ETHIRAJ COLLEGE FOR WOMEN
(AUTONOMOUS)
CHENNAI – 600 008

B.Sc., Mathematics with Computer Applications (Self – Supporting)

SYLLABUS

CHOICE BASED CREDIT SYSTEM
OUTCOME BASED EDUCATION

(OFFERED FROM THE ACADEMIC YEAR 2018 -2019)

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COURSE OUTLINE CONTENT

Ethiraj College for Women (Autonomous)

Department of Mathematics with Computer Applications

Revised Syllabus with effect from June 2018

PREAMBLE

As per the guidelines given by the University Grants Commission and the Tamil Nadu State Council for Higher Education , the B.Sc. degree programme is designed in such a way to have a foundation in Mathematics and Computer Applications ; a Mathematical attitude towards problem formulation and solving   analytical skills and desire for correctness; and appreciation of the approaching of mathematical techniques, the programming skills at higher level computer language and research aptitude in both Mathematics and Computer Applications .

Department of Mathematics with Computer Applications; is revising syllabi with effect from the academic year 2018- 2019, as specified by the Government of Tamil Nadu. Part IV and Part V components will seek to build the capacity of the students and provide inputs for her social service and social analysis capabilities.

Every academic year is divided into two semester sessions. Each semester will have minimum of 90 working days and each day will have five working hours, teaching is organized into a modular pattern of credits course. Credit is normally related to the number of hours a teacher teaches a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

REGULATIONS

1.   ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the degree of B.Sc. course shall be required to have passed the higher secondary examinations in the subjects MATHEMATICS/ PHYSICS/CHEMISTRY/STATISTICS/COMPUTER SCIENCE conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto by the syndicate of University of Madras.

2. ELIGIBILITY FOR THE AWARD OF DEGREE:

The candidate shall be eligible for the award of degree only if she has undergone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the six semesters prescribed earning 140 credits – 12 credits from Part I, 12 credits from Part II, 95 credits from Part III and 20 credits from Part IV.

Extension activity is compulsory which is out of college hours. (NSS, NCC, CSS, YRC, RRC, ROTRACT, Sports, Yoga, SIFE and E- cell etc)

3. DURATION OF THE PROGRAMME : 3 YEARS

Each academic year is divided into two semester sessions. The first academic year shall comprise the first and second semesters, the second academic year of the third and fourth semesters and the third academic year of fifth and sixth semesters respectively. Each semester will have a minimum of 90 working days and each day will have 5 working hours. Teaching is organized into a modular pattern of credit courses. Credit is normally related to the number of teaching hours of a particular subject. It is also related to the number of tutorial and practical hours.

4. COURSE OF STUDY :

The main subject of study for bachelor degree shall consist of the following:

Part – I : Tamil/Hindi, Sanskrit and French

Part - II : English

Part – III: Core, Allied subjects and Elective

Part – IV : **1.** (a) Those who have not studied Tamil upto 12thStandard   taken a

non Tamil language under Part I shall take Tamil comprising of

2 courses (Level will be at 6thSTD)

(b) Those who studied Tamil up to 12thSTD and taken a Non Tamil language

under Part I shall take Advanced   Tamil comprising of two courses.

(c) Others that do not come under (a) & (b) can choose Non Major elective .

2. Soft Skill paper (offered by English Department)

3. Environmental Studies

4. Value Education

PART V: Extension activities: Extension activity is compulsory which is out of college hours (ROTRACT, NCC, NSS, CSS, YRC, RRC, SPORTS, YOGA, SIFE, E-Cell, etc.)

5.   PASSING MINIMUM :

A candidate shall be declared to have passed in each paper/ practical of the main subject of study wherever prescribed, if she secured NOT LESS THAN 40% of the marks prescribed for the examination.

1.   There shall be no passing minimum for Internal.
2.   For External Examination Passing Minimum shall be 40% of the maximum marks prescribed for the paper for each paper / practical and project.
3.   In the aggregate (External +Internal) the Passing Minimum shall be of 40%.
4.   She shall be declared to have passed the whole examination, if she passed in all the papers and Practical paper where ever prescribed /as per scheme of examinations by earning 140 credits in part I, II, III, IV and V. She shall also fulfil the extension activities prescribed earning a minimum of one credit to qualify for the degree.

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES :
   ## Part I, II, III & IV:

Successful Candidates passing the examination and securing the marks

(i)   60% and above in aggregate shall be declared to have passed the examination with first class.

(ii)   50% and above but below 60% in the aggregate shall be declared to have passed the examination in the second class. All other successful candidates shall be declared to have passed the examination in the third class.

(iii)   Candidates who pass all the examination (Part I, II, III & IV) prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

On obtaining an undergraduate degree the students will be able to:

PEO1: Apply and advance the knowledge and skills acquired, to become a creative professional in their chosen fields.

PEO2: Engage in self- directed continuous learning ,aimed at global competency, which will promote professional and personal growth.

PEO3: Develop management skills and entrepreneurial skills, by harnessing core competencies tempered by values and ethics.

PEO4: Work towards achieving economic and social equity for women through applications of relevant knowledge.

PEO5: Contribute to promoting environmental sustainability and social inclusivity.

PROGRAMME OUTCOMES

PO1- To promote and apply scientific knowledge for finding sustainable solution to solve the issues pertaining to the society/Industry.

PO2- Identify, Analyse and formulate novel ideas to yield, substantial results in the fields of research utilizing the principles of Physical and Biological Science.

PO3- Relate key concepts and scientific principles to various scientific phenomenon and their applications in day-to-day life.

PO4- Cultivate unparallel comprehension of fundamental concepts relevant to basic sciences leading to an individual progress and career advancement at the national and Global levels.

PO5- To communicate effectively their views and ideas orally/written in English and in other related languages.

PO6- Design solutions for complex problems and design system components or processes that meets the specific needs with appropriate consideration for public health and safety, cultural, societal and environmental conditions.

PROGRAMME SPECIFIC OUTCOME

PSO 1-Understanding of Mathematical concepts help students to analyse and solve problems which is useful in clearing competitive exams. And cultivate the practice of constructing proofs using basic axioms which helps in research and advance programme.

PSO 2-Identify the applications of Mathematics in other disciplines and society to solve real life problems. Logical thinking and reasoning enhances the capability of solving complex problems to meet the opportunities of career development and higher studies.

PSO 3-Provide program in Mathematics that enable students to define Mathematical concepts, calculate quantities, estimate solutions, solve problems, represent Mathematical information, interpret data and communicate Mathematical thoughts.

PSO 4-The ability to understand, analyse and develop computer programs in the areas related to Mathematics, Algorithm, System software, Web design and Networking for efficient designs of Computer-based programs.

PSO 5-Explore technical knowledge in diverse areas of Mathematics and Computer Applications and experience on environment conducive in cultivating skills for successful career, Entrepreneurship.

S E M	PART	COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	CA	SE	TOTAL
PROGRAMME PROFILE- B.SC MATHEMATICS WITH COMPUTER APPLICATIONS									
I	I	Part I	Tamil/ Hindi / French/ Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	5	75	40	60	100
	III	MC18/1C/TLT// MA18/1C/TLT	Trigonometry & Laplace Transforms	4	5	75	40	60	100
		MC18/1C/PLC	Programming Language C (Theory)	3	3	45	40	60	100
		MC18/1C/PR1	Programming Language C (Practical)	1	2	30	40	60	100
		MC18/1A/FD1// MA18/1A/FD1	Calculus of Finite Differences-I	5	6	90	40	60	100
	IV	Part IV	1a/1b/NME	2	2	30	-	50	50
			Soft Skill(offered by English Department)	3	2	30	-	50	50
II	I	Part I	Tamil/ Hindi / French/ Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	5	75	40	60	100
	III	MC18/2C/CAL	Calculus	4	5	75	40	60	100
		MC18/2C/C++	Object Oriented Programming with C++(Theory)	3	3	45	40	60	100
		MC18/2C/PR2	Object Oriented Programming with C++(Practical)	1	2	30	40	60	100
		MC18/2A/FD2 // MA18/2A/FD2	Calculus of Finite Differences-II	5	6	90	40	60	100
	IV	Part IV	1a/1b/NME	2	2	30	-	50	50
			Soft Skill(offered by English Department)	3	2	30	-	50	50
III	I	Part I	Tamil/ Hindi / French/ Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	5	75	40	60	100
	III	MC18/3C/CLA	Classical Algebra	4	5	75	40	60	100
		MC18/3C/DEF	Differential equations& Fourier series	4	5	75	40	60	100
		MC18/3A/MS1// MA18/3A/MS1	Mathematical Statistics& R Software –I	5	6	90	40	60	100
	IV	Part IV	Soft Skill	3	2	30	-	50	50
			Environmental Studies	2	2	30	-	50	50
IV	I	Part I	Tamil/ Hindi / French/ Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	5	75	40	60	100
	III	MC18/4C/DSA	Data Structures and Algorithms	4	5	75	40	60	100
		MC18/4C/VGF// MA18/4C/VGF	Vector Calculus, Geometry and Fourier Transforms	4	5	75	40	60	100
		MC18/4A/MS2// MA18/4A/MS2	Mathematical Statistics& R Software –II	5	6	90	40	60	100
	IV	Part IV	Soft Skill	3	2	30	-	50	50
			Value Education	2	2	30	-	50	50
V	III	MC18/5C/ALS	Algebraic Structures	4	5	75	40	60	100
		MC18/5C/RAN	Real analysis	4	5	75	40	60	100
		MC18/5C/MEC	Mechanics	5	6	90	40	60	100
		MC18/5C/PYT	Python Programming(Theory)	3	5	75	40	60	100
		MC18/5C/PR3	Python Programming (Practical)	1	3	45	40	60	100
		MC18/5E/OR1	Operations Research-I	5	6	90	40	60	100
		MC18/5E/ENT	Elementary Number Theory	5	6	90	40	60	100
VI	III	MC18/6C/LAL	Linear Algebra	4	5	75	40	60	100
		MC18/6C/CAN	Complex Analysis	4	5	75	40	60	100
		MC18/6C/JAV	Programming in Java(Theory)	3	6	90	40	60	100
		MC18/6C/PR4	Programming in Java(Practical)	1	3	45	40	60	100
		MC18/6E/DIM	Discrete Mathematics	4	5	75	40	60	100
		MC18/6E/OR2	Operations Research-II	5	6	90	40	60	100
		MC18/6E/FSA	Fuzzy set theory and its applications	5	6	90	40	60	100
			TOTAL	**139**					

Total Minimum Credits: 139 +1(Compulsory extension activity credit) = 140

EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT

INTERNAL VALUATION BY COURSE TEACHER/S

PART I, II AND III-THEORY PAPERS

COMPONENT	TIME	MAX.MARKS	CAMARK
1.*TEST I	2 HRS	50 MARKS(TO BE CONVERTED)	10
2.*TEST II	2 HRS	50 MARKS (TO BE CONVERTED)	10
3. ASSIGNMENT/SEMINAR/FIELD VISIT			10
4. PARTICIPATORY LEARNING			10
TOTAL			**40**

PART III- PRACTICAL PAPERS

COMPONENT	MARKS		
1.*TEST I	2 HRS	50 MARKS(TO BE CONVERTED)	10
2.*TEST II	2 HRS	50 MARKS (TO BE CONVERTED)	10
3. RECORD			20
TOTAL			**40**

CA QUESTION PAPER PATTERN

Knowledge Level	Section	Word Limit	Marks	Total
K 1	A-5X2 marks	50	10	
K1, K 2	B-4/6x7marks	200	28	**50**
K2, K 3	C-1/2x12 marks	500	12	

RUBRICS FOR CONTINUOUS ASSESSMENT

Assignment	Content/originality/Presentation/Schematic Representation and Diagram/Bibliography
Seminar	Organisation/Subject Knowledge/Visual Aids/Confidence level/presentation-Communication and Language
Field Visit	Participation/Preparation/Attitude/Leadership
Participation	Answering Questions/Clearing Doubts/Participating in Group Discussions/Regular Attendance
Problem Solving	Understanding Concepts/Formula and Variable Identification/Logical Sequence/Answer
Group Discussion	Preparation/Situation Analysis/Relationship Management/Information Exchange/Delivery Skills
Flipped/Blended Learning	Preparation/Information Exchange/ Group interaction/Clearing doubts

END SEMESTER EVALUATION PATTERN

THEORY PAPERS

PART III

SEMSTER: I/II/III/IV/V/VI

DOUBLE VALUATION: BY COURSE TEACHER AND EXTERNAL EXAMINER

MAXIMUM MARKS: 100 TO BE CONVERTED TO 60

PASSING MARK: 40

PART IV

SEMSTER: I/II/III/IV

SINGLE VALUATION

ORAL TEST/WRITTEN TEST

MAXIMUM MARKS: 50

PASSING MARK: 25

PRACTICAL PAPERS

PART III

SEMSTER: I/II/V/VI

DOUBLE VALUATION BY COURSE TEACHER AND EXTERNAL EXAMINER

MAXIMUM MARKS: 100

PASSING MARKS: 40

SEMESTER –I

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	CA	SE	TOTAL
MC18/1C/TLT// MA18/1C/TLT	Trigonometry & Laplace Transforms	4	5	75	3-2-0	40	60	100
MC18/1C/PLC	Programming Language C (Theory)	3	3	45	2-1-0	40	60	100
MC18/1C/PR1	Programming Language C (Practical)	1	2	30	0-0-2	40	60	100
MC18/1A/FD1// MA18/1A/FD1	Calculus of Finite Differences-I	5	6	90	3-3-0	40	60	100
Part IV	1a/1b/NME	2	2	30	0-0-2	-	50	50

NON MAJOR ELECTIVE PAPER COURSE PROFILE- OFFERED TO OTHER DEPARTMENTS

Sem	COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	SE	TOTAL
I	MC18/1N/OFM// MC18/1N/OFMH/	Office Management	2	2	30	0-0-2	50	50

NB: I B.Com Honours alone, the code for non- major elective is MC18/ 1N / OFMH

SEMESTER I

TRIGONOMETRY AND LAPLACE TRANSFORMS

TOTAL HOURS: 75 hrs   **COURSE CODE: MC18/1C/TLT//**
                                                                      MA18/1C/TLT

CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable students to
1. Know the principles and concepts of Trigonometry and Laplace Transforms.
2. Compute logarithm of complex quantities.
3. Apply Laplace Transform to solve differential equations.

COURSE OUTLINE:

UNIT I : Expansion of $\sin nx$, $\cos nx$, $\tan nx$, $\sin^n x$, $\cos^n x$. Expansion of $\sin x$, $\cos x$, $\tan x$ in

ascending powers of x.

Book 1: Chap 3 - Sec 1, 2, 4 and 5.   (15 hrs)

UNIT II : Hyperbolic Functions: Definition, Relation between hyperbolic

functions and Inverse hyperbolic functions

Book 1: Chap 4 - Sec 1,2.1,2.2,2.3   (20 hrs)

UNIT III: Logarithm of complex quantities

Book 1: Chap 5 - Sec 5 – 5.1,5.2.   (10 hrs)

UNIT IV: Summation of Trigonometric series by using complex quantities:

C+iS Form, Gregory series (only simple problems in both the cases)

Book 1: Chap 6 - Sec 3.   (15 hrs)

UNIT V: Laplace Transform: Laplace Transform- Inverse Transform,

Properties. Applications of Laplace Transforms to solution of the first

and second Order linear differential equations (with constant

coefficients)

Book 2: Chap 9   (15 hrs)

RECOMMENDED TEXT:

1. S. Narayan and T.K. ManicavachagomPillay (2013), Trigonometry, S.Viswanathan printers and publishers Pvt. Ltd, Chennai.
2. S. Narayan and T.K. ManicavachagomPillay (2003), Differential Equations and its Applications,S.Viswanathan printers and publishers Pvt. Ltd, Chennai.
3.

