Choice questions- Making notes.
2. Speaking: Role play activity
3. Reading: Note making. Note-Taking.
4. Writing: Guided Writing (developing hints) Email Writing
5. Grammar & Vocabulary: Worksheets-Games.

UNIT II

1. Listening: Process Descriptions (Processes of condensation and evaporation./Process of Measuring the thickness of a wire using a screw-gauge./process of extraction of sugar from sugarcane)
2. Speaking: Role Play Reading: Multiple choice questions-Evaluative answers- Classifying And labeling
3. Writing: Picture description-Description of natural phenomena (rainbow, earthquake, volcanic eruption, erosion, natural disasters in 100 words).
4. Grammar: Activities, Worksheets & Games
5. Vocabulary: Expansion of compound nouns

UNIT III

1. Listening: Gap filling exercises-Listening comprehension
2. Speaking: Debates Reading: Reading comprehension
3. Writing: Essay Writing
4. Grammar & Vocabulary: Activities, Worksheets & Games.

UNIT IV

1. Listening: Note taking (of listening & viewing items)-Filling a table based on the listening item.
2. Speaking: JAM, Presentations. (PPT-TECHNICAL)
3. Reading: Reading comprehension
4. Writing: Difference between recommendations and instructions Questions/MCQs based on graphs/flow diagrams/charts
5. Grammar & Vocabulary: Activities, Worksheets & Games.

UNIT V

1. Listening: Radio News/ TV News telecast
2. Speaking: Watch or listen to documentaries and ask questions
3. Reading: Reading motivational stories (success stories in subject area)
4. Writing: Essay writing.

5. Grammar&Vocabulary:Activities, Worksheets & Games

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS	CLASS
VALUE ADDED COURSE	***	NUMERICAL APTITUDE	40	III – B.Sc MATHEMATICS

Preamble

To enable the students to learn about the concepts of aptitude.

Course Outcomes

On the successful completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the formulae in numerical aptitude	K ₁
CO2	explain the procedure for solving the problems numerically.	K ₂
CO3	apply various formulae to obtain the numerical solutions.	K ₃
CO4	analyze the problems based on Ages and percentage.	K ₄
CO5	evaluate the solutions of simple problems on numbers ,ages and percentage.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I

Numbers-H.C.F and L.C.M of Numbers-Simplification

UNIT II

Square roots and Cube roots .

UNIT III

Problem on Numbers.

UNIT IV

Problem on Ages.

UNIT V

Percentage- Concept of percentage.

TEXT BOOK:

Aggarwal R.S. (2012 Edition), Quantitative Aptitude for Competitive Examinations, S. Chand & Company Ltd, New Delhi

REFERENCE BOOKS:

1. Sijwali B. S.(2007), Quantitative Aptitude,Arihand Publications (India) PVT LTD.
2. AbhijitGuha(2006), Quantitative Aptitude for Competitive Examinations, McGraw Hill Companies.

**SYLLABUS FOR CERTIFICATE COURSE OFFERED
BY DEPARTMENT OF MATHEMATICS**

S.NO	CLASS	NAME OF THE COURSE
1	II – B.Sc MATHEMATICS	MATLAB

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS	CLASS
CERTIFICATE COURSE	***	MATLAB	40	II – B.Sc MATHEMATICS

COURSE CONTENT:

Unit-I

Introduction-Basics of MATLAB-Input-Output-File types-Platform dependence-
General commands

Unit-II

Interactive computation-Matrices and Vertices-Matrix array operations

Unit-III

Programming in MATLAB-Scripts and functions-Script files-Function files-Language
specific features-Advanced Data objects

Unit-IV

Plotting-Two-dimensional plots- Three dimensional plots

Unit-V

Applications-Linear algebra- Solving a linear system-Finding Eigen values and Eigen
vectors-Matrix Factorizations

Text Book: “Getting Started with MATLAB 7” Rudra Pratap, first Indian edition 2006.

Reference Book:

“An introduction to MATLAB” David.F.Griffiths, March 2015

**SYLLABUS FOR OPEN ELECTIVE OFFERED BY
DEPARTMENT OF MATHEMATICS**

S.NO	CLASS	NAME OF THE COURSE
1	OTHER DEPARTMENT UG	MATHEMATICS FOR BUSINESS

CATEGORY	COURSE TYPE	COURSE CODE	TITLE OF THE COURSE	CONTACT HOURS	CREDIT
OPEN ELECTIVE	CORE - XVIII		MATHEMATICS FOR BUSINESS	48	2

Preamble

To enable the students to learn Business Mathematics.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of sequence and series ,matrix, set theory, simple interest and compound interest.	K ₁
CO2	interpret sequence and series ,matrix, set theory, simple interest and compound interest.	K ₂
CO3	apply different quantitative models in solving business problems	K ₃
CO4	determine the solutions of the problems based on matrix , simple interest and compound interest problems	K ₄
CO5	evaluate the problems on sequence and series ,matrix, set theory, simple interest and compound interest problems.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	0
CO5	3	3	3	1	0	0	0

Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs contribution to POs	2.29	2.10	1.86	1.28	1.31	0.91	0.83

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I: SERIES

(10 Hours)

Sequence and series - Arithmetic progression –Geometric progression – Arithmetic mean - Geometric mean – Harmonic mean.

UNIT II: MATRICES

(6 Hours)

Fundamental ideas about Matrices and their operational rules- Matrix Multiplication- Inverse of a matrix.

UNIT III: SET THEORY

(6 Hours)

Introduction- Types of sets- Set operation- Venn diagrams, Inconsistency of data.

UNIT IV: MATHEMATICS OF FINANCE

(7 Hours)

Simple Interest.

UNIT V: MATHEMATICS OF FINANCE

(7 Hours)

Compound Interest.

NOTE: No derivation and proof, simple problems only.