REFERENCE BOOKS:

1. A.Singaravelu, Algebra and Trigonometry Volume I (2003), Meenakshi Agency, Chennai
2. S.L.Loney, Plane Trigonometry – Part-II (1982), Cambridge University Press London.
3. Dr. M.D. Raisinghania, H.C.Saxena, H. K. Dass, Trigonometry (1999), S. Chand & Company Pvt. Ltd., New Delhi.
4. B.S. Grewal Higher Engineering Mathematics (2002), Khana Publishers, New Delhi.
5. Dr. A. Singaravelu, Differential Equations and Laplace Transforms, New Revised Edition (2015). A.R.S. Publications, Chennai.

JOURNALS:

Algebra and Trigonometry

International Journal of Mathematical Education in Science and Technology.

E-LEARNING RESOURCES:

https://www.mathsisfun.com/algebra/trigonometry.html
http://mathsfirst.massey.ac.nz/Trig/TrigGenSol.htm
https://www.mathwarehouse.com/trigonometry/
http://dsp-book.narod.ru/TAH/ch05.pdf
http://tutorial.math.lamar.edu/Classes/DE/LaplaceTransforms.aspx

COURSE OUTCOMES: Upon successful completion of Trigonometry and Laplace Transform students will be able to

CO No.	CO Statement
CO 1	Expand and solve problems involving Trigonometric functions in terms of series of multiple of θ.
CO 2	Evaluate the hyperbolic functions and inverse hyperbolic functions and study the relation between them.
CO 3	Analyse and calculate the logarithm of complex quantities.
CO 4	Discuss and find the summation of series of complex quantities.
CO 5	Applying Laplace Transforms and Inverse Laplace Transforms, to solve problems of linear differential equations.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	2	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	2	3	2	2
AVERAGE	3	2.6	3	2	2

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		
K1, K 2	B-5/8x7 marks	200	35	100	-
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER I

PROGRAMMING LANGUAGE C

TOTAL HOURS: 45   **COURSE CODE : MC18/1C/PLC**

CREDITS: 3   **L-T-P: 2 - 1- 0**

COURSE OBJECTIVES:

Enable the students

1. Introduce the concept of programming language and to enable the students to understand the basic concepts of C.
2. Impart knowledge in control statements like if, if else switch etc.
3. Study about arrays and operations.
4. Enable the students to understand about functions and pointers.
5. Impart knowledge about structures and to teach about file management in C.

COURSE OUTLINE:

UNIT I:
About C – Introduction – Data types and variables – Character set – C tokens keywords – Identifiers – Constants – Variables – Data types declaration – Assigning values to the variables – Operators and expressions.

(6hrs)

UNIT II:
Control statements: Decision making and looping - Decision making and branching.   (10hrs)

UNIT III:
Arrays: One and Two dimensional arrays – Initializing two dimensional arrays – Strings – Handling of character strings – Declaring and initializing string variables – Reading strings from the terminal – Writing strings to screen – Arithmetic operation on characters – String handling function.

(9 hrs)

UNIT IV:
 Functions: Defining, accessing – Passing arguments to functions – Specifying argument data types – Recursion. Pointers: Understanding pointer – Accessing address of a variable – Declaring and initializing pointer – Accessing a variable through its point – Points and arrays – Pointers and character strings   (11 hrs)

UNIT V:

Structures: Structure definition giving values to members – Structure initialization – Arrays of structures – Arrays within structures. File Management in C**:** Introduction – Defining and opening a File-closing file - Input/output operations on file.

(9 hrs)

RECOMMENDED TEXT:

1. Programming in ANSI C, Sixth edition, E. Balagurusamy (case study excluded), Tata   McGraw Hill, New Delhi.

REFERENCE BOOKS:
1. Programming in 'C', Schaum Series, Bryon S. Gottfried, Tata Mc-Graw Hill, New Delhi.
2. Let us C, Yashavant P. Kanetkar, BPB Publications.
3. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Pearson Publications.
4. C Programming Absolute Beginner's Guide, greg Perry and Dean Miller, Third Edition Que.
5. The C Programming Language, Brain w. Kernighan, Dennis M. Ritchie, Second Edition, Prentice Hall Software Series

JOURNALS:

International journal of Computer science and Security
Programming journal (magazines)

WEBSITES & e-LEARNING SOURCES:

http://www.technopedia.com/c-programming

http://www.guru99.com/c-programming-language.html

http://computer.howstuffsworks.com/c.2html

http://www.program1z.com/c-programming

http://fresh2.refresh.com/c-programming

COURSE OUTCOMES: Upon successful completion of Programming Language C students will be able to

CO No.	CO Statement
CO 1	Revise the basic concepts of programming and enable students to understand about data types input output statements and write simple programs.
CO 2	Explain about decision making statements like if, if else, else if ladder, switch, goto etc.
CO 3	Explain and Use the concept of one dimensional array, two dimensional array and operators in Programs.
CO 4	Analyze about in-build functions, user defined functions and study about pointers and recursion to develop programs.
CO 5	Explain the basics of file handling and structure concepts like arrays of structures, arrays within structures.

MAPPING- COURSE OUTCOMES WITH PROGRAM SPECIFIC OUTCOMES

CO / PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	3	3	3
CO 3	2	2	3	3	3
CO 4	2	3	3	3	3
CO 5	2	3	3	3	3
Average	**2**	**2.6**	**2.8**	**2.8**	**2.8**

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY
CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

PROGRAMMING IN C – PRACTICALS

TOTAL HOURS: 30   **COURSE CODE: MC18/1C/PR1**

CREDITS: 1   **L-T-P: 0- 0 -2**

COURSE OBJECTIVES

Enable the students

1. Develop programming skills using the concept of control statements arrays, functions.
2. Impart the knowledge of writing algorithm for programming.

COURSE OUTLINE:

PRACTICAL PROGRAMS
Implement the following programming concepts using C
1.   Control statements.
2.   Arrays.
3.   Functions.
4.   Pointers.
5.   Structures.
6.   File handling
 Two to three programs under each heading

RECOMMENDED TEXT:

1. Programming in ANSI C, Sixth edition, E. Balagurusamy (case study excluded), Tata   McGraw Hill, New Delhi.

REFERENCE BOOKS:
1. Programming in 'C', Schaum Series, Bryon S. Gottfried, 1998, Tata Mc-
2. GrawHill, New Delhi.
3. Let us C, Yashavant P. Kanetkar, BPB Publications.
4. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Pearson Publications.
5. C Programming Absolute Beginner's Guide, greg Perry and Dean Miller, Third Edition Que.
6. The C Programming Language, Brain w. Kernighan, Dennis M. Ritchie, Second Edition, Prentice Hall Software Series

JOURNALS:

International journal of Computer science and Security
Programming journal (magazines)

WEBSITES & e-LEARNING SOURCES:

https://www.programmingsimplified.com/c-program-examples
https://www.programiz.com/c-programming/examples
https://beginnersbook.com/2015/02/simple-c-programs
https://www.studyonight.com.c/programs
https://www.javapoint.com/c-programs

COURSE OUTCOMES: Upon successful completion of Programming Language C- Practical students will be able to

CO No.	CO Statement
CO 1	Create different programs using if, if else, for , arrays, functions and pointers and prepare the students to write programs.
CO 2	Apply the concept of structures and file handling to develop programs.

MAPPING-COURSE OUTCOMES WITH PROGRAM SPECIFIC OUTCOMES

CO / PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	3
CO 2	2	3	3	3	3
Average	**2**	**3**	**3**	**3**	**3**

*Mapping Levels: 1 – Slight (Low) 2 – Moderate (Medium)   3 – Substantial (High)

Question Paper Pattern

Duration – 3 hours**.**
Maximum marks – 100 (Internal 40 + External 60)
Practical Examination – 60 (2 x 30)

One Internal Examiner and one External Examiner to be appointed to conduct the practical examination.

SEMESTER I

CALCULUS OF FINITE DIFFERENCES – I

TOTAL HOURS: 90   **COURSE CODE: MC18/1A/FD1//**
                                              MA18/1A/FD1

CREDITS: 5   **L-T-P:** 3 3 0

COURSE OBJECTIVES:

Enable the students to

1. Solve Mathematical problem using difference operators.
2. Compute Numerical solutions of Differential and Integration problems.
3. Interpolate an unknown value from a given set of data.

COURSE OUTLINE:

UNIT I: FINITE DIFFERENCES
        Forward, Backward, Divided Difference and Shift Operators, Relation between operators, Representation of Polynomials in Factorial Notations, Successive differences of Polynomial- Differences of zero.(Proof of theorems in finite differences excluded and simple problems)   (20 hrs)

UNIT II: INTERPOLATION
        Newton's Forward and Backward formulae for Interpolation finding the
missing terms- Central difference formulae- Gauss Forward, Gauss Backward, Stirling's and Bessel's formulae(Derivations are not included for all the formulae and simple problems)
                                                                            (15hrs)

UNIT III: INTERPOLATION (contd)
        Largange's Formula for Interpolation – Newton's Divided Differences formula. Largange's inverse interpolation (Derivations are not included for all the formulae and simple problems)   (20hrs)

UNIT IV: NUMERICAL DIFFERENTIATION
        Methods of Derivatives using Interpolation Formulae (only first order),Maxima and Minima using Newton's forward formula – simple problems.(Derivations are not included for all the formulae and theorem and simple problems)   (15 hrs)

UNIT V: NUMERICAL INTEGRATION

Quadrature Formula for equidistant ordinates based on Newton's Forward formula – Trapezoidal rule – Simpson's one third rule – Simpson's Three Eighth rule. (Derivations are not included for all the formulae and theorems and simple problems)   (20 hrs)

RECOMMENDED TEXTBOOKS:
1. B.D.Gupta Numerical Analysis, KonarkPub.Ltd., Delhi.
2. S.G.Venkatachalapathy,Calculus of finite differences and Numerical analysis, Margham publications, Chennai.
3. Dr. M/K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition, The National Publishing Company, Chennai.

REFERENCE BOOKS:
1. H.C. Saxena , Finite difference and numerical analysis S.Chand&Co.Delhi.
2. S.Arumugham, Numerical Methods, New Gamma Publishing, Palayamkottai.
3. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation, Sixth edition, New age International Publishers, New Delhi.
4. E.Balagurusamy, Numerical Methods ,Tata Mc.Graw Hill, New Delhi.
5. T.K.Manicavachagam Pillai & Prof. S. Narayanan, Numerical Analysis, New Edition S. Viswanathan Printers & publishers Pvt Ltd, Chennai.

JOURNALS:
Journal of Computational and Applied Mathematics
ARPN Journal of Engineering and Applied Sciences

E-LEARNING RESOURCES:
https://divisbyzero.com/2018/02/13/finite-differences-of-polynomials/

https://www.geeksforgeeks.org/newton-forward-backward-interpolation/

https://www.geeksforgeeks.org/bessels-interpolation/

https://www.geeksforgeeks.org/program-stirling-interpolation-formula/

https://www.geeksforgeeks.org/lagranges-interpolation/

https://www.geeksforgeeks.org/newtons-divided-difference-interpolation-formula/

https://en.wikipedia.org/wiki/Numerical_differentiation

https://en.wikipedia.org/wiki/Numerical_integration

COURSE OUTCOMES: Upon successful completion of Calculus of Finite Differences - I students will be able to

CO No.	CO Statement
CO 1	Compare accuracy, precision and errors.
CO 2	Applying the Methods of interpolation to compute the missing value in real life problems.
CO 3	Utilize various numerical operators to find the generalized term.
CO 4	Compute the missing values for unequal intervals using Divided differences and Lagrange Method.
CO 5	Evaluate the approximate values of the first derivative, max and min values of the function using Newton's formula.
CO 6	Compute definite integral for different combinations of integrands using various methods and analyze their accuracy.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	2	2	2
CO2	2	3	2	2	2
CO3	2	3	2	3	2
CO4	3	3	2	2	3
CO5	3	3	3	3	2
AVERAGE	2.4	2.8	2.2	2.4	2.2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

OFFICE MANAGEMENT

TOTAL HOURS: 30   **COURSE CODE: MC18/1N/OFM//**
                                              MC18/1N/OFMH
CREDITS: 2   **L-T-P: 0-0-2**

COURSE OBJECTIVES

Enable the students to

1. Learn to create, edit, format documents using MS-Word.
2. Learn to create worksheet, align data and to calculate statistical problems using Mathematical functions.
3. Learn to edit data and represent data in a pictorial format such as charts, tables and pictures.

COURSE OUTLINE:

UNIT I:
MS WORD- Text manipulation- Usage of Numbering – Bullets, Tools and Headers – Find & Replace – Text Formatting – Picture Insertion and Alignment- Creation of documents using templates-Creation of templates-Mail Merge Concept.

(10 hrs)

UNIT II:
MS EXCEL- Creation of worksheet and entering information- Aligning- Editing data in cell, Excel function(Date, Time, Statistical-Standard Deviation- Skewness-Mathematical functions)-Changing of column width and row height.

(10 hrs)

UNIT III:
MS EXCEL –Moving, Copying, Inserting - Deleting rows & Columns-Formatting numbers and other numeric formats-Conditional & Pivot Formatting-Drawing borders around cells-Creation of charts.

(10 hrs)

RECOMMENDED TEXT:

Ananthi Seshasaayee and Seshasaayee, Computer Applications in Business and Management, Margham Publications.

REFERENCE BOOKS:
1. Dinesh Maidasani ,Learning Computer Fundamentals, Ms Office and Internet & Web Tech, Firewall Media, An Imprint of Laxmi Publications Pvt Ltd, New Delhi.
2. Dr. S.S. Srivastava ,MS-Office, Firewall Media, An Imprint of Laxmi Publications Pvt Ltd, New Delhi.
3. Joan Lambert ,Microsoft Word 2019 Step by Step, Pearson Education Pvt Ltd.
4. Curtis Frye,Microsoft Excel 2016 Step by Step, Published by Microsoft Press, Washington.

E-LEARNING RESOURCES:

https://youtu.be/IaiZc0jomz4
http://www.electricteacher.com/tutorials.htm
https://youtu.be/RdTozKPY_OQ
https://www.guru99.com/excel-tutorials.html

COURSE OUTCOMES: Upon successful completion of Office Management students will be able to

CO No.	CO Statement
CO 1	Create document and prepare formatted reports with precision and accuracy.
CO 2	Apply the knowledge of mathematical formulae and make the calculation easier for enormous data.
CO 3	Apply the pictorial representation for analysing the data to present it effectively.

MAPPING OF COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	3	3
CO 2	2	3	3	3	3
CO 3	3	3	3	3	3
Average	2	2.6	3	3	3

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2,**W**EAKLY CORELATED-1,**N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Peer Learning, Self-Study Papers

Question Paper Pattern

(All the units to be covered through Practical sessions)

5 Questions are to be answered carrying 10 marks each (Practicals)

SEMESTER –II

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	CA	SE	TOTAL
MC18/2C/CAL	Calculus	4	5	75	3-2-0	40	60	100
MC18/2C/C++	Object Oriented Programming with C++(Theory)	3	3	45	2-1-0	40	60	100
MC18/2C/PR2	Object Oriented Programming with C++(Practical)	1	2	30	0-0-2	40	60	100
MC18/2A/FD2 // MA18/2A/FD2	Calculus of Finite Differences-II	5	6	90	3-3-0	40	60	100
Part IV	1a/1b/NME	2	2	30	0-0-2	-	50	50

NON MAJOR ELECTIVE PAPER COURSE PROFILE- OFFERED TO OTHER DEPARTMENTS

Sem	COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	SE	TOTAL
II	MC18/2N/WEB// MC18/2N/WEBH/	Web Designing	2	2	30	0-0-2	50	50

NB: I B.Com Honours alone, the code for non- major elective is MC18/ 1N / OFMH// MC18/2N/WEBH

SEMESTER-II

CALCULUS

TOTAL HOURS: 75 hrs **COURSE CODE: MC18/2C/CAL**

CREDITS: 4 **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable students to

1. Provide understanding of existence of *n*'th order derivative.

2. Find the radius of curvature in Cartesian form and in parametric form.

3. Apply the reduction formula to evaluate definite integral.

4. Develop an understanding of Double and Triple Integrals.

5. Describe methods for solving Beta and Gamma Function.

COURSE OUTLINE:

UNIT I: Differential Calculus:
Successive Differentiation- n^{th} derivative, Standard results – Leibnitz
Theorem (without Proof) and its applications
Calculus -Vol I - Chap-3 Section 1.1 -1.6 & Section 2.1 -2.2 (18hrs)

UNIT II: **Envelopes:**
Maxima and Minima, Curvature – Circle, radius and centre of
curvature, Cartesian and Polar formula for the radius of curvature.
Calculus- Vol I – Chap – 5 Section 1.1 to 1.5
Chap -10, Section1.1 – 1.3, 2.1-2.3&2.6 (17hrs)

UNIT III: Integral Calculus:
Reduction formulae:$\int e^{ax}\cos bx\ dx$, $\int e^{ax}\sin bx\ dx$-
$\int \sin^m x\cos^n x\ dx$ (m, n being positive integers),
$\int x^m(\log x)^n\ dx$, $\int \cos^m x\cos nx\ dx$, $\int \cos^m x\sin nx\ dx$, Bernoulli's formula.
Calculus –Vol II - Chapter 1 Sec 1.3, 13.1 – 13.10 (15 hrs)

UNIT-IV: Double integrals (Cartesian co-ordinates only), Change of order of
integration. Triple integrals (Cartesian co-ordinates only)
Calculus Vol II- Chapter 5 Sec 2.1, 2.2 & 4 (15 hrs)

UNIT-V: Beta and Gamma functions (Applications to simple problems)
Calculus – Vol II - Chapter 7 Sec 2.1-2.3, 3, 4. (10hrs)

RECOMMENDED TEXTBOOKS:

1. S. Narayanan & T.K. Manickavachagom Pillay, Calculus Volume I (2004), S.Viswanathan Printers & Publishers.
2. S. Narayanan & T.K. Manickavachagom Pillay, Calculus Volume II (2004), S.Viswanathan Printers & Publishers.

REFERENCE BOOKS:

1. Singaravelu, R. Ramaa, Calculus & Co-ordinate Geometry of 2 dimensions (Paper II), Meenakshi Agency, Chennai.
2. P. Kandasamy and K. Thigavathi, Mathematics for B.Sc- Volume II- 2004, S.Chand and Co, New Delhi.
3. Shanti Narayan, Dr. P.K.Mittal, Differential Calculus, Rajendra Ravindra Printers, 2012.
4. George Yankovsky, Differential and integral Calculus (Vol –II), MIR Publishers.
5. N.P.Bali, Differential Calculus, Laxmi Publications Private Limited.

JOURNALS:

Journal of Logic and Computation.
Fractional Differential Calculus.

E-LEARNING RESOURCES:

https://www.scribd.com/doc/34048532/Btech-1st-Sem-Maths-Successive-Differentiation
https://www.math24.net/envelope-family-curves/
https://en.wikibooks.org/wiki/Calculus/Integration_techniques/Reduction_Formula
https://en.wikibooks.org/wiki/Calculus/double Integration_techniques
https://study.com/academy/lesson/gamma-function-properties-examples.html

COURSE OUTCOMES: Upon successful completion of Calculus students will be able to

CO No.	CO Statement
CO 1	Use Leibnitz Theorem to determine the nth derivative of product of functions.
CO 2	Compute radius of curvature for Cartesian curves, parametric curves.
CO 3	Evaluate integral values by appropriate reduction formula.
CO 4	Identify and Evaluate the multiple integral techniques.
CO 5	Analyse the relation between Beta and Gamma Function and solve problems.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	2	3	2	2
CO3	3	3	3	2	2
CO4	3	2	3	2	2
CO5	3	3	3	2	2
AVERAGE	3	2.6	3	2.2	2

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER II

OBJECT –ORIENTED PROGRAMMING WITH C++ (THEORY)

TOTAL HOURS: 45   **COURSE CODE: MC18/2C/C++**
CREDITS   : 3   **LTP : 2 1 0**

COURSE OBJECTIVES:

Enable the students to

1. Impart knowledge on Object Oriented Programming C++ and its basic concepts.

2. Introduce data analysis using arrays and friend function.

3. Encourage the students to have a clear knowledge on constructors, destructors and operator overloading.

4. Study the various inheritance while examining the execution.

5. Gain knowledge on file management in Object Oriented Programming C++.

COURSE OUTLINE:

UNIT – I: Procedure Oriented Programming, Object- Oriented Programming
Paradigm –Basic concepts of object- oriented programming – Benefits
of OOP – Applications of OOP. Introduction to C++   Operators,
Manipulators, Expressions and their types.

(7 hrs)

UNIT – II: Functions in C++ - Main Function- Function prototyping- Call by
Reference- Return by references Inline functions – Inheritance
introduction -Functions overloading. Classes and objects- Arrays
within a class, Arrays of objects- Friend functions

(10 hrs)

UNIT- III: Constructors and destructors – Multiple constructors in a class –
Constructor with Default arguments, Copy constructors- Dynamic
constructors – destructors- Operator overloading and Type
conversions.

(11 hrs)

UNIT- IV: Inheritance – Single inheritance – Multilevel Inheritance- Multiple
Inheritances-Hierarchical Inheritance- Hybrid Inheritance.

(9 hrs)

UNIT – V: Working with files – Classes for file stream operations – Opening and closing a file– Command Line arguments.

(8 hrs)

(Case studies excluded in all the units)

RECOMMENDED BOOK:

1. E. Balaguruswamy , Object Oriented Programming with C++,Tata McGraw- Hill ,Fifth edition.

REFERENCES BOOKS:

1. Schaum's Outline of , "Fundamentals of Computing with C++"John R.Hubbard
2. Herbert Schildt, The Complete Reference C++, Tata McGraw – Hill
3. Robert Lafore Object – Oriented Programming in Microsoft C++ ,Galgotia Publications Pvt.ltd.
4. Mastering C++ programming by jeganathan swaminathan, packt publishing pvt.ltd.
5. Object oriented programming using C++, kavitha pabreja,neethu narwal,IK international publishing pvt.ltd.

JOURNALS:
Object-Oriented Finite Element Analysis of Metal Working Processes- scientific research.
Programming journal(magazines)

E-LEARNING SOURCES :

http://www. c++tutor.com

http://www.opensource.org

https://www.studytonight.com/cpp/basics-of-cpp.php

https://www.studytonight.com/cpp/constructors-and-destructors-in-cpp.php

https://www.sitesbay.com/cpp/cpp-file-handling.

COURSE OUTCOMES: Upon successful completion of Object Oriented Programming with C++ students will be able to

CO No.	CO Statement
CO 1	Identify the data and understand the basic concepts in Object Oriented Programming C++.
CO 2	Apply the concepts of arrays and friend function for program development and execution.
CO 3	Evaluate the data and use constructors, destructors and operator overloading in the program for execution.
CO 4	Demonstrate the usage of inheritance while examining the execution.
CO 5	Formulate the file management of Object Oriented Programming C++ for writing program.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	3
CO2	2	2	3	3	3
CO3	2	3	3	3	3
CO4	2	2	3	3	3
CO5	2	2	3	3	3
AVERAGE	2	2.2	3	3	3

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2 **W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

OBJECT –ORIENTED PROGRAMMING USING C++ - PRACTICALS

Total Hours: 30 hrs   **Course Code: MC18/2C/PR1**

Credit: 1   **LTP: 0 02**

COURSE OBJECTIVES

Enable the students to

1. Impart knowledge on Object Oriented Programming C++ and its basic concepts.
2. Introduce data analysis using arrays and friend function.
3. Encourage the students to have a clear knowledge on constructors, destructors and operator overloading.
4. Study the various inheritance while examining the execution.
5. Gain knowledge on file management in Object Oriented Programming C++.

COURSE OUTLINE:

Implement the following programming concepts using C++

1. Classes and objects
2. Friend function.
3. Function overloading
4. Operator overloading
5. Constructors and destructors.
6. Inheritance (Single, Multiple).

Two to three programs under each heading

RECOMMENDED BOOK:

1. E.Balaguruswamy , Object Oriented Programming with C++,Tata McGraw- Hill ,Fifth edition.

REFERENCES BOOKS:

1. Schaum's Outline of , "Fundamentals of Computing with C++"John R.Hubbard
2. Herbert Schildt, The Complete Reference C++, Tata McGraw – Hill
3. Robert Lafore Object – Oriented Programming in Microsoft C++ ,Galgotia Publications Pvt.ltd.
4. Mastering C++ programming by jeganathan swaminathan, packt publishing pvt.ltd.
5. Object oriented programming using C++, kavitha pabreja,neethu narwal,IK international publishing pvt.ltd.

JOURNALS:
Object-Oriented Finite Element Analysis of Metal Working Processes- scientific research.
Programming journal(magazines)

E-LEARNING SOURCES:

http://www. c++tutor.com
http://www.opensource.org
https://www.studytonight.com/cpp/basics-of-cpp.php
https://www.studytonight.com/cpp/constructors-and-destructors-in-cpp.php
https://www.sitesbay.com/cpp/cpp-file-handling.

COURSE OUTCOMES : Upon successful completion of Object Oriented Programming with C++ - Practicals students will be able to

CO No.	CO Statement
CO 1	Identify the data and understand the basic concepts in Object Oriented Programming C++.
CO 2	Apply the concepts of arrays and friend function for program development and execution.
CO 3	Evaluate the data and use constructors, destructors and operator overloading in the program for execution.
CO 4	Demonstrate the usage of inheritance while examining the execution.
CO 5	Formulate the file management of Object Oriented Programming C++ for writing program.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	3
CO2	2	2	3	3	3
CO3	2	3	3	3	3
CO4	2	2	3	3	3
CO5	2	2	3	3	3
AVERAGE	2	2.2	3	3	3

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2 **W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

Question Paper Pattern

Duration – 3 hours**.**
Maximum marks – 100 (Internal 40 + External 60)
Practical Examination – 60 (2 x 30)

One Internal Examiner and one External Examiner to be appointed to conduct the practical examination.

SEMESTER II

CALCULUS OF FINITE DIFFERENCES – II

TOTAL HOURS: 90   **COURSE CODE: MC18/2A/FD2 //**

MA18/2A/FD2

CREDITS: 5   **L-T-P:** 3 3 0

COURSE OBJECTIVES:

Enable students to

1. Find the numerical solutions of Algebraic, Transcendental & Simultaneous equations.
2. Understand the fundamental concepts of difference equation.
3. Compute the numerical solution of ordinary differential equation.

COURSE OUTLINE:

UNIT I: SUMMATION OF SERIES
Use of forward difference operators – Summation Using Euler – Maclaurin's formula.

(15hrs)

UNIT II: SOLUTION OF ALGEBRAIC AND TRANSCEDENTAL EQUATIONS
Numerical solutions of polynomial and Transcendental equations in one variable.
      i.   Bisection Method
      ii.   Method of false position (Regular falsi Method)
      iii.   Method of Iteration
      iv.   Newton Raphson Method
(Derivations are not included for all the formulae and theorems and simple problems)

(20 hrs)

UNIT III: SOLUTION OF A SYSTEM OF ALGEBRAIC EQUATIONS
Numerical solution of Simultaneous Linear Equations in three variables by
      i.   Gauss Elimination Method
      ii.   Gauss Jordan Method
      iii.   Jacobi Iteration Method
      iv.   Gauss Seidel Method
(Derivations are not included for all the formulae and theorems and simple problems)

(20hrs)

UNIT IV: DIFFERENCE EQUATIONS

      Definition, method of solutions, first order linear difference equation with constant, variable coefficients, second order linear difference equation with constant Coefficients-Particular integrals of type

        i. a^x

        ii. x^m

        iii. $x^m a^x$ – Simple problems.   (15 hrs)

UNIT V: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER.

    i.   Euler's Method

    ii.   Modified Euler Method

    iii.   Picard's method of successive approximation

    iv.   **Runge- Kutta Method of order four.**

                 (20hrs)

RECOMMENDED TEXTBOOKS:

1. B.D.Gupta (2001) Numerical Analysis, KonarkPub.Ltd., Delhi.
2. S.G.Venkatachalapathy,Calculus of finite differences and Numerical analysis, Margham publications, Chennai. (2003).
3. Dr. M/K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition (1999), The National Publishing Company, Chennai.

REFERENCE BOOKS:

1. H.C. Saxena (1991) Finite difference and numerical analysis S.Chand&Co.Delhi.
2. S.Arumugham(2003) Numerical Methods, New Gamma Publishing, Palayamkottai.
3. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation, Sixth edition(2012), New age International Publishers, New Delhi.
4. E.Balagurusamy, Numerical Methods (1999),Tata Mc.Graw Hill, New Delhi.
5. T.K.Manicavachagam Pillai & Prof. S. Narayanan, Numerical Analysis, New Edition (2001), S. Viswanathan Printers & publishers Pvt Ltd, Chennai.

JOURNALS:

    Science Direct Journal

    LMS Journal of Computation and Mathematics

E-LEARNING SOURCES:

    https://en.wikipedia.org/wiki/Euler%E2%80%93Maclaurin_formula

    https://www.shodor.org/unchem/math/newton/

    https://en.wikipedia.org/wiki/Bisection_method

    https://en.wikipedia.org/wiki/Regula_falsi

    https://brilliant.org/wiki/newton-raphson-method/

    https://en.wikipedia.org/wiki/Gaussian_elimination

    https://en.wikipedia.org/wiki/Euler_method

    https://www.math24.net/linear-differential-equations-first-order/

COURSE OUTCOMES: Upon successful completion of Calculus of Finite Differences - II students will be able to

CO No.	CO Statement
CO 1	Compute the summation of series by applying Numerical operators and Euler Maclaurin Method
CO 2	Apply Numerical Methods to evaluate numerical solution of algebraic and transcendental equations.
CO 3	Solve Simultaneous linear equation in three variables.
CO 4	Formulate difference equation for the given problem and solve the equation.
CO 5	Evaluate the solution of first order differential equation using Euler, Picard's and Runge-Kutta Methods.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	3
CO4	3	3	2	2	2
CO5	3	3	3	2	2
AVERAGE	3	2.8	2.8	2.2	2.2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER II
WEB DESIGNING

TOTAL HOURS: 30   **COURSE CODE: MC18/2N/WEB//**
                                       MC18/2N/WEBH
CREDITS: 2   **L-T-P: 0-0-2**

COURSE OBJECTIVES

Enable the students to

1. Learn the language of the web: HTML.
2. Understand the principles of creating an effective web page.
3. Learn to embed other media links into web pages.