TEXT BOOK

Navnitham P.A (2012) – “Business Mathematics and Statistics”, Sultan Chand & Sons, New Delhi.

UNIT	CHAPTER	PAGE
I	1	1 -33.
II	4	147-184.
III	3	104-136.
IV	2	43-51.

V	2	51-61.
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REFERENCE BOOK:

Vittal.P.R (2002) - "Business Mathematics and Statistics, Margham publishers, Chennai.

WEB REFERENCES:

1. <http://www.mim.ac.mw/books/Business%20mathematics%20and%20statistics,%206th%20ed.pdf>
2. https://en.wikipedia.org/wiki/Business_mathematics
3. <https://youtu.be/pn2Fx9-G1Ds>

SYLLABUS FOR ADVANCED LEARNERS

S.NO	NAME OF THE COURSE
1	NUMERICAL TECHNIQUES
2	MATRIX THEORY
3	GROUP THEORY
4	PROGRAMMING IN C

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CREDIT
EXTRA CREDIT		NUMERICAL TECHNIQUES	4

Preamble

To enable the students to learn and gain knowledge about simultaneous linear algebraic equations , interpolation ,numerical differentiation and integration .

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of simultaneous linear algebraic equations , interpolation , numerical differentiation and integration.	K ₁
CO2	explain the concepts of simultaneous linear algebraic equations , interpolation , numerical differentiation and integration.	K ₂
CO3	apply different formulae to solve the problems on simultaneous linear algebraic equations , interpolation , numerical differentiation and integration.	K ₃
CO4	analyze simultaneous equations and interpolation.	K ₄
CO5	evaluate the problems based on Gauss Elimination Method ,Gauss Jordan Method, interpolation , numerical differentiation and integration.	K ₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COURSE CONTENT:

UNIT I: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS

Introduction – Gauss Elimination Method – Gauss Jordan Method – Inversion of a matrix using Gauss Elimination method

UNIT II: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS(cont...)

Method of Triangularisation method - Crout's method.

UNIT III: CENTRAL DIFFERENCE INTERPOLATION FORMULAE

Central Difference table – Gauss's forward interpolation formula - Gauss's backward interpolation formula

UNIT IV: NUMERICAL DIFFERENTIATION

Introduction – Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives – Problems

UNIT V: NUMERICAL INTEGRATION

Numerical Integration – The Trapezoidal Rule – Simpson's $1/3^{\text{rd}}$ and Simpson's $3/8^{\text{th}}$ Rules.

TEXT BOOK:

1. Dr.P.Kandasamy,Dr.K.Thilagavathi,Dr.K.Gunavathi(2005)-“Numerical Methods”, S.Chand & Company LTD, New Delhi-110055.

UNIT	CHAPTER	PAGE NUMBER
I	IV	112-126
II	IV	126-141
III	VII	231-240
IV	IX	281-283,286,287
V	IX	299-305,308-313

REFERENCE BOOKS:

1.Dr.Venkataraman.M.K. (2013) – “Numerical Methods in Science and Technology”, the National Publishing Company, Chennai.

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CREDIT
EXTRA CREDIT		MATRIX THEORY	4

Preamble

To enable the students to gain the knowledge about matrix theory.

Course Outcomes

On the successful completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the notions and definitions of matrices, determinants, adjoint matrix, ranks, eigen values and eigen vectors	K ₁
CO2	explain the concepts of matrices, determinants, adjoint matrix, ranks, eigen values and eigen vectors	K ₂
CO3	apply matrix theory to numerical problems	K ₃
CO4	examine ranks , orthogonality, eigen values , eigen vectors , Jordan canonical form, real quadratic form and the solution of system of simultaneous linear equations	K ₄
CO5	evaluate inverse matrix, ranks , orthogonality, eigen values , eigen vectors , Jordan canonical form, real quadratic form and the solution of system of simultaneous linear equations	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT - I: Matrix Types and operations

Types of Matrices- Matrix operations- Matrix equations

UNIT - II: Determinants

Minor, cofactor, Algebraic complement- Laplace's expansion – multiplication of determinants- Jacobi's theorems.

UNIT - III : Solution to System of linear equations

Adjoint or adjugate of a matrix – Cramer’s rule- Inverse of a matrix

UNIT - IV: Rank and orthogonality

Orthogonal and unilateral matrices- Rank of a matrix- Congruent matrix

UNIT - V: Eigenvalues and Eigen vectors

Cayley-Hamilton theorem- Minimal polynomial- Similarity of matrices –
Diagonalization – Jordan canonical form – Real quadratic form

TEXT BOOK

Dipak Chatterjee (2009) second edition-“Abstract Algebra”,PHI Learning Pvt. Ltd, New Delhi

Unit	Section	Page
I	8.1-8.3	245-256
II	8.4	257-268
III	8.5-8.7	268-276
IV	8.8-8.10	277-292
V	8.11	293-315

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CREDIT
EXTRA CREDIT		GROUP THEORY	4

Preamble:

To enable the students to learn and gain knowledge about types of Groups and some functions on groups.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recollect the definitions and fundamental ideas of various Groups and some functions on groups.	K₁
CO2	Illustrate the basic concepts on types of Groups.	K₂
CO3	apply theoretical ideas of set theory and group theory for solving the simple problems .	K₄
CO4	analyze the various theorems and lemmas for groups.	K₃
CO5	evaluate the simple problems of Group theory.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: GROUP (12 Hours)

Binary operations-Groups: Definitions and Examples – Basic properties.

UNIT II: SUB GROUPS (15 Hours)

Abelian group, Symmetric group , permutation groups ,alternating groups,Quaternion group

UNIT III:SOME SPECIAL GROUPS AND SUB GROUPS (15 Hours)

Klein’s Group Subgroups – Group of isometries- Symmetric group -I_sDihedral Group-Automorphism of group-Cyclic subgroup - Index of a group – Order of an element – Lagrange’s theorem .

UNIT IV: SUB GROUPS AND HOMOMORPHISMS (15 Hours)

Normal Subgroups –centralizer –normalizer- commutator-Quotient Groups -Homomorphism theorem.

UNIT V: REPRESENTATION THEOREMS (15 Hours)

Cayley’s theorem -Cauchy’s theorem – Sylow’s theorem

TEXT BOOK

Dipak Chaterjee (2009)—“Topics in Algebra”, 2nd edition, PHI Learning PVT ltd,New Delhi

UNIT	CHAPTER	SECTION
I	2	2.1 - 2.2
II	2	2.3.1 - 2.3.3
III	2	2.3.4 - 2.4.3
IV	2	2.4.4 - 2.5
V	2	2.6 - 2.8

REFERENCE BOOKS

- 1.Fraleigh John .B (1986) - “An First course in Abstract Algebra”,Narosa Publishing House ,New Delhi Madras Bombay Calcutta.
2. Arumugam and Issac A.T (2003) - “Scitech Publishing (India) Pvt Ltd.
3. Vasishtha A.R (1994 – 95) - “Modern Algebra”, Krishna Prakashan Mandir, Meerut.

CATEGORY	COURSE CODE	TITLE OF THE COURSE	CREDIT
EXTRA CREDIT		PROGRAMMING IN C	4

Preamble

To enable the students to learn and gain knowledge about C Programming such as its structure, data types, operators in C.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of c programming	K ₁
CO2	explain the concept of operator, expression, managing input, output operations- decision making	K ₂
CO3	identity the importance of c programming	K ₃
CO4	analyze the necessary features of operator, expression, managing input- output operations, decision making	K ₄
CO5	evaluate the values of mathematical function by using operators, expression, decision making and branching	K ₅

UNIT - I : Constants, Variable and Data Types

Introduction – Importance of C- Basic structure of C programming –Character set- Tokens- keywords and identifiers- Constants- Variables – Data types – Declaration of variable – Assigning values to a variable – Defining symbolic constant.

UNIT - II : Operators

Introduction - Arithmetic operators – relational operators- logical operators – assignment operators – increment and decrement operators – conditional operators- special operators.

UNIT - III : Expressions

Arithmetic expression – Evaluation of expressions – precedence of arithmetic operators – some computational problems – Type conversion in expression – operator precedence and associativity mathematical functions.

UNIT – IV: Managing Input – Output Operations

Introduction – Reading character- writing character – formatted input- formatted output.

UNIT –V: Decision Making and Branching

Introduction – Decision making with IF statement – simple IF statement –IF ELSE statement – Nesting of IF ELSE statement –ELSE IF ladder - the Switch statement - the ? Operator – the GOTO statement.

Text Book

E. Balaguruswamy, Programming in ANSI C, Third Edition, Tata McGrawHill Publishing Company Limited.

UNIT	CHAPTER	SECTION
I	1 & 2	1.1, 1.2, 1.8, 2.1 – 2.11
II	3	3.1 - .3.9
III	3	3.10 – 3.16
IV	4	4.1 -4.5
V	5	5.1 – 5.9

REFERENCE BOOKS:

1. Programming with Ansi and Turbo C – Ashok N.Kamthane (Pearson Education Publishers,2002)
2. Programming In C – Kris A.Jamsa (Galgotia Publications Pvt.ltd.1992)

SYLLABUS FOR ALLIED COURSES

SYLLABUS FOR ALLIED COURSES

SEMESTER - I

BUSINESS MATHEMATICS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	72	4

Preamble

To enable the students to gain the knowledge about the series, set theory, matrix, simple and compound interest, linear programming problem.

Course Outcomes

On the successful completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the notions and concepts of set theory, matrices, series, simple and compound interest and LPP	K ₁
CO2	classify interests, series, sets and matrices	K ₂
CO3	apply the formulae to solve the different business problems based on interests, series, matrix, sets and LPP	K ₃
CO4	examine series, sets and set operations, interests, matrix and matrix operations and LPP	K ₄
CO5	evaluate LPP using graphical method, set operations and the solution of system of simultaneous linear equations	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT - I: SERIES (12 Hours)

Sequence and series - Arithmetic progression –Geometric progression .

UNIT- II: SET THEORY (12 Hours)

Introduction- Types of sets- Set operation- Venn diagrams.

UNIT - III : MATHEMATICS OF FINANCE (12 Hours)

Basic concepts - Simple Interest and Compound Interest: Simple Interest – Formulae and problems – Compound Interest – Formulae and problems.

UNIT - IV: MATRICES, DETERMINANTS (12 Hours)

Definition of a matrix- Order of a matrix – Types of a matrix– Matrix operations: A System of Linear Equations – Determinants- Cramer’s Rule.

UNIT - V: LINEAR PROGRAMMING PROBLEM (12 Hours)

Introduction-meaning and scope -Limitations -Linear Programming Problem – Formulation of LPP – Solution by Graphical Method Solution.

NOTE: Distribution Of Marks: Theory 20%, Problem 80%.

TEXT BOOK

Navnitham. P.A.(2012) - “Business mathematics and statistics”, Jai publishers, Trichy.

Unit - I	Chapter 1	Page: 1-29
Unit - II	Chapter 3	Page: 104-126
Unit -III	Chapter 2	Page: 43-60
Unit -IV	Chapter 4	Page: 147-175
Unit -V	Chapter 9	Page: 328-345

REFERENCE BOOKS:

1. Sundaresan and Jayaseelan, (2013)- “ Introduction to Business Mathematics”, Sultan chand Co& Ltd, Newdelhi.
2. Sanchetti, D.C and Kapoor, V.K.(2011)- “ Business Mathematics” , Sultan chand Co& Ltd, Newdelhi.
3. G.K.Ranganath, C.S.Sampamgiram and Y.Rajan(1998)-“A Text book Business Mathematics-Himalaya Publishing House.