COURSE OUTLINE:

UNIT I:

Introduction – HTML Basics – Understanding Tags

(10 hrs)

UNIT II:

Tags for Document structure(HTML,Head,Body,Tag), Block level elements:(bold, italic, font, small, strong, strike, big tags).

(10 hrs)

UNIT III:

List: Types of lists: Ordered, Unordered- Nesting Lists- Other tags: Marqueue, HR, BR – Using Images- Creating Hyperlinks.

(10 hrs)

RECOMMENDED TEXT:

HYPERTEXT MARK UP LANGUAGE, Dr. S. Aruna, Margham Publications

REFERENCE BOOKS:

1.Jon Duckett, HTML and CSS: Design and Build Websites, John Wiley & Sons, Inc.
2.IztokFajfar ,Start Programming Using HTML, CSS, and JavaScript, CRC Press, Taylor & Francis Group.
3.Jennifer Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web, USA.
4.A.A.Puntambekar, Web Technologies, Technical Publications, Pune.

E-LEARNING RESOURCES:

https://www.w3schools.com/html/html_intro.asp
https://youtu.be/CmsoTHqdTn8
https://html.com/

COURSE OUTCOMES : Upon successful completion of Web Designing will be able to

CO No.	CO Statement
CO 1	Develop skills to write HTML programming.
CO 2	Develop an understanding of the formalistic aspects of design.
CO 3	Implement other sources of data into webpage and creates an attractive webpage.

MAPPING -COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	3
CO 2	2	3	3	3	3
CO 3	2	3	3	3	3
Average	**2**	**3**	**3**	**3**	**3**

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2, **W**EAKLY CORELATED-1, **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Peer Learning, Self-Study Papers

Question Paper Pattern

(All the units to be covered through Practical sessions)

5 Questions are to be answered carrying 10 marks each (Practicals)

SEMESTER –III

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	CA	SE	TOTAL
MC18/3C/CLA	Classical Algebra	4	5	75	3-2-0	40	60	100
MC18/3C/DEF	Differential equations & Fourier series	4	5	75	3-2-0	40	60	100
MC18/3A/MS1// MA18/3A/MS1	Mathematical Statistics & R Software –I	5	6	90	4-1-1	40	60	100
Part IV UG18/3S/EVS	Environmental Studies	2	2	30	2-1-0	-	50	50

CLASSICAL ALGEBRA

Total Hours: 75 **Course Code: MC18/3C/CLA**
Credits : 4 **L T P : 3 2 0**

COURSE OBJECTIVES

Enable the students to

1. Impart knowledge and skill in various summation of series.
2. Study the logics of polynomial equations.
3. Introduce the Reciprocal equation and various rules on finding the roots of the equation.
4. Study the concepts of divisibility and primes.
5. Introduce the concept of congruence and primitive roots of number theory.

COURSE OUTLINE:

UNIT-I: Summation of series using Binomial, Exponential and Logarithm-Series
  Book1:VolI:Chapter-3 Section: 10
  Chapter-4 Section: 3, 4 (15 hrs)

UNIT-II: Theory of Equation: Polynomial equation – Relation between roots and coefficient
  – Symmetric function of rules, Formation of equations
  Book1:VolI:Chapter - 6, Section 1-12. (15hrs)

UNIT-III: Transformation of equations, Reciprocal equations, Discard's rule of signs,
  Approximation   of roots of cubic equation by Horner's Methods.
  Book 1:   Vol I: Chapter – 6 Section: 5 – 17, 24, 30. (15hrs)

UNIT-IV: Introduction – Divisibility- Primes.
  Book 2:Chapter 1: Sections - 1.1 to 1.3 (15 hrs)

UNIT-V: Congruences, Solution of Congruences, Chinese Remainder Theorem-
  Primitive roots and Power Residues.
  Book 2:   Chapter: 2: Sections 2.1 to 2.3, (15 hrs)

RECOMMENDED TEXT:

1. Algebra Vol I, T.K.ManicavachagamPillay, T.Natarajan, K.S. Ganapathy S.VishwanathanPvt,.Ltd, 2008.
2. An introduction to the Theory of Numbers (5th edition) by Ivan Niven, Herbert S. Zuckarmanand Hugh L. Montgometry John Wiley & Sons, Inc.2001.

REFERENCE BOOKS:
1. Elementary theory of numbers, cy. Hsiung, Allied publishers, 1995.
2. Elementary Number Theory, Allyn and Bacon Inc., Boston, 1980.
3. Introduction to Analytic Number Theory, Tom. M. Apostol, Narosa Publishing House, New Delhi, 1989.
4. Allied Mathematics, S.G.Venkatachalapathy, Margham Publishers.
5. Allied Mathematics, P.R.Vittal, Margham Publishers.

JOURNALS:
ScienceDirect.com – Journal – on – Algebra
ScienceDirect.com – Journal of Number thoery

E-LEARNING SOURCES:
https://en.wikipedia.org/wiki/Binomial_theorem
https://en.wikipedia.org/wiki/List_of_mathematical_series
http://www.mathforum.org
http://poincare.matf.bg.ac.rs/~zarkom/Polynomials_EJBarbeau.pdf
https://www.pdfdrive.com/number-theory-art-of-problem-solving-aops-d1505092.html

COURSE OUTCOMES: Upon successful completion of Classical Algebra students will be able to

CO No.	CO Statement
CO 1	Evaluate the summation of series using Binomial, Exponential and Logarithmic methods.
CO 2	Compare and identify the polynomial equations
CO 3	Apply the analytical techniques in finding the roots of any polynomial equation.
CO 4	Demonstrate the concept of divisibility and primes.
CO 5	Apply the procedure to find congruence and primitive roots.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	3	2	2
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	3	3	2	2	2
CO5	3	3	2	2	2
AVERAGE	2.8	3	2.2	2	2

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

DIFFERENTIAL EQUATIONS AND FOURIER   SERIES

TOTAL HOURS: 75   **COURSE CODE: MC18/3C/DEF**

CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable students to

1. Use the method of integrating factors to solve linear, first-order DEs.

2. Find the complete solution of a non homogeneous differential equation.

3. Solve the first order differential equations using variable separable method.

4. Introduce and solve linear Partial Differential with different methods.

5. Expand odd or even functions periodically extended beyond that range in fourier series.

COURSE OUTLINE:

UNIT I: Differential Equations of first order: Bernoulli's equations, Exact
   Differential Equations, Equations solvable for p, Equations solvable
   for x, Equations Solvable for *y*, Clairaut's Equation
   Chapter 1: Sections 2.5, 3.1, 5.1, 5.2,5.3, 5.4, 6.1   (16 hrs)

UNIT II: Linear equations: Linear equations with Variable Coefficients,
    Equations reducible to the linear homogeneous equations, Method
    of Variation of Parameters.
    Chapter 2: Sections 8, 9, 10   (15hrs)

UNIT III: Simultaneous Differential equations: Simultaneous equations of
    first Order and first degree, Solutions of dx/P = dy/Q = dz/R, Total
    differential equations.
    Chapter 3: Section 2, 3, 7, 7.2, 7.3, 7.4   (15 hrs)

UNIT IV: **Partial Differential equations:** Formation of P.D.E by eliminating
     constants and by eliminating variables, Different integrals of Partial
     differential equations, Standard types of first order equations.
       Chapter 4: Section2.1, 2.2, 3, 4, 5.1, 5.2, 5.3, 5.4   (19hrs)

UNIT V: Fourier series: Fourier series of periodic functions, Fourier series of
     odd and even functions.
       Chapter 6: Section – 1, 2, 3   (10 hrs)

RECOMMENDED TEXT:

1. S.Narayanan & T.K. Manicavachagam Pillay, Calculus Vol III, S.Vishwanathan Printers and publishers pvt.ltd, Chennai.(2016).

REFERENCE BOOKS:

1. N.P. Bali, Differential Equations, Firewall Media Publications, (2006).
2. S.Narayanan, Differential Equations and its Applications, Dhivya Subramanian for Anand Book Depot (2017).
3. Kalipada Maity, Introduction to Differential Equations, Narosa Publishing House Private Limited- 2017.
4. V. Venkateswara rao , S. Sanganatham , S. Anjaneya Sastry , N. Krishnamurthy & B.V.S.S. Sarma, Differential Equations, S.Chand Publishing House, Chennai, (2018).
5. A.R.Forsyth, A Treatise on Differential Equations, 6th Edition, Macmillan & Co. Limited.

JOURNALS:

Journal of Differential Equations.
International Journal of Differential Equations.

E-LEARNING RESOURCES:

https://brilliant.org/wiki/first-order-differential-equations-problem-solving/
https://en.wikipedia.org/wiki/Variation_of_parameters.
http://mathsfirst.massey.ac.nz/Algebra/SystemsofLinEq.htm.
https://en.wikipedia.org/wiki/List_of_partial_differential_equation_topics
https://en.wikipedia.org/wiki/Fourier_series

COURSE OUTCOMES: Upon successful completion of Differential Equation and Fourier series students will be able to

CO No.	CO Statement
CO 1	Evaluate and solve Separable, Homogeneous, Exact, and Linear first order differential equations.
CO 2	Analyse and solve differential equations using variable coefficients and variation of parameters
CO 3	Formulate the separation of variables and solve simultaneous equations and analyze the behaviour of solutions.
CO 4	Formulate P.D.E by eliminating arbitrary constants and variables and solve its standard types.
CO 5	Identify the nature of the Fourier series that represent even and odd functions and examine the derivations of a Fourier series

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	3	2
CO5	3	3	2	3	2
AVERAGE	3	3	2.8	2.6	2

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER III

MATHEMATICAL STATISTICS &R-SOFTWARE-I

TOTAL HOURS: 90　　　　**COURSE CODE: MC18/3A/MS1//**
　　　　　　　　　　　　　　　　　　　　MA18/3A/MS1

CREDITS: 5　　　　　　　　　**L-T-P: 4-1-1**

COURSE OBJECTIVES:

Enable the students to

1. Distinguish between discrete and continuous distribution.
2. Equip Students with the Knowledge of R-Programming and apply it to compute statistical measures.
3. Study the degree of relationship between two variables and to compute the relationship as linear equations.

COURSE OUTLINE:

Concept of probability to be revised (not included for examination purpose)

THEORY COMPONENT

UNIT I: RANDOM VARIABLES: Definition of a Random Variable, Discrete and Continuous Random Variable, Mathematical Expectation of a Discrete and Continuous Random Variable.
　　　Book 1　Chapter 5　Sections 5.1 - 5.4.1
　　　　　　　　Chapter 6 Sections 6.1 - 6.7　　　　　　　　　　　　(15hrs)

UNIT II: DISCRETE DISTRIBUTIONS: Binomial, Poisson distributions –
　　　Definitions, Mean, Median, Mode, Recurrence formula for moments,
　　Moment Generating Function, Additive Property, Fitting of Distributions.
　　Book 1　Chapter 7　　　　　　　　　　　　　　　　　　　　(15 hrs)

UNIT III: CONTINUOUS DISTRIBUTION: Rectangular distribution, Normal
　　　Distribution - Definition, limiting form of Binomial distribution,
　　　(derivation excluded).Chief characteristics of Normal distribution.
　　　Normal Probability curve, Mean, Mode, Median, Moment Generating
　　　Functions, Moments, Area property, Fitting of Normal Distribution.
　　　Book 1　Chapter 8　Sections 8.1-8.2.14　　　　　　　　　　(15hrs)

UNIT IV: CORRELATION &REGRESSION: Simple correlation - Rank
　　　correlation, Product moment correlation for raw and grouped data.

Regression lines for X on Y and Y on X, Computation of means, variances and correlation coefficient from regression lines.(Derivation of formulae for correlation and regression lines excluded).
  Book 1 Chapter   10 Sections 10.1-10.6.1,10.7- 10.7.5   (30 hrs)

PRACTICAL COMPONENT

UNIT V: COMPUTATIONAL STATISTICS USING "R" SOFTWARE

(Practicals only): Diagrammatic representation of data by subdivided and Multiple Bar diagram, pie chart. Graphical representation of frequency data Rod &Spike graph, frequency polygon . Less than and more than Ogives. Correlation and rank correlation between two variables. Regression lines of X on Y and Y on X. **.   (Internal Practicals only,No questions for the end semester examination)**
  Book 2   (15hrs)

RECOMMENDED TEXT:
1. S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third edition (2015)Sultan Chand & Sons publications,NewDelhi.
2. Sudha G.Prohit, SharadD.Gore and Shailaja R. Deshmukh, Statisitcs using R, Secondedition(2015), Narosa Publishing House, NewDelhi.

REFERENCE BOOKS:

1. P.R. Vittal, Mathematical Statistics(2002), Margham Publications,Chennai.
2. S.C. Gupta and V.K. Kapoor,Fundamentalsof Mathematical Statistics, Eleventh edition (2002)Sultan Chand & Sons publications
3. RobertV.Hogg,Joseph Mckean &Craig A.T,Introduction to Mathematical Statistics,(2013)Pearsons Education India
4. George W.Snedecor, William G.Cochran ,Statistical Methods(1967),Oxford &IBH Publishers.

5. Dr.S.P.Gupta, Statistical Methods,41st edition (2011),Sultan Chand &Sons,NewDelhi.

JOURNALS:
   Mathematics Newsletter Published by Ramanujam Mathematical Society
   Discrete Mathematical Science & Cryptography.

E-LEARNING SOURCES:
                    http://faculty.arts.ubc.a>notes_exp and
                    https://www.probabi;itycourse.com>
                    https://cimt.org.uk>stats_ch6 and
                    http://www.probabilityformula.org>
                    https://www.slideshare.net
                    https://www.svce.ac.in>
                    http://www.r-project.org

COURSE OUTCOMES: Upon successful completion of Mathematical Statistics and R-Software – I students will be able to

CO Number	CO STATEMENT
CO 1	Differentiate between discrete and continuous random variables and compute the mathematical expectation of random variable
CO 2	Compute mean, median and mode of binomial and poisson distribution and their moments
CO 3	Analyse rectangular and normal distribution and compute the various parameter of the distribution. Apply normal distribution properties to solve real life problems.
CO 4	Compute correlation and rank correlation and to find the relation between two variables using regression.
CO 5	Effectively use 'R' software for representation of data, computation of correlation and regression lines.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	3	3	2
CO3	3	3	3	2	2
CO4	3	3	3	3	3
CO5	2	3	3	3	3
AVERAGE	2.8	3	3	2.4	2.4

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER –IV

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	CA	SE	TOTAL
MC18/4C/DSA	Data Structures and Algorithms	4	5	75	3-2-0	40	60	100
MC18/4C/VGF// MA18/4C/VGF	Vector Calculus, Geometry and Fourier Transforms	4	5	75	3-2-0	40	60	100
MC18/4A/MS2// MA18/4A/MS2	Mathematical Statistics& R Software –II	5	6	90	4-1-1	40	60	100
Part IV	Soft Skill	3	2	30		-	50	50
UG18/4S/VED	Value Education	2	2	30	2-1-0	-	50	50

DATA STRUCTURES AND ALGORITHMS

TOTAL HOURS: 75   **COURSE CODE: MC18/4C/DSA**

CREDITS: 4   **L-T-P: 3-2-0**

COURSE OBJECTIVES

Enable the students to

1. Impart the basic concepts of data structure, array and its operations.

2. Introduce the concept of linked list and its operations.

3. Understand the concept of Stack & Queue , its representation and operations.

4. Understand the concept of Tree & Graph , its representation and operations.

5. Study the basic concepts of algorithms and step by step approach in writing algorithms with help of fundamental data structures .