WEB REFERENCES:

1. <https://www.youtube.com/watch?v=xFAwNmq5nX8>

2. <https://youtu.be/pn2Fx9-G1Ds>
3. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjgnuGA9JbzAhVNgUsFHQ88BngQFnoECAyQAQ&url=https%3A%2F%2Fwww.slideshare.net%2FEShubina%2Fset-theory&usg=AOvVaw00ArORMHihl7hXEse-TTPj>
4. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQj5ek9JbzAhUYXSsKHWDJBh4QFnoECDQQAQ&url=https%3A%2F%2Fwww.craftonhills.edu%2Fcurrent-students%2Ftutoring-center%2Fmathematics-tutoring%2Fmatrices-cramers.pdf&usg=AOvVaw0eqkDuobIihESS3V0IVLKs>

B.Sc (CS) / B.Sc (IT) / BCA DEGREE PROGRAMME

MATHEMATICAL STRUCTURE FOR COMPUTER SCIENCE	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	3

Preamble

To enable the students to learn about Matrices ,Simultaneous Linear equations, Numerical Differentiation and Integration and also Measures of central tendency.

Course Outcome

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of Matrices, upper and lower triangular matrix, Numerical Differentiation and Integration, Measures of central tendency and Simultaneous algebraic equations.	K₁
CO2	explain the basic concepts of Matrices, Gauss Elimination, Gauss Jordon, Gauss Jacobi Methods, Gauss Seidel Methods and also Newton's forward & backward Difference Formula , Newton's cotes formula and also Measures of central tendency.	K₂
CO3	apply various formulae to solve the problems on Matrices, Numerical Differentiation and Integration, Measures of central tendency and algebraic equations.	K₃
CO4	analyze the relationship between mean , median , mode and Trapezoidal Rule & Simpson's rule	K₄
CO5	evaluate the problems under Matrices ,Simultaneous Linear equations, Numerical Differentiation and Integration and also Measures of central tendency.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: MATRIX (15 Hours)

Matrices – Introduction – Addition , Subtraction and Multiplication of Matrix –
Determination – Inverse of a matrix – Rank of a Matrix .

UNIT II: SIMULTANEOUS LINEAR ALGEBRAIC EQUATION (10 Hours)

System of Simultaneous Linear algebraic Equation . Gauss Elimination, Gauss
Jordan, Gauss Jacobi Methods, Gauss Seidel Methods.

UNIT III: NUMERICAL DIFFERENTIATION (10 Hours)

Newton’s forward Difference Formula - Backward Difference Formula – Stirling’s
formula.

UNIT IV: NUMERICAL INTEGRATION (10 Hours)

Introduction- Newton’s cotes formula - Trapezoidal Rule - Simpson’s 1/3 rule –
Simpson’s 3/8 rule.

UNIT V: MEASURES OF CENTRAL TENDENCY (15 Hours)

Mean, Median and Mode – Relationship among mean median and mode.

Note: Distribution of Marks: Theory 20% Problem 80%

TEXT BOOKS:

1. P.A.Navanitham (Revised Edition -2012) “Business Mathematics and Statistics”, Jai
Publishers, Trichy-21, April 2012.

(Unit I & V)

2. P.Kandasamy , K.Thilagavathy,K.Gunavathi. (Revised Edition -2005) “Numerical
Methods ” S.Chand & Company Ltd,Ram Nagar, New Delhi-110 055.

(Unit II & III & IV)

UNIT	BOOK	CHAPTER	PAGE
I	1	Part I	147-188.
II	2	4	112-121, 145-159.
III	2	9	280-290.
IV	2	9	299-317.
V	1	Part II	159-181,196-227.

REFERENCE BOOKS:

1. E. Balagurusamy –(2007) “Numerical Methods”, 22nd Edition ,Tata McGraw Hill, New
Delhi.

2. S. C. Gupta, V. K. Kapoor – (2007)“Fundamental of Mathematical Statistics”, 12th Edition, Sultan Chand & Sons, New Delhi.

WEB RESOURCES:

1. <https://youtu.be/J8dSwvPfEc4>
2. <https://www.slideshare.net/TausifShahanshah/presentation-on-numerical-integration>
3. <https://www.slideshare.net/CasperWendy/measures-of-central-tendency-mean-median-mode>

B.Sc (AI & ML) DEGREE PROGRAMME

DISCRETE MATHEMATICS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	3

Preamble

To enable the students to learn about Mathematical Logics, Relations and Functions, Combinatorics, Recurrence Relations and Lattices.

Course Outcome

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of logical operations, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K ₁
CO2	illustrate the properties of logical operations, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K ₂
CO3	apply the various formulae to solve the rules of tautology, rules of inference, properties of functions, Combinatorics, Recurrence Relations and Lattices.	K ₃
CO4	examine about logical operators, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K ₄
CO5	evaluate the problems based on logical expressions, relations, functions, Combinatorics, Recurrence Relations and Lattices..	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

UNIT I MATHEMATICAL LOGIC (15 hours)

Propositional Calculus – Basic Logical Operations – statements generated by set – conditional statements – biconditional statements – tautologies – contradiction – arguments – methods of proof – Equivalence and implication – Predicate Calculus – Quantifiers.

UNIT II RELATIONS AND FUNCTIONS: (10 hours)

Binary relations – types of relations - Partial Order relations - Equivalence Relations - Composition of Relations.

Definition and notation of a function – types of functions – invertible functions – Composition of functions - identity function.

UNIT III COMBINATORICS (15 hours)

Permutations – Combinations - Pigeonhole principle.

UNIT IV RECURRENCE RELATIONS (10 hours)

Introduction - Recurrence Relation –linear recurrence relations with constant coefficients – methods of solving with constant coefficients - non-homogeneous recurrence relations.

UNIT V LATTICES (10 hours)

Totally ordered set or chain - Product set and partial order relation – Hasse diagrams - Lattice– Properties of Lattices – duality – types of lattices.

Text Book:

Sharma.J.K. (Fifth Edition) – “Discrete Mathematics”, University Science Press (An imprint of Laxmi Publications Pvt. Ltd.)

REFERENCE BOOKS:

- 1.Tremblay.J.P.,Manohar.R.(1997) – “Discrete Mathematical Structures with Applications to Computer Science”, Mc Graw Hill Education (India) Pvt.Ltd.
2. Venkataraman.M.K., Sridharan.N, Chandarasekaran.N.(2001) – “Discrete Mathematics”, National Publishing Company, Chennai.

UNIT	CHAPTER	PAGE NO.
I	12	394 – 427
II	3	84 – 92, 101,102
	4	109 – 121
III	6	155 – 166, 170-177, 179
IV	8	218 – 243
V	14	487 – 504

Web Resources:

1. <https://youtu.be/XJnIdRXUi7A?si=B-hVfsVXWvMvg9wK>
2. <https://youtu.be/3UkC3sXLqhQ?si=qVpqs3huWgczMKaP>

B.Com (PA) DEGREE PROGRAMME

MATHEMATICS FOR BUSINESS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	4

Preamble

To enable the students to gain knowledge about sequence and series ,matrix, set theory, LPP, simple interest and compound interest.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of sequence and series ,matrix, set theory, LPP, simple interest and compound interest.	K ₁
CO2	explain sequence and series ,matrix, set theory, LPP, simple interest and compound interest.	K ₂
CO3	apply different quantitative models in solving business problems	K ₃
CO4	determine the solutions of the problems based on matrix , simple interest and compound interest problems	K ₄
CO5	evaluate the problems on sequence and series ,matrix, set theory , annuity ,simple interest and compound interest problems.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: SET THEORY

(10 Hours)

Definition – Description of sets – Types of sets – Venn diagram – Set operations – Laws on Sets - Number of elements – Cartesian product

UNIT II: SEQUENCE AND SERIES

(10 Hours)

Introduction – Arithmetic progression – Arithmetic Means – Geometric Progression – Geometric Means – Harmonic Progression – Harmonic Means

UNIT III: MATHEMATICS OF FINANCE

(10 Hours)

Basic concepts – Simple interest – Compound interest - Depreciation - Annuity – Present value – Future value – Sinking fund – Amortisation table – Discounting – True discount – Banker's gain

UNIT V: MATRIX (10 Hours)

Matrix: Basic Concepts – Addition and Multiplication of matrices – Inverse of a matrix – Rank of matrix - Solution of simultaneous linear equations.

UNIT V: LINEAR PROGRAMMING PROBLEM (10 Hours)

Linear Programming Problem – Formation – Solution by Graphical Method Solution by Simplex Method.

TEXT BOOK:

1. Navnitham. P.A.(2012) - "Business Mathematics and Statistics", Jai publishers, Trichy.

UNIT	CHAPTER	PAGE
I	3	104 - 138
II	1	1 – 33
III	2	43 – 88
IV	4	147 - 200
V	9	328 - 374

REFERENCE BOOKS:

1. Sundaresan and Jayaseelan, (2013)-" Introduction to Business Mathematics ", Sultan chand Co& Ltd, Newdelhi.
2. Sanchetti D.C and Kapoor V.K.(2011)- " Business Mathematics" , Sultan chand Co& Ltd, Newdelhi.
3. G.K.Ranganath, C.S.Sampangiram and Y.Rajan(2015)-"A Text book of Business Mathematics-Himalaya Publishing House.

WEB RESOURCES:

1. <https://www.youtube.com/watch?v=xFAwNmQ5nX8>
2. <https://youtu.be/pn2Fx9-G1Ds>
3. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjgnuGA9JbzAhVNgUsFHQ88BngQFnoECAyQAQ&url=http%3A%2F%2Fwww.slideshare.net%2FEShubina%2Fset-theory&usg=AOvVaw00ArORMHihl7hXEse-TTPj>
4. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQj5ek9JbzAhUYXsSKHWDJBh4QFnoECDQQAQ&url=http%3A%2F%2Fwww.craftonhills.edu%2Fcurrent-students%2Ftutoring-center%2Fmathematics-tutoring%2Fmatrices-cramers.pdf&usg=AOvVaw0eqkDuobIihESS3V0IVLKs>

B.Sc (PHY) DEGREE PROGRAMME

ALLIED MATHEMATICS-I	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	84	

Preamble

To enable the students to learn about matrices and determinants, different types of equations, Laplace transforms and Fourier series.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions of matrices, polynomial equations, Laplace, inverse Laplace transforms and Fourier series.	K₁
CO2	explain the operations of matrix, roots of the equations, standard functions of Laplace, inverse Laplace transforms and Fourier series.	K₂
CO3	apply the concepts of matrices, theory of equations, Fourier series of functions, Laplace and inverse Laplace transforms to solve the problems.	K₃
CO4	analyze Cramer's Rule, Irrational roots, complex roots, hyperbolic functions and Transform of $tf(t), f(t)/t$.	K₄
CO5	evaluate the problems in Laplace transforms, inverse Laplace transforms, Matrices, Reciprocal Equations and Fourier series.	K₅

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COURSE CONTENT:

UNIT I: MATRICES, DETERMINANTS (15 Hours)

Definition of a matrix- Order of a matrix – Types of a matrix– Matrix operations I:A System of Linear Equations – Determinants- Cramer’s Rule – Matrix Operation II: Inverse of a matrix –Rank of matrix .

UNIT II:THEORY OF EQUATIONS (20 Hours)

Polynomial Equations with real coefficients - Irrational roots, complex roots - Reciprocal Equations - Newton’s method to find a root approximately.