COURSE OUTLINE:

UNIT I: Data Structures: Definition of a Data structure – Data structure operations-primitive and composite Data Types, Arrays-Linear Arrays-Representation of Linear Array in Memory-Traversing Linear Array-Inserting and Deleting in Linear Arrays   (15hrs)

Chapter 1: 1.3-1.4 & Chapter 4: 4.1-4.5

UNIT II: Linked list-Representation of Linked lists in Memory-Insertion into a linked list-Deletion from a linked list.   (15 hrs)

Chapter 5: 5.1-5.3, 5.7-5.8

UNIT III: Stack- Array representation of stack-Linked representation of Stack-Application of Stack (infix to postfix conversion)-**Queue**-Linked representation of Queue.   (15 hrs)

Chapter 6: 6.1-6.4 , 6.10-6.11

UNIT IV: Trees- Binary trees-Representing Binary tree in Memory-Traversing Binary
trees. **Graph-** Graph terminology- Sequential representation of graph: Adjacency
matrix, Linked representation- Traversing a graph(Breadth First Search &
Depth First Search)-Warshall's& Shortest path Algorithm.

(20hrs)

Chapter 7: 7.1-7.4 Chapter 8: 8.1-8.5, 8.7

UNIT V: Algorithms – Definitions-examples, Complexity of Algorithms- Bubble
sort – linear Search

(10 hrs)

Chapter 1: 1.5 Chapter 2: 2.5 Chapter 4: 4.6-4.7

RECOMMENDED TEXT:

DATASTRUCTURES by SEYMOUR LIPSCHUTZ, Edition 2006,TataMcGraw-hill Publications.

REFERENCE BOOKS:
1. Data Structures and Algorithms , L. MathuKrithigaVenkatesh, Margham Publications.
2. R. Kruse C.L. Tondo and B. Leung ,1997, Data Structures and Program design in C, PHI.
3. Cangsam,Auguenstein, Tenenbaum,Data Structures using C & C++,PHI
4. D.Samantha,2005, Classic Data Structures, PHI,New Delhi.
5. A.A.Puntambekar, Data Structures And Algorithms, Technical Publications, Pune.

JOURNALS
http://computers.journalspub.info/index.php?journal=JDSA&page=article&op=view&path%5B%5D=79
https://arxiv.org/format/1908.03042

E-LEARNING RESOURCES:

http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-851-advanced-data-structures-spring-2012/
https://www.studytonight.com/data-structures/introduction-to-data-structures

https://cs.lmu.edu/~ray/notes/algds/

https://www.cs.cmu.edu/~adamchik/15-121/lectures/Arrays/arrays.html

https://www.programiz.com/dsa/linked-list

https://www.cs.cmu.edu/~adamchik/15121/lectures/Stacks%20and%20Queues/Stacks%20and%20Queues.html

https://www.hackerearth.com/practice/algorithms/graphs/graph-representation/tutorial/

https://www.tutorialride.com/data-structures/trees-in-data-structure.htm

https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm

COURSE OUTCOMES : Upon successful completion of Data Structures and Algorithm students will be able to

CO No.	CO Statement
CO 1	Identify the data and apply the suitable concepts of data structure in programming.
CO 2	Demonstrate linked list and its operations for programming.
CO 3	Explain and utilize the concepts of stack and queue for programming.
CO 4	Compare the data in the required format using search and sort techniques.
CO 5	Ability to analyze and check the algorithms.

MAPPING OF COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	3	3
CO 2	2	3	3	3	3
CO 3	2	3	3	3	3
CO 4	2	3	3	3	3
CO 5	2	3	3	3	3
Average	**2**	**3**	**2.8**	**3**	**3**

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2, **W**EAKLY CORELATED-1, **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER IV

VECTOR CALCULUS, GEOMETRY AND FOURIER TRANSFORMS

TOTAL HOURS: 75

COURSE CODE: MC18/4C/VGF//
MA18/4C/VGF

CREDITS: 4

L-T-P: 3 2 0

COURSE OBJECTIVES:

Enable students to

1. Understand the fundamental concepts of vector differentiation.
2. Compute line, Surface & Volume integrals by using Green's Stroke's & Gauss Divergence theorem.
3. Compute the Fourier Transform of a continuous function.

COURSE OUTLINE:

UNIT I: Vector Differentiation: Directional Derivative, Gradient, Unit normal to the surface, Equation of tangent plane to a surface, Equation of normal to a surface, Divergence, Curl, Laplace operators.
Book 1 - Chapter 2 Sections 2.1-2.13   (15 hrs)

UNIT-II: Evaluation of line integral, surface integral and volume integral.
Book 1- Chapter 3 Sections 3.1-3.6   (15hrs)

UNIT-III: Application of Green's theorem, Gauss-Divergence theorem, Stokes theorem (proofs of theorems not included)- simple problems.
Book 1- Chapter 4 Sections 4.1-4.8   (15 hrs)

UNIT-IV: Planes: Equation of a plane, Angle between two planes, Equation of a plane through line of intersection of two planes, length of perpendicular, To find the equation of the plane which bisects the angle between two given planes-simple problems.
Book 2- Chapter II Sections 1-11   (15hrs)

UNIT-V: Polar Co ordinates: Distance between the points, area of Triangle- equation of straight line.
Fourier Transforms: Integral transforms, Fourier Integral Theorem (Without proof), Fourier sine and cosine integrals (Only Formulae) Fourier transforms (Fourier sine transforms and cosine transforms of elementary functions)
Book 3- Chapter 5, Book 4 – Chapter 6   (15 hrs)

RECOMMENDED TEXT:

1. Duraipandian, P., Kayalal Pachaiyappa, Vector Analysis First Edition (2014) S.Chand & Company Ltd., New Delhi.
2. T.K. Manicavachagam Pillay & T.Natrajan, Revised edition(1996) Analytical Geometry (Part II-Three dimensions), S.Vishwanathan Printers and publishers pvt.ltd, Chennai.
3. Prof. S. G. Venkatachalapathy, Analytical Geometry (Two dimensions & Three dimensions), Frst edition (2008), Margham Publications, Chennai.
4. A. Singaravelu, Differential Equations, Fourier Series and Laplace Transforms, First Edition (2002), Meenakshi Traders, Chennai.

REFERENCE BOOKS:
1. M.L.Khanna, Co-ordinate Geometry, Jai Prakash Nath & co.
2. P.R.Vittal, Vector analysis, Analytical solid Geometry and sequences and series, Third edition (2003), Margham Publications, Chennai.
3. Dr. K.Venkataraman – Engneering Mathematics – Part –B, National Publishing Company, Chennai.
4. B.S. Grewl, Higher Engineering Mathematics (2002), Khanna Publishers, New Delhi.
5. G.B. Thomas and R.L. Finnery, Calculus and Analytic Geometry, Ninth Edition (1998), Addison Wesley, New Delhi.

JOURNALS:
    Global Journal of Science Frontier Research
    International Journal of Mathematical Education in Science and Technology.

E-LEARNING RESOURCES:

    http://www.bhojvirtualuniversity.com/slm/bsc1_maths3.pdf
    https://en.wikipedia.org/wiki/Vector_calculus
    https://www.intmath.com/vectors/10-vector-calculus.php
    http://www0.cs.ucl.ac.uk/teaching/GZ05/03-fourier.pdf
    http://rundle.physics.ucdavis.edu/PHYGEO30/Fourier_Transforms.pdf

COURSE OUTCOMES: Upon successful completion of Vector calculus, Geometry and Fourier Transforms students will be able to

CO No	CO STATEMENT
CO 1	Discuss the Basic concepts of gradient, Scalar Potential, Directional Derivative, Divergence and Curl
CO 2	Evaluate line integral, surface integral and volume integral
CO 3	Apply Green's theorem, Gauss-Divergence theorem, Stoke's theorem to evaluate Area and Volume.
CO 4	Discuss the Geometrical concepts of Planes.
CO 5	Apply the concept of Polar coordinates to find the Distance between the Points, Area of a triangle and Solve problems on Straight lines. Determine Fourier Transform for a given function.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	2	2
CO4	3	2	3	2	2
CO5	3	3	3	2	2
AVERAGE	3	2.8	3	2.4	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER IV

MATHEMATICAL STATISTICS &R-SOFTWARE-II

TOTAL HOURS: 90 **COURSE CODE: MC18/3A/MS1//**
  MA18/3A/MS1

CREDITS: 5 **L-T-P: 4-1-1**

COURSE OBJECTIVES:

Enable the students to

1. Understand the concepts of sampling, testing of hypothesis, critical region and standard error.
2. Understand the significance of the connection between statistics and their applications to the real world.
3. To equip the students with the knowledge of R-Programming and apply it to compute statistical measures.

COURSE OUTLINE:

THEORY COMPONENT

UNIT I : SAMPLING THEORY: Tests of Hypothesis, Concepts of Standard Error, Null Hypothesis, Alternative Hypothesis, Error in Sampling, Critical Region and Level of Significance, One tailed and Two tailed tests, Degrees of freedomSimple and Composite Hypothesis, Size and Power of a test,.
 Book 1 Chapter 12 Sections 12.1 - 12.7 (15 hrs)

UNIT II : TEST OF SIGNIFICANCE FOR LARGE SAMPLES: Test of
 Significance of single mean, Test of significance of difference of two means,Difference between two standard deviation, Test for single proportion, Test of   significance for difference of two proportions, Confidence Intervals.
 Book 1, Chapter 12, Sections 12.8 -12.9.2, 12.13 – 12.15.
 TEST OF SIGNIFICANCE FOR SMALL SAMPLES:
  t- Test – Test for single mean,Test of Significance for Difference between two Population Means, t-Test for Paired Observations, F- test.
 Book 1 Chapter 14 Sections 14.1-14.2.7, 14.3.2 (40 hrs)

UNIT III : CHI-SQUARE TEST: Chi-Square test for Homogenity, Chi-Square Test
of Goodness of Fit, Test of Independence of two Attributes.

Book 1   Chapter 11 Sections 11.7 – 11.8
Chapter 13 Sections 13.5.2& 13.5.3   (10 hrs)

UNIT IV : ANALYSIS OF VARIANCE:
ANOVA – One way classification, Two way classification

Chapter 17   Sections17.1 – 17.3   (10 hrs)

PRACTICAL COMPONENT

**UNIT V: COMPUTATIONAL STATISTICS USING "R" SOFTWARE (
Practicals only):**Measures of central tendency, Mean, Median, Mode, Skewness
and Kurtosis. Fitting of distribution Binomial, Poisson and Normal. Chi-
Square test of Goodness of fit. Test of Significant difference between
two means and two proportions . Paired t- test ,ANOVA one way
classification**.   (Internal Practicals only,No questions for the
end semester examination)**
Book 2   (15 hrs)

RECOMMENDED TEXT:
1. S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third edition (2015)
    Sultan Chand & Sons, publications,NewDelhi.
2. Sudha G.Prohit, SharadD.Gore and Shailaja R. Deshmukh, Statisitcs using R,
    Secondedition(2015), Narosa Publishing House, NewDelhi.

REFERENCE BOOKS:

1. P.R. Vittal, Mathematical Statistics(2002), Margham Publications,Chennai.
2. S.C. Gupta and V.K. Kapoor,Fundamentalsof Mathematical Statistics, Eleventh
    edition (2002)Sultan Chand & Sons publications
3. RobertV.Hogg,Joseph Mckean &Craig A.T,Introduction to Mathematical
    Statistics,(2013)Pearsons Education India
4. George W.Snedecor, William G.Cochran ,Statistical Methods(1967),Oxford &IBH
    Publishers.
5. Dr.S.P.Gupta, Statistical Methods,41st edition (2011),Sultan Chand
    &Sons,NewDelhi.

JOURNALS:
Mathematics Newsletter Published by Ramanujam Mathematical Society
Discrete Mathematical Science & Cryptography.

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E-LEARNING SOURCES:

COURSE OUTCOMES: Upon successful completion of Mathematical Statistics and R Software – II students will be able to

CO No	CO STATEMENT
CO 1	Determine the basic concepts of sampling, test statistics and critical region.
CO 2	Understand, apply and compute sample test of hypothetic problem.
CO 3	Apply and examine the chi-square goodness of fit, test for independence ad homogeneity
CO 4	Analyse the principles of designs of experiments to yield valid conclusion.
CO 5	Effectively use 'R' software to find averages and derive at statistical inference from various distribution.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	2	3	3	3	3
AVERAGE	2.8	2.8	3	2.8	2.8

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER –V

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	MARKS		
						CA	SE	TOTAL
MC18/5C/ALS	Algebraic Structures	4	5	75	3-2-0	40	60	100
MC18/5C/RAN	Real analysis	4	5	75	3-2-0	40	60	100
MC18/5C/MEC	Mechanics	5	6	90	4-2-0	40	60	100
MC18/5C/PYT	Python Programming (Theory)	3	5	75	2-3-0	40	60	100
MC18/5C/PR3	Python Programming (Practical)	1	3	45	0-0-3	40	60	100
MC18/5E/OR1	Operations Research-I	5	6	90	3-3-0	40	60	100
MC18/5E/ENT	Elementary Number theory	5	6	90	3-3-0	40	60	100

TOTAL HOURS: 75   **COURSE CODE: MC18/5C/ALS**

CREDITS: 4   **L-T-P: 3-2-0**

COURSE OBJECTIVES

Enable the students to

1. Present the relationships between abstract algebraic structure groups & subgroups with familiar number system such as integers and real numbers.
2. Impart knowledge of normal and quotient subgroups.
3. Understand the relation between groups and permutation by Cayley's theorem.
4. Learn the extended concept of group & field such as rings and its properties.
5. Introduce the concept of ideals and its types to define Euclidean ring and unique factorization theorem.

COURSE OUTLINE:

UNIT I : Groups –Subgroups.   (15 hrs)

UNIT II: A Counting Principle –Normal subgroups –Quotient groups.   (15 hrs)

UNIT III: Homomorphism –Isomorphism- Automorphism - Cayley's theorem.

(15hrs)

UNIT IV: Rings: Definitions- Examples - Some Special Classes of rings-
       Homomorphism- Isomorphism.

(15hrs)

UNIT V: Ideals and Quotient Rings-Maximal Ideals, Principal Ideals, Definition of
       Euclidean Ring, Unique Factorization Theorem (Theorem 3.7.2 only)

(15hrs)

RECOMMENDED TEXT:
       I.N.Herstein (1989) Topics in Algebra(2nd edition) Wiley Eastern Ltd.
       New Delhi.
              Chapter-2: Sec2.1 to 2.9 (except applications1 and 2 of section 2.7,
                     Examples 2.8.1 & 2.8.2 and applications of section 2.9),
              Chapter-3: Sec 3.1 to 3.5, 3.7 (definition and theorem 3.7.2 only)

REFERENCE BOOKS:

1. Joseph Gallian, <u>Contemporary Abstract Algebra 8th Edition</u>, Brooks/Cole, Cengage Learning, USA.
2. John B Fraleigh, <u>A First Course in Abstract Algebra 7th Edition</u>, Pearson Education in South Asia.
3. S. Arumugam, A.ThangapandiIssac, <u>Modern algebra,</u> New Gamma Publishinghouse, Palayamkottai.
4. K. ViswanathaNaik, <u>Modern algebra</u>, Emerald Publishers.
5. Vijay K Khanna, S K Bhambri, <u>A Course in Abstract Algebra 4th Edition</u>, Vikas Publishing House Pvt Ltd.