UNIT III: LAPLACE TRANSFORMS (20 Hours)

Definition – Laplace Transform of Standard functions – Linearity property – First shifting theorem – Transform of $tf(t), f(t)/t$.

UNIT-IV: INVERSE LAPLACE TRANSFORMS (15 Hours)

Inverse Laplace transforms of standard functions – First shift theorem - Laplace Transform of derivatives and integrals.

UNIT V: FOURIER SERIES (14 Hours)

Fourier series of functions in $(0, 2\pi)$ and $(-\pi, \pi)$.

NOTE: Distribution of Marks: Problem 100%.

TEXT BOOKS

1. Navnitham. P.A.(2012) - “Business mathematics and statistics”, Jai publishers, TRICHY.
2. Kandasamy. P, Thilagavathi. K(2012) - “ALLIED MATHEMATICS”, Paper-I, S.Chand and Company Ltd, New Delhi.
3. Kandasamy. P, Thilagavathi. K “MATHEMATICS for B.Sc– Volume III(2004) and Volume IV(2005)”, S. Chand and Company Ltd,New Delhi.

UNIT	BOOK	CHAPTER	VOLUME	PAGE NO
I	1	4	I	147-188
II	2	1,2,3	I	39-47,56-71
III	3	1	III	187-201
IV	3	1	III	202-225
V	3	1	IV	93-134

REFERENCE BOOKS

1. Manickavasagam Pillai.T.K.and Narayanan.S(2012) – “Trigonometry” -
Viswanathan Publishers and Printers Pvt. Ltd.
2. Manickavasagam Pillai.T.K.and Narayanan.S.,Hanumantha Rao.R(2011) -
“Ancillary Mathematics”, Volume-II Viswanathan Publishers and Printers Pvt.
Ltd.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Inverse_Laplace_transform
2. https://youtu.be/5nNPf_EB7Es
3. <https://nptel.ac.in/courses/111/107/111107112/>

SEMESTER - II

BBA DEGREE PROGRAMME

BUSINESS STATISTICS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	72	4

Preamble

To enable the students to gain the knowledge about diagrams and graphs, measures of central tendency, time series, correlation and regression.

Course Outcomes

On the successful completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the formulae of mean, median, mode, correlation, regression and secular trend methods	K₁
CO2	identify one and two dimensional diagrams, properties of correlation and regression, graphs of time series and types of averages	K₂
CO3	draw trend line, regression line, graphs, one dimensional and two dimensional diagrams.	K₃
CO4	analyze the time series, co-efficient of correlation and regression equations and relationship among mean, median, mode.	K₄
CO5	evaluate the problems on correlation and regression , measures of central tendency, time series and graphs of time series	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT –I: DIAGRAMS AND GRAPHS (12 Hours)

Diagrams - Rules for Constructions- Types of Diagrams-Drawing Diagrams in one dimensional, two dimensional. Graphs- Graphs of time series & Histograms – Graphs of frequency distribution (equal class-intervals only)

UNIT –II: MEASURES OF CENTRAL TENDENCY (12 Hours)

Meaning and definition-Types of averages -Arithmetic mean –Median – Mode

UNIT–III: CORRELATION (12 Hours)

Correlation Analysis – Meaning of correlation; Types of correlation -Scatter Diagram - Karl Pearson’s coefficient of correlation - Spearman’s rank correlation coefficient – Concurrent Deviation Method.

UNIT –IV: REGRESSION (12 Hours)

Simple linear regression- Meaning and uses - Differences between Correlation and regression - Two regression lines -Properties of Regression lines and Co-efficient.

UNIT –V: ANALYSIS OF TIME SERIES (12 Hours)

Analysis of Time Series: Definition – Uses - Methods of Secular Trend – Graphical Method – Method of Semi Averages – Method of Moving Averages – Method of Least squares.

NOTE: No derivation and proof, simple problems only.

TEXT BOOK

Navnitam. PA(2012) – “Business Mathematics and Statistics”, Jai Publishers, Trichy.

UNIT	CHAPTER	PAGE
I	VI	98-118, 124-134
II	VII	159 – 227
III	XII	503-539
IV	XIII	540-553,563-571
V	XIV	579-600

REFERENCE BOOKS:

1. Gupta S.P(2014) – “Statistical Methods” , Sultan Chand & Sons, New Delhi.
2. Vittal. P.R(2002) - Business Mathematics and Statistics, Margham publishers, Chennai.

WEB REFERENCES:

1. <https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/>
2. <http://www.pitt.edu/~super4/33011-34001/33851.ppt>
3. <https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm>

B.Sc (CS) / B.Sc (IT) / BCA DEGREE PROGRAMME

DISCRETE MATHEMATICS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	3

Preamble

To enable the students to gain knowledge about the set theory, logical operations, relations, grammars and graphs

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic terms of set operations, logical operations, relations, grammars and graphs	K ₁
CO2	explain the concepts of sets, relations, logical operations and graphs.	K ₂
CO3	apply the various formulae to solve the problems based on set operations, logical operations, relations, grammars and graphs.	K ₃
CO4	examine the relation between sets, logical operations and graphs.	K ₄
CO5	evaluate the problems on set operations, logical operations, relations, grammars and graphs.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: SET THEORY

(12 Hours)

Introduction-Set and its elements-Set description-Types of sets-Venn-Euler Diagrams- Set operations and laws of set theory.

UNIT II: RELATIONS (12 Hours)

Binary relations – Cartesian product of sets - Set operations on relations-Types of relations – Partial order relations – Equivalence relation – Composition of relations .

UNIT III: GRAPH THEORY (12 Hours)

Introduction – Basic terminology – Paths, cycles and connectivity – Sub graphs - Types of graphs – Isomorphic graphs-Homeomorphic graphs-Representation of graphs in computer memory.

UNIT IV: MATHEMATICAL LOGIC (12 Hours)

Introduction- Propositional calculus –Basic logical operations- Tautologies- Contradiction-Contingency-Argument-Method of proof- Equivalence and implication.

UNIT V: LANGUAGE, GRAMMAR AND AUTOMATA (12 Hours)

Introduction-Languages – Operations on languages – Regular expressions and regular languages – Grammar – Types of grammars – Finite state machine.

TEXT BOOK

Sharma.J.K. (2010) – “Discrete Mathematics”, Macmillan publishers India Ltd.

UNIT	CHAPTER	PAGE NUMBER
I	I	1-16
II	III	77-85,92-93
III	IX	221-247
IV	XII	333-341,352-364
V	XV	440-467

REFERENCE BOOKS:

- 1.Tremblay.J.P.,Manohar.R.(1997) – “Discrete Mathematical Structures with Applications to Computer Science”, Mc Graw Hill Education (India) Pvt.Ltd.
2. Venkataraman.M.K., Sridharan.N, Chandarasekaran.N.(2001) – “Discrete Mathematics”, National Publishing Company, Chennai.

WEB RESOURCES:

1. <https://youtu.be/xlUFkMKS3Y>
2. <https://youtu.be/oaOm2pnKkyY>

B.Sc (AL & MI) Degree Programme

APPLIED MATHEMATICS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	3

Preamble

To enable the students to gain knowledge about set theory, graph theory, grammars, measures of central tendency and probability.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic terms of set operations, graphs, grammars, Measures of Central Tendency and probability.	K ₁
CO2	explain the concepts of sets, graphs, grammars, Measures of Central Tendency and probability.	K ₂
CO3	apply the various formulae to solve the problems based on set operations, graphs, grammars, Measures of Central Tendency and probability.	K ₃
CO4	analyze the relationships between mean, median and mode, set operations, graphs, grammar and probability.	K ₄
CO5	evaluate the problems on sets, graphs, grammars, Measures of Central Tendency and probability.	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

UNIT – I Sets (10 hours)

Introduction – sets and its element – set description – types of sets – Venn-Euler diagram – set operations and laws of set theory.

UNIT – II Graph Theory (10 hours)

Introduction – basic terminology – Paths, Cycles and Connectivity – sub graphs – types of graphs – isomorphic graphs – homeomorphic graphs – representation of graphs in computer memory.

UNIT – III Language, Grammar and Automata (15 hours)

Introduction – Language: The set theory of strings – Languages – regular expressions and regular languages – Grammar – Finite state machine - Finite state Automata.

UNIT – IV Measures of Central Tendency (15 hours)

Mean, Median and Mode – Relationship among mean median and mode.

UNIT – V Probability (10 hours)

Random Experiment – relative frequency approach – example problems (Method – I, II, III and IV)

Text Book:

Book 1 - Sharma.J.K. (Fifth Edition) – “Discrete Mathematics”, University Science Press (An imprint of Laxmi Publications Pvt. Ltd.) **(Unit I, II and III)**

Book 2 - P.A.Navanitham (Revised Edition -2012) “Business Mathematics and Statistics”, Jai Publishers, Trichy-21, April 2012. **(Unit IV & V)**

REFERENCE BOOKS:

- 1.Tremblay.J.P.,Manohar.R.(1997) – “Discrete Mathematical Structures with Applications to Computer Science”, Mc Graw Hill Education (India) Pvt.Ltd.
2. Venkataraman.M.K., Sridharan.N, Chandarasekaran.N.(2001) – “Discrete Mathematics”, National Publishing Company, Chennai.

UNIT	Book 1 and Book 2	CHAPTER	PAGE NO.
I	Book 1	1	2 - 18
II	Book 1	9	258 - 287
III	Book 1	15	518 – 526, 532-538,540 - 554
IV	Book 2	Part 2	159-181,196- 226.
V	Book 2	Part 2	654 - 679

Web Resources:

1. <https://youtu.be/tyDKR4FG3Yw?si=dB6mgffCuNnLmaBq>
2. https://youtu.be/sWsXBY19o8I?si=i6EvQ_N8F8j8l3PB

B.Com (PA) DEGREE PROGRAMME

STATISTICS FOR BUSINESS	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	60	3

Preamble

To enable the students to learn the Statistical methods and their applications in Commerce

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of statistics, measures of central tendency, correlation, regression, time series and probability	K ₁
CO2	explain the concept based on statistics, measures of central tendency, correlation, regression, time series and probability	K ₂
CO3	apply various formulae to solve the problems on statistics, measures of central tendency, correlation, regression, time series and probability.	K ₃
CO4	analyze the relations between Mean Median, Mode, correlation and regression	K ₄
CO5	evaluate the problems on statistics, measures of central tendency, correlation, regression, time series and probability	K ₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I : (10 Hours)

STATISTICS: Introduction to statistics- Meaning - Definition – Methods of collecting data – Primary and Secondary data- Classification and tabulation – Diagrammatic and graphical representation.

UNIT II : (10 Hours)

MEASURES OF CENTRAL TENDENCY: Mean Median, Mode, Geometric Mean and Harmonic Mean - Merits and demerits.

UNIT III (10 Hours)

CORRELATION: Meaning - Definition –Scatter diagram, Karl Pearson's co-efficient of correlation, Spearman's Rank correlation, advantages and limitations of correlation.

REGRESSION: Regression Analysis – Meaning of regression and linear prediction
– Regression in two variables – Uses of regression.

UNIT IV (10 Hours)

TIME SERIES: Definition of Time Series - Components of Time Series-Methods of estimating trend – Graphic, Semi-average, Moving average and Method of Least squares – Advantages and Disadvantages

UNIT V (8 Hours)

PROBABILITY: Definition – Concept – Addition and Multiplication theorems.
(No derivation and proof, Simple Problems only).

Theory – 20%

Problems – 80%

TEXT BOOK

Navnitham. PA.(2012) - “Business Mathematics and Statistics”, Jai publishers, Trichy.