JOURNALS

https://link.springer.com/chapter/10.1007%2F978-1-4684-9458-7_6

https://www.researchgate.net/publication/270222541_Group_Algebra_and_Coding_Theory

https://www.jstor.org/stable/27956028?seq=1#page_scan_tab_contents

E-LEARNING RESOURCES:

https://www.mathsisfun.com/sets/groups-introduction.html

http://www.math.niu.edu/~beachy/aaol/groups2.html

https://ysharifi.wordpress.com/tag/cayleys-theorem/

https://www.emathzone.com/tutorials/group-theory/introduction-to-rings-in-algebra.html

https://study.com/academy/lesson/field-theory-definition-examples.html#lesson

https://www.bubblyprimes.com/prime-factorization/

COURSE OUTCOMES : Upon successful completion of Algebraic Structures students will be able to

CO No.	CO Statement
CO 1	Demonstrate the importance of algebraic properties and definitions.
CO 2	Explain the equivalence relation between sets and equivalence classes to form a normal subgroup and quotient group.
CO 3	Demonstrate the embedding of any group into a group of permutations.
CO 4	Identify the rings and analyse the basic theoretical proofs.
CO 5	Formulate any given integer either as prime or product of primes in unique way.

MAPPING -COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	2	2
CO 2	3	3	3	2	2
CO 3	3	3	2	2	2
CO 4	3	3	2	2	2
CO 5	3	3	3	2	2
Average	**3**	**3**	**2.6**	**2**	**2**

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2, **W**EAKLY CORELATED-1, **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20	100	-
K1, K 2	B-5/8x7 marks	200	35		
K2, K 3	C-3/5x15 marks	500	45		

REAL ANALYSIS

TOTAL HOURS: 75   **COURSE CODE: MC18/5C/RAN**

CREDITS: 4   **L-T-P: 3-2-0**

COURSE OBJECTIVES

Enable the students to

1. Impart the concepts of countability of real numbers, least upper bounds, convergence & divergence of a sequence and Cauchy sequence.

2. Understand the types of convergence and divergence of a series using comparison test, root test and ratio test.

3. Define the limit of a function and to determine continuity of a function. Also to learn about metric spaces, open sets and closed sets.

4. Learn more about open sets, compactness, connectedness and completeness of metric spaces.

5. Learn the concepts of Sets of measure zero & Riemann Integral.

COURSE OUTLINE:

UNIT I: Countability of Real Numbers- Least Upper Bounds-Sequences and Subsequences- Limit of a Sequence- Convergent and Divergence Sequence- Bounded Sequences- Monotone Sequences-Cauchy Sequences.

     Chapter 1: Sections 1.5-1.7.   Chapter 2: Sections 2.1-2.6 and 2.10. (15hrs)

UNIT II: Convergence and Divergence of Series- Series with Non-Negative Terms- Alternating Series- Conditional and Absolute Convergence- Test for Absolute Convergence.

     Chapter 3: Sections 3.1-3.4 and 3.6.   (15 hrs)

UNIT III: Limit of a Function- Metric Spaces- Function Continuous at a Point on the Real Line- Open Sets- Closed Sets.

     Chapter 4: Sections 4.1-4.2
     Chapter 5: Sections 5.1,5.4, 5.5   (15hrs)

UNIT IV: More about Open sets-Connected Sets-Complete Metric Spaces-
Compact Metric Spaces.

Chapter 6: Sections 6.1-6.2,6.4-6.5 (20hrs)

UNIT V: Sets of measure Zero- Definition of the Riemann Integral – Existence of
the Riemann Integral (statement only)

Chapter 7: Sections7.1-7.3 (10hrs)

RECOMMENDED TEXT:

1. "Methods of Real Analysis" by "Richard R Goldberg" Oxford and IBH Publishing
   Co.Pvt.Ltd, New Delhi.

REFERENCE BOOKS:
1. Tom.M.Apostal , 'Mathematical Analysis' Narosa Publishing house ,II edition.

2. Rudin W.,1976, Principles of Mathematical Analysis , Tata McGraw Hill company
   ,New York.
3. Malik .S.C &SavitaArora ,19991 , Mathematical Analysis , Wiley eastern Limited, New
   Delhi
4. Sanjay Arora&Bansi Lai,19991,Introduction to Real Analysis, SatyaPrakashan ,
   NewDelhi
5. Gelbaum .B.R & Olmsted, 1964, Counter Examples in Analysis, Holden Day,
   San Fransis Co.
6. A.L.Gupta& N.R.Gupta,2003, Principles of Real Analysis , Pearson Education (India
   Print)

JOURNALS:

https://www.sciencedirect.com/science/article/pii/S0022000010001042?via%3Dihub

https://www.researchgate.net/publication/261995635_ON_D-METRIC_SPACES

E-LEARNING RESOURCES:

https://www.mathsisfun.com/numbers/evolution-of-numbers.html

https://www.google.com/url?sa=t&source=web&rct=j&url=https://home.iitm.ac.in/naru/ma1010/notes/MA1010-Note001.pdf&ved=2ahUKEwji7pjEgvjjAhVIrY8KHeuYAn0QFjACegQIEBAI&usg=AOvVaw14VTBTROsCrwEA1NqioD0_&cshid=1565430418833

https://mathcs.org/analysis/reals/numser/series.html

http://www-history.mcs.st-and.ac.uk/~john/MT4522/Lectures/L5.html

http://math.feld.cvut.cz/mt/txtd/1/txe3da1a.htm

COURSE OUTCOMES: Upon successful completion of Real Analysis students will be able to

CO No.	CO Statement
CO 1	Explain the fundamental properties of real numbers that leads to formal development of real analysis. Also able to demonstrate the limits and how their use in sequences, series & derivatives.
CO 2	Identify the given series as whether convergent or divergent.
CO 3	Apply the abstract ideas and rigorous methods of mathematical analysis to practical problems.
CO 4	Construct mathematical proofs for basic results of real analysis.
CO 5	Identifying the sets of measure zero and Riemann Integral.

MAPPING - COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	2	2
CO 2	3	3	2	2	2
CO 3	3	3	2	2	2
CO 4	3	3	2	2	2
CO 5	3	3	2	2	2
Average	**3**	**3**	**2**	**2**	**2**

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2, **W**EAKLY CORELATED-1, **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

TOTAL HOURS: 90   **COURSE CODE: MC18/5C/MEC**
CREDITS: 5   **L-T-P:4-2-0**

COURSE OBJECTIVES:

Enable the students to

1. Study the concept of forces and equilibrium of a particle.

2. Introduce forces on a rigid body.

3. Impart knowledge and skill in kinematics of a particles

4. Study projectile motion and impact.

5. Expose to central orbits.

COURSE OUTLINE:

UNIT I   : Forces: Linear momentum – Friction – Laws of Friction- Angle and Cone of
friction. Resultant of two, three and several forces acting on a particle.
Equilibrium of a particle: Triangle law of forces and its converse –
Lami's theorem, Equilibrium of a particle under several forces – Limiting
equilibrium of a particle on an inclined plane

Chapter 2: Sections 2.1, 2.2.
Chapter 3: Sections 3.1, 3.2.   (20hrs)

UNIT II: Forces on a rigid body: Moment of a force- General Motion of a rigid
body –Equation of motion of a rigid body (statement only)- Equivalent
systems of forces resultant of Like and Unlike parallel forces –
Varignon's theorem

Chapter 4: Sections 4.1, 4.2, 4.3, 4.4.   (15 hrs)

UNIT III: Kinematics: Velocity-Resultant Velocity- Relative velocity-Acceleration-
Velocity and Acceleration in a coplanar motion-Angular velocity-
Relative Angular Velocity.

Chapter 1: Sections 1.1, 1.2, 1.3, 1.4.   (20hrs)

UNIT IV: Projectiles: Forces on a projectile – Nature of trajectory – Results
pertaining to the motion of a projectile – Maximum Horizontal Range for a

given velocity – Two Trajectories with a given speed and range .
Impact: Impulsive force-Impact of sphere – Impact of two smooth
spheres – Oblique impact of two smooth spheres- Change in Kinetic energy.

Chapter 13: Sections 13.1-13.1.1 to 13.1.5
Chapter 14: Section 14.1-14.3, 14.5(Omit 14.4)   (20 hrs)

UNIT V: Central Orbits: General Orbits- Central force- Differential equation of a
central Orbit-Laws of central force- Method to find the central orbit-Conic
as a central orbit- Kepler's law of planetary motion.

Chapter 16: Sections   16.1, 16.2, 16.3.   (15 hrs)

RECOMMENDED TEXTBOOKS:

1. Duraipandian, P. LaxmiPandian, MuthamizhJayapragasam. (2005).Mechanics
   (6thRevised Edition), New Delhi: S.Chand and Co.

REFERENCE BOOKS:

1. Dharmapadam, A.V. (1991), Mechanics, Chennai, S. Viswanathan and Co.,
2. ViswanathNaik, K. (2000), Statics, Chennai, Emerald Publishers (Reprint).
3. S.Narayanan and others ,Statics ,S.Chand&co
4. S.G.Venkalachalapthy,Dynamics ,Margham Publications.
5. Dr.P.R.Vittal&V.AnanthaNarayanan ,Dynamics-Margham Publications.

JOURNALS:

Journal of Mechanics-https://www.cambridge.org>journal

E-LEARNING RESOURCES:

www.vssut.ac.in>lecture_notes
www.engineering.armstrong.edu>
https://www.embibe.com>
http://courses.lumenlearning.com>and http://www.kpu.ca>
http://www.dspace.wbpublibnet.gov.in>

COURSE OUTCOMES: Upon successful completion of Mechanics students will be able to

CO No.	CO STATEMENT
CO 1	Identify the nature of forces, the conditions of equilibrium of a particle and solve problems based on real life conditions.
CO 2	Explain moment of forces and use varignons theorem to calculate the moment effect of a force.
CO 3	Identify basic kinematics quantities of rectilinear and curvilinear motion of a particle and solve the related problems .
CO 4	Predict the location and to find velocity of a projectile at different points in trajectory properties of a projectile and also to discuss direct and oblique impact problems.
CO 5	Able to derive basic orbit equations and its relationship to the conic sections.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	2
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	3	3	2	2	2
CO5	3	3	2	2	2
AVERAGE	3	3	2	2	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER V
PYTHON PROGRAMMING (THEORY)

TOTAL HOURS: 75   **COURSE CODE: MC18/5C/PYT**

CREDITS   : 3   **L T P   : 2 3 0**

COURSE OBJECTIVES

Enable the students to

1. Impart knowledge and skill in getting started with Python basic concepts.

2. Expose to the concepts of sequences, string and built-in-fuctions of python.

3. Introduce the various control statements and loopings for decision making.

4. Study the exceptions and error handling in program execution.

5. Gain the knowledge on file management in Python Programming.

COURSE OUTLINE:

UNITI : Introduction to Python – Origins – Features – Downloading and Installing Python – Running Python – Python Documentation. Getting Started – Program Output statement – Program Input function – Python Basics – Statements and syntax – Variable Assignment – Identifiers – Numbers – Introduction – Integers – Double Precision Floating Point Numbers – Complex Numbers – Operators – Built-in functions for all numeric types.

(15hrs)

UNITII: Sequences: Strings, Lists and Tuples – Sequences – Strings – Strings and Operators – String-Only Operators – Built-in Functions – String Built-in Methods – Lists – Operators - Built-in Functions – List Type Built-in Methods – Tuples – Tuple Operators and Built-in Functions - Mapping and Set Types: Dictionaries – Mapping Type Operators – Mapping Type Built-in Functions and Built-in Methods– Dictionary Keys. (15 hrs)

UNIT III: Conditionals and Loops – If statement – else statement – elif statement – Conditional expressions – while statement – for statement – break statement – Continue statement – pass statement - Functions and Functional Programming – Calling Functions – Creating Functions – Passing Functions – Formal Arguments – Variable-Length Arguments. (15 hrs)

UNIT IV: Errors and Exceptions – Exceptions in Python – Detecting and Handling Exceptions Context Management – with statement – Raising Exceptions – Modules – What are Modules? – Modules and Files – Namespaces – Importing Modules – Features of Module - Import – Module Built-in Functions – Packages – Other Features of Modules

(15 hrs)

UNIT V: Files and Input / Output: File Objects – File Built-in Functions – File Built-in Methods – File Built-in Attributes – Command-Line Arguments - File System – Object-oriented Programming – Introduction – Classes – Class Attributes – Instances– Instance Attributes – Binding and Method Invocation – Subclassing Inheritance.

(15 hrs)

RECOMMENDED TEXT

Wesley J. Chun, "Core Python Programming", 2nd Edition, Pearson Education LPE, New Delhi, 2007.

REFERENCE BOOKS:

1. Mark Summerfield,Programming in Python 3, Pearson Education LPE, New Delhi, 1996.
2. Python Programming,Brain draper,kindle unlimited pvt.ltd.
3. Core Python Programming,Dr.R.Nageswara Rao, dreamtech pvt ltd. Kindle.
4. The complete reference on Python,Martin.C.Brown MAC Graw Hill pvt.ltd.
5. Coding for beginers using Python, Louie Stowell, kindle publishing pvt.ltd.

JOURNALS:

Python to learning-IOP Science
Python – Fastest learning Programming Language - IRJET

E-LEARNING SOURCES :

www.udemy.com/Python/Online-Course
https://www.educba.com/python-programming-beginners-tutorial/
https://en.wikiversity.org/wiki/Python_Concepts
https://www.tutorialspoint.com/python/
https://www.w3resource.com/python-exercises/math/

COURSE OUTCOMES: Upon successful completion of Python Programming students will be able to

CO No.	CO Statement
CO 1	Analyze data and understand the basic concepts in Python.
CO 2	Apply the concept of sequences, string and built-in-fuction of python for program development and execution.
CO 3	Identify the data and use correction control statements for executing the inputs.
CO 4	Apply the knowledge of error correction to execute the python program
CO 5	Formulate the file management in Python Programming.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	3
CO2	2	3	3	3	3
CO3	2	2	3	3	3
CO4	2	2	2	3	3
CO5	2	2	3	3	2
AVERAGE	2	2.2	2.8	3	2.8

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2 **W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER V
PYTHON PROGRAMMING (PRACTICALS)

TOTAL HOURS: 45   **COURSE CODE: MC18/5C/PR3**

CREDITS   : 1   **LTP   : 0 0 3**

COURSE OBJECTIVES

Enable the students to

1. Impart knowledge and skill in getting started with Python basic concepts.

2. Expose to the concepts of sequences, string and built-in-function of python.

3. Introduce the various control statements and looping for decision making.

4. Study the exceptions and error handling in program execution.

5. Gain the knowledge on file management in Python Programming.

PRACTICAL PROGRAMS

1. Program for System configuration
2. Working with Strings
3. Working with Lists
4. Working with Tuples
5. Working with Dictionary
6. Working with conditional loops – if, else, elif
7. Working with conditional expressions – for, while, break, continue
8. Implementing programs on functions
9. Working with function – formal arguments and variable-length arguments
10. Working with Detecting and Handling Exception
11. Working with modules
12. Working with Built-in Functions
13. Working with file handling
14. Working with classes
15. Working with Inheritance

RECOMMENDED TEXT

Wesley J. Chun, "Core Python Programming", 2nd Edition, Pearson Education LPE, New Delhi, 2007.

REFERENCE BOOKS:

1. Mark Summerfield,Programming in Python 3, Pearson Education LPE, New Delhi, 1996.
2. Python Programming,Brain draper,kindle unlimited pvt.ltd.
2. Core Python Programming,Dr.R.Nageswara Rao, dreamtech pvt ltd. Kindle.
3. The complete reference on Python,Martin.C.Brown MAC Graw Hill pvt.ltd.
4. Coding for beginers using Python, Louie Stowell, kindle publishing pvt.ltd.