UNIT	CHAPTER	PAGE
I	I, III V, VI	1-19, 28-40, 60-91, 98-147
II	VII	159-270
III	XII & XIII	503-554
IV	XIV	579-601
V	XVI	654-680

REFERENCE BOOKS

1. Gupta. S.P. (2016) - “Statistical Methods”, Sultan Chand & Sons, New Delhi.
2. Vittal. P.R. (2013) - “Mathematical Statistics”, Margham Publishers, Chennai.

WEB RESOURCES:

1. <https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/>
2. <http://www.pitt.edu/~super4/33011-34001/33851.ppt>
3. <https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm>

B.Sc (PHYSICS) DEGREE PROGRAMME

ALLIED MATHEMATICS- II	CATEGORY	CONTACT HOURS	CREDIT
	CORE ALLIED	84	4

Preamble

To enable the students to learn and gain the knowledge and ideas about curvature, multiple integrals, Ordinary and Partial differential equations.

Course Outcomes

On the successful completion of the course students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of curvature ,differentiation and integration .	K₁
CO2	express radius of curvature, double and triple integrals, beta and gamma functions, ordinary and partial differential equations.	K₂
CO3	apply the formula for Beta - Gamma functions, radius and centre of curvature for finding the results.	K₃
CO4	analyze the general of ordinary, partial differential equations , Beta - Gamma functions and change of order of integrations..	K₄
CO5	Evaluation of multiple integrals and differential equations.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT I: CURVATURE (20 Hours)

Curvature – Radius of curvature – Center of curvature – Circle of curvature

UNIT II: INTEGRATION (20 Hours)

Evaluation of double integrals - Change of order of integration in double integrals

-Evaluation of triple integrals .

UNIT III: BETA AND GAMMA FUNCTIONS (20 Hours)

Beta and Gamma functions – Relations between Beta and Gamma functions –

Evaluation of multiple integrals using Beta and Gamma functions.

UNIT IV: ORDINARY DIFFERENTIAL EQUATIONS (10 Hours)

Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx} , where v is any function of x -to find the meanings for $f(D^2)\sin(ax+b)$ and $f(D^2)\cos(ax+b)$.

UNIT V: PARTIAL DIFFERENTIAL EQUATIONS (14 Hours)

Formation of partial differential equations by elimination of arbitrary constants and functions

-Definitions of general, particular and complete solutions - Solving standard forms

$f(p, q) = 0$.

Note: Distribution of Marks: Theory 20% Problem 80%

TEXT BOOK

1. Kandasamy. P, Thilagavathi.K.(2004) - “Mathematics for B.Sc. Branch I”, 1st edition, Volume II and III, S.Chand and Company Ltd, New Delhi.
2. Narayanan.S. and Manicavachasam Pillai.T.K (2017) – “ Calculus Volume II”- Viswanathan Publishers.

UNIT	BOOK	CHAPTER	VOLUME	PAGE NO
I	1	II	II	324-344
II	1	VI	II	432-444
III	2	VIII	II	278-295
IV	1	II	III	16-35
V	1	I	III	117-136

REFERENCE BOOK:

Narayan.S and Manicavachagam Pillay.T.K. (1993) - “Ancillary Mathematics”, Viswanathan Publishers and Printers Pvt. Ltd.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Beta_function
2. <https://users.aber.ac.uk/ruw/teach/260/classification.php>

SEMESTER - III

B.Sc (C/S), B.C.A. DEGREE PROGRAMME

OPERATIONS RESEARCH	COURSE CODE	CATEGORY	CONTACT HOURS	CREDIT
		CORE ALLIED	48	3

Preamble

To enable the students to understand how to formulate a real-world problem into a LPP.

Course Outcomes

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the mathematical tools that are needed to solve Operations Research problems.	K₁
CO2	discuss the properties of Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K₂
CO3	identify the solution of LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K₃
CO4	analyze the salient features of operations research in different problem solving methods.	K₄
CO5	evaluate the problems on LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K₅

K₁ - Remember; K₂ – Understand; K₃ - Apply; K₄ - Analyze; K₅ – Evaluate.

COURSE CONTENT:

UNIT-I: LINEAR PROGRAMMING PROBLEM (10 HOURS)

Linear Programming -Mathematical Model assumption of linear Programming –
Graphical method -Simplex method (Simple Problems only).

UNIT-II:TRANSPORTATION AND ASSIGNMENT PROBLEM(10 HOURS)

Transportation problem-NWC method-Least cost method-VAM method-assignment
problem.

UNIT-III:GAME THEORY(10 HOURS)

Game Theory -Concept of Pure and Mixed Strategies –Solving 2 x 2 matrix with
and without saddle point -n x 2 -2 x m games.

UNIT-IV: REPLACEMENT (10 HOURS)

Replacement models -Elementary replacement models -Present value -Rate of return
-Depreciation -Individual replacement –Group replacement.

UNIT-V:CPM(8 HOURS)

Network representation - CPM -Backward pass -Forward pass.

TEXT BOOKS:

1. Manmohan, P.K. Gupta, Kanthiswarup, S(2017) –“Operations Research”
Chand & sons.

UNIT	CHAPTER	PAGE
I	2,3,4	39-78, 87, 99-106
II	10,11	247,252-258, 298-314
III	17	443-457
IV	18	477-495
V	25	763-780

REFERENCE BOOKS:

1. Hamdy A Taha (2002) – “Operations Research” Pearson Education, 7th edition,
2. P.K. Gupta, D.S. Hira-“Problems in Operations Research”,S. Chand Publishers.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Operations_research
2. <https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf>
3. https://www.researchgate.net/publication/311694393_SIMPLEX_METHOD
4. <http://nsdl.niscair.res.in/jspui/bitstream/123456789/1047/1/Chapter%208.pdf>