JOURNALS:

Python to learning-IOP Science
Python – Fastest learning Programming Language - IRJET

E-LEARNING SOURCES :
www.udemy.com/Python/Online-Course
https://www.educba.com/python-programming-beginners-tutorial/
https://en.wikiversity.org/wiki/Python_Concepts
https://www.tutorialspoint.com/python/
https://www.w3resource.com/python-exercises/math/

COURSE OUTCOMES: Upon successful completion of Python Programming – Practical students will be able to

CO No.	CO Statement
CO 1	Analyze data and understand the basic concepts in Python.
CO 2	Apply the concept of sequences, string and built-in-fuction of python for program development and execution.
CO 3	Identify the data and use correction control statements for executing the inputs.
CO 4	Apply the knowledge of error correction to execute the python program
CO 5	Formulate the file management in Python Programming.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	3	3
CO2	2	3	3	3	3
CO3	2	2	3	3	3
CO4	2	2	2	3	3
CO5	2	2	3	3	2
AVERAGE	2	2.2	2.8	3	2.8

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2 **W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

Question Paper Pattern

Duration – 3 hours**.**

Maximum marks – 100 (Internal 40 + External 60)

Practical Examination – 60 (2 x 30)

One Internal Examiner and one External Examiner to be appointed to conduct the practical examination.

OPERATIONS RESEARCH – I

TOTAL HOURS: 90   **COURSE CODE: MC18/5E/OR1**

CREDITS: 5   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

Enable the students to

1.Introduce concepts based on optimization.

2. Study in detail the various concepts of optimization.

3. Learn the concept of optimization using Transportation Techniques.

4. Optimise the allocation of resources and minimize the cost using assignment.

5. Study the Mathematical models of strategic interactions between rational decision makers.

COURSE OUTLINE:

UNIT I: LINEAR PROGRAMMING
       General LPP- Mathematical formulation-Solution for LPP By Graphical Method and Simplex Method (finite optimal solution, unbounded   solution, alternative optimal solution)- Slack and surplus variables – Solution for LPP with unrestricted variables
Chapter 6: Sections 6.1 - 6.12   (20hrs)

UNIT II: LINEAR PROGRAMMING
       Artificial Variable Technique- Big-M Method (Charner's Penalty Method) – Concept of Duality- Dual theorem (only statement)- Reading solution of the dual from the final simplex table of the primal and vice-versa
Chapter 6: Section 6.23- 6.28, 6.31,6.33,6.34   (20hrs)

UNIT III: TRANSPORTATION PROBLEMS
       Mathematical formulation- North-West corner Rule - Least cost Method- Vogel's approximation method- Optimality test
Chapter 9 : Section 9.1- 9.7   (20 hrs)

UNIT IV: ASSIGNMENT PROBLEMS
       Hungarian method of solving an assignment problem – Unbalanced assignment problems – Travelling Salesman (routing) problem
Chapter 8 : Section 8.1 – 8.5, Chapter 10 : Section 10.9   (15hrs)

UNIT V: GAME THEORY

Two persons zero sum games, the Maxmin- Minmax principle, Saddle point and Value of games, Games without saddle points, Pure and mixed strategies, Properties of optimal mixed strategies, Dominance property, Graphical method for 2 X norm X2 games

Chapter 12 : Section 12.1 – 12.16   (15 hrs)

RECOMMENDED TEXTS:

1. R.K. Gupta, Operations Research, Krishna Prakash

REFERENCE BOOKS:

1. Taha, Operation Research, Printice Hall, New Delhi.
2. Springer series in Operations Research ,George S. Fishman, Monte Carlo.
3. Kalavathy , Operations Research   Vikas Publishing House Pvt .Ltd.
4. Gupta P.K &Hira D.S ,Problems in Operations Research, S.Chand& Co, Delhi
    S.D. Sharma, Operations Research, KedharNath Ram Nath& co, Meerut
5. V.Sundaresan, K.S. Ganapathy Subramanian, &K.Ganesan, Resource Management Techniques (Operations Research), A.R. Publications, Nagapattinum District .

JOURNALS:

International journal of Operational Research (Inderscience)
European journal of Operations Research(Elsevier)

E-LEARNING SOURCES:

http://www.yourarticlelibrary.com/linear-programming/simplex-method-of-linear-programming/34866

https://en.wikipedia.org/wiki/Big_M_method

https://en.wikipedia.org/wiki/Dual_linear_programhttps://www.linearprogramming.info/vogel-approximation-method-transportation-algorithm-in-linear-programming/

https://www.linearprogramming.info/northwest-corner-method-transportation-algorithm-in-linear-programming/

https://businessjargons.com/least-cost-method.html

https://en.wikipedia.org/wiki/Hungarian_algorithm

https://en.wikipedia.org/wiki/Min-max_theorem

https://www.slideshare.net/Anupamthecooldude/game-theory-and-principle-of-dominance

COURSE OUTCOMES: Upon successful completion of Operations Research – I students will be able to

CO No.	CO Statement
CO 1	Analyse and study the concepts in linear programming problems to optimize the solution.
CO 2	Examine, Analyse , formulate and evaluate the optimal solutions using various methods in linear programming.
CO 3	Evaluate the optimal solution for various industry oriented problems using quantitative and qualitative tools like Modi's method
CO 4	Compute the optimal solution by using Hungarian method to minimize the cost.
CO 5	Analyse the application of game theory in various fields and obtain the best solution to optimize the function.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	3	2	3	3
CO5	3	2	3	2	2
AVERAGE	3	2.8	2.6	2.8	2.6

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER V

ELEMENTARY NUMBER THEORY

TOTAL HOURS: 90   **COURSE CODE: MC18/5E/ENT**
CREDITS: 5   **L-T-P: 3 - 3- 0**

COURSE OBJECTIVES:

To enable the students

1. To have the conceptual understanding of the fundamental concepts of Number Theory.
2. Apply the knowledge of Number theory in real life problems.
3. Apply the various techniques of solving puzzles in applications.
4. To know the connections of number theory with other branches.
5. To gain competence in solving problems.

COURSE OUTLINE:

UNIT I: **Introduction** – Basic binary Operations on the set of Integers – Ordering
of Integers - Well Ordering Principle – Mathematical Induction.
Chapter – 1: Sections 1.3 to 1.6   (17hrs)

UNIT II: Divisibility Theory: Greatest common Divisor- Relatively Prime
integers – Algorithm to find G.C.D : Investigation of the set of integers
$\{bx+cy\}$- Least Common Multiple.
Chapter – 2: Sections 2.3 to 2.5 and 2.7.   (17hrs)

UNIT III: Linear Diophantine Equations: Linear Diophantine Equations – The
Equation $ax+by=c$ – Diophantine Equations in Three or More
Unknowns - Diophantine Equation of the Second Degree (Statements of
theorems and problems only)
Chapter – 3: Sections 3.2 – 3.5.
Cryptography: Applications to Cryptography, Data encryption
standard, Asymmetric key cryptography
Chapter -7: Sections 7.8 -7.10   (17hrs)

UNIT IV: Quadratic Residues: Introduction, quadratic residues, Elementary
Properties.
Chapter -9: Section 9.1 – 9.3.   (17hrs)

UNIT V: Perfect Numbers: Introduction, Perfect Numbers, Necessary and
Sufficient Conditions for a positive Integer to be an even Perfect
number, Mersenne Numbers, Fermat Numbers.
Chapter -10: Sections 10.1- 10.5.   (17hrs)

RECOMMENDED TEXT:

Theory of Numbers, Dr. Sudhir, K.Pundir, Pragati Prakashan Publications, third revised edition 2012.

REFERENCE BOOKS:

6. Elementary theory of numbers, cy. Hsiung, Allied publishers, 1995.
7. Elementary Number Theory, Allyn and Bacon Inc., Boston, 1980.
8. Introduction to Analytic Number Theory, Tom. M. Apostol, Narosa Publishing House, New Delhi, 1989.
9. Theory of Numbers, Dr. Sudhir, K.Pundir, Pragati Prakashan Publications.
10. An introduction to the Theory of Numbers (Vth edition) by Ivan Niven, Herbert S. Zuckarman and Hugh L. Montgometry John Wiley & Sons, Inc.2001.

JOURNALS:

Journal of Number Theory
International Journal of Number theory

WEBSITES & e-LEARNING SOURCES:

https://en.wikipedia.org/wiki/Mathematical_theorem
https://en.wikipedia.org/wiki/List_of_gcd and lcm mathematical_series
http://www.cryptography.org
http://poincare.matf.bg.ac.rs/~zarkom/Polynomials_EJBarbeau.pdf
https://www.pdfdrive.com/number-theory-art-of-problem-solving-aops-d1505092.html

COURSE OUTCOMES: Upon successful completion of Elementary Number Theory students will be able to

CO No.	CO Statement
CO 1	Understand the fundamental concepts of Mathematical Induction.
CO 2	Evaluate the Greatest common Divisor and Least common multiple using the algorithms.
CO 3	Determine the Diophantine equations for three or more unknowns and understand the knowledge of cryptography.
CO 4	Demonstrate the quadratic residues, elementary Properties.
CO 5	Evaluate and analyse the perfect numbers using the Mersenne and Fermat Numbers.

MAPPING- COURSE OUTCOMES WITH PROGRAM SPECIFIC OUTCOMES

CO / PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	2	3	2
CO 3	2	3	3	2	2
CO 4	3	2	2	2	3
CO 5	2	2	2	2	2
Average	2.2	2.4	2.2	2.2	2.2

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

 TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER –VI

COURSE CODE	COURSE TITLE	Credits	Hrs	Total Hrs	L-T-P	CA	SE	TOTAL
MC18/6C/LAL	Linear Algebra	4	5	75	3-2-0	40	60	100
MC18/6C/CAN	Complex Analysis	4	5	75	3-2-0	40	60	100
MC18/6C/JAV	Programming in Java(Theory)	3	6	90	2-4-0	40	60	100
MC18/6C/PR4	Programming in Java(Practical)	1	3	45	0-0-3	40	60	100
MC18/6E/DIM	Discrete Mathematics	4	5	75	3-2-0	40	60	100
MC18/6E/OR2	Operations Research-II	5	6	90	3-3-0	40	60	100
MC18/6E/FSA	Fuzzy set theory and its Applications	5	6	90	3-3-0	40	60	100

SEMESTER VI
LINEAR ALGEBRA

TOTAL HOURS: 75   **COURSE CODE: MC18/6C/LAL**

CREDITS: 4   **L-T-P: 3-2-0**

COURSE OBJECTIVES

Enable the students to

  a. Learn the concept of vector spaces and subspaces.
  b. Explore the dimension of vector space using bases and linear dependency concept.
  c. Understand the concept of Inner product space and its properties.
  d. Impart the knowledge of linear transformation & its regularity and also its rank.
  e. Analyse the characteristic roots & vectors of linear transformation and the representation of linear transformation in Matrix form.

COURSE OUTLINE:

UNIT I: VECTOR SPACES

  Basic concepts-Definition-Examples-Homomorphism-Internal Direct Sum-External Direct Sum.   (15hrs).

UNIT II: VECTOR SPACES (CONTD)

  Linear dependence and independence of vectors, Linear Span, Bases, Dimension of Vector Spaces.   (15 hrs)

UNIT III: INNER PRODUCT SPACES

  Inner Product Space, Definition, Examples, Schwarz inequality, Orthogonal Set, Orthonormal Set, Gram Schmidt Orthogonalization Process (15hrs)

UNIT IV: LINEAR TRANFORMATIONS

  Algebra of Linear transformations, Regular and Singular Linear Transformations, Rank of Linear Transformation.   (15hrs)

UNIT V: LINEAR TRANSFORMATIONS (CONTD)

Characteristic Roots, Characteristic Vectors & Matrices.   (15hrs)

RECOMMENDED TEXT:

1. I.N.Herstein (2012) <u>Topics in Algebra </u>(2nd edition) Wiley Eastern Ltd.
   New   Delhi.
   Chapter 4: Sec 4.1, 4.2 & 4.4, Chapter 6: Sec 6.1 – 6.3

REFERENCE BOOKS:

1. <u>Gilbert Strang</u>, <u>Introduction to Linear Algebra 5th edition</u>, Wellesley-Cambridge Press, 2016

2. Vijay K Khanna, S K Bhambri, <u>A Course in Abstract Algebra 4th Edition</u>, Vikas Publishing House Pvt Ltd.

3. Sheldon Axler, <u>Linear Algebra Done Right 2nd Edition</u>, Springer Science+ Business Media, LLC.

4. S.Arumugam ,A.ThangapandiIsaac,.<u>ModernAlgebra</u>,New Gamma Publishing House Palayamkottai.

5. K.ViswanathaNaik, <u>Modern Algebra</u>, Emerald Publishers

JOURNALS
https://www.omicsonline.org/open-access/classification-of-canonical-bases-for-n1dimensional-subspaces-of-ndimensional-vector-space-1736-4337-1000241.php?aid=81891

https://link.springer.com/chapter/10.1007/978-1-4612-1670-4_15

https://www.researchgate.net/publication/297123535_Extension_of_Matrix_Algebra_and_Linear_spaces_of_Linear_Transformations

E-LEARNING RESOURCES:
https://www.khanacademy.org/math/linear-algebra/vectors-and-spaces
http://fourier.eng.hmc.edu/e161/lectures/algebra/node1.html
https://brilliant.org/wiki/linear-transformations/
http://linear.ups.edu/html/section-LT.html
https://mathinsight.org/matrices_linear_transformations
https://www.mathbootcamps.com/matrix-linear-transformation/
http://www.infocobuild.com/education/audio-video-courses/mathematics/LinearAlgebra-IIT-Madras/lecture-28.html

COURSE OUTCOMES: Upon successful completion of Linear Algebra students will be able to

CO No.	CO Statement
CO 1	Identify the vector spaces and its subspaces.
CO 2	Find the dimension of vector space and distinguishes the linear dependent and independent vectors which expands knowledge in Matrices.
CO 3	Evaluate the length & distance of vectors and to construct orthonormal sets of vectors that helps in understanding the few concepts of mechanics.
CO 4	Able to characterize the linear transformation as one-one, onto transformations and their role in carrying a basis of vector space to another vector space.
CO 5	Express linear transformation in matrix form to make the calculation or representation easier, for analysing the given data.

MAPPING OF COURSE OUTCOMES WITH PROGRAMME SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	2	2
CO 2	3	3	3	3	2
CO 3	3	3	3	2	3
CO 4	3	3	3	2	2
CO 5	3	3	3	3	2
Average	**3**	**3**	**3**	**2.4**	**2.2**

KEY: **S**TRONGLY CORELATED-3 ,**M**ODERATELY CORELATED-2, **W**EAKLY CORELATED-1, **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER VI

COMPLEX ANALYSIS

TOTAL HOURS: 75   **COURSE CODE: MC18/6C/CAN**

CREDITS: 4   **L-T-P:3-2-0**

COURSE OBJECTIVES:

Enable the students to

1. Study the concept and consequences of analytic function and Cauchy Riemann equations.
2. Impart knowledge and skill in conformal mapping and bilinear transformation of straight lines and circles.

3. Introduce the theory and techniques of complex integration.

4. Expose to different types of series and Residues .

5. Study evaluation of contour integrals of different types.

COURSE OUTLINE:

UNIT I: Analytic functions: Functions of complex variables- Limit continuity-UniformContinuity- Analytic Functions- Cauchy-Riemann equations.

(15hrs)

UNIT II: Transformations- Definitions- Definitions of Conformal Mapping- Necessary and sufficient condition for a conformal mapping- The Bilinear transformations w=az+b, w=1/z.   (15 hrs)

UNIT III: Complex Integrations: Rectifiable arcs, Contours- Complex line integrations- Cauchy's theorem, Cauchy- Goursat theorem (statement only)- Cauchy's Integral formula- Cauchy's integral formula for first derivative- Cauchy's formula for higher derivatives (without proof).

(15 hrs)

UNIT IV: Taylor's and Laurent's series(statement only): Residue Calculus- Zeros and Poles of a functions- Meromorphic functions-The Residue at a pole- Residue theorem- Argument Principle- Rouche's theorem (simple problems)

(15 hrs)

UNIT V: Contour integration:

Evaluation of

(i)   ∫f(cos x, sin x) dx.
(ii)   ∫f dx where f(x) is a rational polynomial having no poles on the real axis.
(iii)   ∫f(x) sin mx dx
(iv)   ∫f(x) cos mx dx, where m> 0 and f(x) is a rational functions having no poles on the axis.   (15 hrs)

RECOMMENDED TEXTS

1. R.V. Churchill and J.W.Brown(1990), Complex Variables and applications (5th edition) McGraw Hill International Book Co., New York
   Unit 1: Chapter 2: Sec 12-26
   Unit 2: Chapter 9: Sec 101 & Chapter 8: Sec 90-94
   Unit 3: Chapter 4: Sec 39-41,46, 48-51
   Unit 4: Chapter 6: Sec 68-76(omit 71)& Chapter 7: 86-87
   Unit 5: Chapter 7: 78-81,85

REFERENCE TEXTBOOK

1. T.K. ManicavachagamPillay, Dr.S.P.Rajagopalan, Dr.R.Sattanathan, Complex Analysis, S.Viswanathan printers and Publishers, pvt. Ltd, (2011).
2. S. Ponnusamy, Foundation of Complex analysis, Narosa Publications: New Delhi
3. P. Duraipandian and LaxmiDuraipandian, Complex Analysis (Emerald Publishers) Chennai.
4. S.G.Venkatachalapathy,ComplexAnalysis,Margham Publications.
5. S.Arumugam, A.Thangapandianissac, A.Somasundaram, Complex Analysis, Scitech publications, Chennai.

JOURNALS:

Journal of Complex Analysis-An open access journal-https://www.hindawi.com>

E-LEARNING SOURCES:

https://www.math.columbia.edu/~rf/complex2.pdf
http://mathfaculty.fullerton.edu/mathews/c2003/MobiusTranformationMod.html
https://www.math.ust.hk/~maykwok/courses/ma304/06_07/Complex_4.pdf
http://gn.dronacharya.info/ECEDept/Downloads/QuestionPapers/3rd_sem/Engineering
Mathematics-III/Unit-1/Singularities-Zeros-Poles.pdf
https://web.williams.edu/Mathematics/sjmiller/public_html/372Fa15/coursenotes/Trappe
r_MethodsContourIntegrals.pdf
http://mathfaculty.fullerton.edu/mathews/c2003/IntegralsTrigMod.html

COURSE OUTCOMES: Upon successful completion of Complex Analysis students will be able to

CO No	CO STATEMENT
CO 1	Analyse limits and continuity for complex function and use appropriate techniques for solving problems using C-R equations.
CO 2	Construct conformal mapping between many kinds of domain and able to plot the image of the curve by complex transformation from z-plane to w-plane.
CO 3	Evaluate integration using complex variables.
CO 4	Represent function as Taylor's and Laurent's series and classify zeros and singularities of an analytic functions and also compute residue of a function.
CO 5	Evaluate different types of contour integrals using residue theorem.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	2	2	2
CO3	3	3	2	2	2
CO4	3	3	2	2	2
CO5	3	3	3	2	2
AVERAGE	3	3	2.4	2	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER – VI

PROGRAMMING IN JAVA – THEORY

TOTAL HOURS: 90   **COURSE CODE: MC18/6C/JAV**

CREDITS: 3   **L-T-P: 2 - 4 - 0**

COURSE OBJECTIVES

Enable the students to

1. Introduce the concept of object oriented programming and to enable the students to understand the introduction of Java Programming.
2. Impart knowledge in basic concepts of Java and learn about control statements like if, if else and for.
3. Study about decision making and looping, classes, methods and strings.
4. Enable the students to understand about interfaces and packages.
5. Impart knowledge about multithreading, Exceptions, Applet and Graphic programming.

COURSE OUTLINE:

UNIT I: Introduction to Java- Java features- Difference between Java and C &

Java and C++ , Java and World Wide Web, Introduction to Java language,

Java program structure, Java tokens, Java statements, Java virtual machine,

Command line arguments.

(15hrs)

UNIT II: Constants, variables, Data types, Type casting, Getting values to variables,

Standard default values, Operators and Expressions, Decision making and

Branching – if , if-else, nested if, elseif ladder, switch, ?: operator

(20 hrs)

UNIT III: Decision making and looping – while, do, for, jumps in loops, Labelled

loops, Classes and Objects, Methods and Strings.   (20hrs)

UNIT IV: Interfaces, Multiple Inheritance, Packages, Putting classes together.

                                                                    (15 hrs)

UNIT V: Multi threading programming, Managing errors and exceptions –

Applet programming, Graphic programming.   (20hrs)

RECOMMENDED TEXT:

1. E. Balagurusamy , Programming with Java, second edition, Tata- McGraw-hill publishing co. Ltd.

REFERENCES:

1. Herbert Schildt , The Complete Reference Java 5th edition , Tata- McGraw-hill publishing co. ltd
2. Y. Daniel ziang , An Introduction to Java Programming, Prentice – Hall of India Pvt. Ltd.
3. Core Java Programming A Practical Approach, Tushar B. Kute.
4. Java: Programming Basicsfor Absolute Beginners, Nathan Clark.
5. Core Java Fundamenntals Volume – 1, Cay s. Horstmann, Eleventh Edition.

E-LEARNING SOURCES:
https://howtodoinjava.com

https://www.programiz.com/java-programming

https://www.theserverside.com/javaprogramming

https://www.guru99.com/java-platform.html

https://www.technopedia.com/java

COURSE OUTCOMES: Upon successful completion of Programming in Java students will be able to

CO No.	CO Statement

CO 1	Explain the basic concepts of object oriented programming and enable students to understand about introduction of Java programming.
CO 2	Discuss about data types operators and decision making statements like if, if else, else if ladder etc.
CO 3	Use the concept of decision making and looping, classes, objects, methods, and strings to develop programs.
CO 4	Analyze and to understand the concepts of interfaces inheritance and packages.
CO 5	Explain and develop programs in applet and Graphic Programming, Multithreading and Managing errors and Exceptions.

MAPPING - COURSE OUTCOME WITH PROGRAM SPECIFIC OUTCOMES

CO / PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	3	3	3
CO 3	2	2	3	3	3
CO 4	2	3	3	3	3
CO 5	2	3	3	3	3
Average	**2**	**2.6**	**2.8**	**2.8**	**2.8**

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

x

SEMESTER – VI
PROGRAMMING IN JAVA – PRACTICALS

TOTAL HOURS: 45　　　　　　　**COURSE CODE: MC18/6C/PR4**
CREDITS: 1　　　　　　　　　　**L-T-P: 0 - 0 - 3**

COURSE OBJECTIVES

Enable the students to

1. Develop programming skills using the concept of classes and objects, arrays multithreading and exceptional handling.
2. Impart the knowledge of writing algorithm for programming.

COURSE OUTLINE:

Implement the following programming concepts using Java

1. Classes and objects
2. Arrays
3. Multithreading
4. Exception handling
5. Inheritance
6. Applet programming
 Two or three programs under each heading

RECOMMENDED TEXT:

1. E. Balagurusamy , Programming with Java, second edition, Tata- McGraw-hill publishing co. Ltd.
2. Herbert Schildt, Dale Skrien, Java Fundamentals, Mc Graw Hills Publications.

REFERENCES:

1. Herbert Schildt , The Complete Reference Java 5th edition , Tata- McGraw-hill publishing co. ltd
2. Y. Daniel Ziang , An Introduction to Java Programming, Prentice – Hall of India Pvt. Ltd.
3. Core Java Programming A Practical Approach, Tushar B. Kute.
4. Java: Programming Basics for Absolute Beginners, Nathan Clark.
5. Core Java Fundamentals Volume – 1, Cay s. Horstmann, Eleventh Edition

JOURNALS:

http://www.ijecs.in/index.php/ijecs/article/view/1053

E-LEARNING SOURCES:

https://www.javapoint.com/java-programs
https://beginenersbook.com/2017/09/java-examplea
https://www.programiz.com/java-pgrogramming/examples
https://www.programmingsimplified.com/java-source-codes
https://javatutoring.com/java-programs

COURSE OUTCOMES: Upon successful completion of Programming in Java – Practical students will be able to

CO No.	CO Statement
CO 1	Prepare different programs using if, if else, for , arrays, functions and pointers.
CO 2	Create programs using inheritance and Applet programming.

MAPPING- COURSE OUTCOMES WITH PROGRAM SPECIFIC OUTCOMES

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	3
CO 2	2	3	3	3	3
Average	**2**	**3**	**3**	**3**	**3**

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers

QUESTION PAPER PATTERN

Duration- 3 hours
Maximum Marks- 100 (External – 60, Internal – 40)
Practical Examination- 60 (2 x 30)
        One internal and one external should be appointed to conduct the examination

SEMESTER VI

DISCRETE MATHEMATICS

TOTAL HOURS: 75   **COURSE CODE: MC18/6E/DIM**
CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable students to

1. Evaluate basic logic statements including compound statements, implications, inverses, converses, and contra positives using truth tables and the properties of logic.
2. Appreciate the basic principles of lattices, and its properties.
3. Simplify expression using the properties of Boolean algebra; basic principles of Boolean algebra
4. Learn core ideas of graph definition and graph operations in graph theory.
5. Study the theorem of Eulerian and Hamiltonian graphs.

COURSE OUTLINE:

UNIT I : Propositional Calculus
Tautology and contradiction – Equivalence of formulae -Duality law
– Tautological implications - Normal forms – Disjunctive normal
forms – Conjunctive normal forms.   (15 hrs)

UNIT II: Lattices - Introduction – Principle of duality - Properties of Lattices –
sub Lattice – Distributive Lattice modular lattices – Bounded lattice -
Complemented lattice.   (15 hrs)

UNIT III: Boolean Algebra
Definition – Other basic laws of Boolean Algebra – Principle of
duality for   Boolean Algebras – ATOM definition - ATOMIC
Boolean algebra – Finite BooleanAlgebra. Boolean expression –
Definition – Boolean   function – Literal – Minterm and Maxterm,
Normal forms and Canonical forms.   (15 hrs)

UNIT IV:Graphs, Subgraphs and Connectedness
Introduction – Definition and examples – Degrees – Subgraphs
– Isomorphisms – Walks, Trails and Paths –Connectedness and
Components – blocks – Connectivity.   (15 hrs)

UNIT V: Eulerian and Hamiltonian Graphs
Introduction -Eulerian graphs – Hamiltonian graphs.   (15 hrs)

RECOMMENDED TEXTSBOOKS:

1. Dr. S.P. Rajagopalan, Dr.R. Sattanathan, Discrete Mathematics,
   Margham Publications, Chennai -17, 2011
2. S.Arumugam, S.Ramachandran: Invitation to graph theory, Scitech

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Publications (India) Pvt.ltd, Chennai -17, 2001.

REFERENCE BOOKS:

1. Dr. M. K. Venkataraman, Dr. S.Sridharan and Dr. M. Chandrasekeran, Discrete Mathematics, the National Publishing Company.
2. Dr. G. Balaji, Discrete Mathematics, G.Balaji Publishers.
3. Seymour Lipschutz , Marc Laras Lipson , Varsha H. Patil, Discrete Mathematics (Schaum's Outlines) Seymour Lipschutz(2017).Trembley
4. J.P and Manohar .R , "Discrete Mathematical Structures with Applications to Computer Science", Tata Mcgraw – Hill Publication Co., limited, New Delhi, 2003.
5. Ralph.P. Grimaldi, " Discrete and Combinatorial Mathematics: An Applied Introduction"4th edition, Pearson Eduncation Asia, Delhi 2002.

JOURNALS:

Discrete Mathematics
Journal Of Graph Theory

E-LEARNING RESOURCES:

https://www.zweigmedia.com/RealWorld/logic/logic2.html
https://en.wikipedia.org/wiki/Lattice_(order)
https://en.wikipedia.org/wiki/Boolean_algebra_(structure)
http://www.cs.rpi.edu/~goldberg/14-CC/Notes/notes-graph.pdf
http://compalg.inf.elte.hu/~tony/Oktatas/TDK/FINAL/Chap%203.PDF

COURSE OUTCOMES: Upon successful completion of Discrete Mathematics students will be able to

CO No.	CO STATEMENT
CO 1	Prepare Mathematical concepts in terms of predicates, quantifiers, and logical connectives.
CO 2	Analyse and Identify the knowledge of lattices and its properties.
CO 3	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
CO 4	Learn to understand, analyse and develop a strong background in graph theory
CO 5	Identify the knowledge of Eulerian and Hamiltonian theorem using terminology of graphs.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5

CO1	3	2	3	3	2
CO2	3	3	3	3	2
CO3	3	2	2	3	2
CO4	3	3	3	3	2
CO5	3	2	2	3	2
AVERAGE	**3**	**2.4**	**2.6**	**3**	**2**

KEY: **S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		
K1, K 2	B-5/8x7 marks	200	35	100	-
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER VI

OPERATIONS RESEARCH – II

TOTAL HOURS: 90   **COURSE CODE: MC18/6E/OR2**

CREDITS: 5   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

Enable the students to

1. Introduce the concepts of inventory to minimize the cost.

2. Study the concepts of profit maximization and price breaks using inventory models.

3. Design systems to enable to obtain optimality using queueing theory.

4. Plan , monitor to control and to minimize the cost ,the concept of network analysis is introduced.

5. Analyse the tasks involved in complex projects to obtain optimality

COURSE OUTLINE:

UNIT I: INVENTORY THEORY
 Introduction- Variables in an inventory problem - Need of inventory- Inventory problems -
Advantages and disadvantages of inventory- Classification of   inventory Models - Economic
lot size models
Model I: Economic lot size model with uniform rate size demand, Infinite rate of production
and no shortages
Model II: Order level model with Uniform rate of demand (Q to be fulfilled in constant time)
infinite rate of production and having shortages
to be fulfilled.
Book 1: Chapter 3: Section 3.1- 3.9, 3.13   (15 hrs)

UNIT II: INVENTORY THEORY
Model III: The general single period model of profit maximization with time independent cost
- Discrete case only.
Model IV: Purchase Inventory model with – One price break – Two price breaks. (derivation
excluded),Newspaper boy problem (no derivation) problems only.
Book 1: Chapter 3: 3.20, 3.23   (20 hrs)

UNIT III: QUEUING THEORY
        General concepts and definitions- Classification of queues-Poisson process, Models (No
derivations, only problems)

      i.   (M/M/1) : ($\propto$/ FCFS)
     ii.   (M/M/1) : (N/ FCFS)
    iii.   (M/M/S) : ($\propto$/ FCFS)

Book 1 : Chapter 5: Section 5.1- 5.6, 5.11, 5.12, 5.14, 5.15,5.17,5.18   (15 hrs)

UNIT IV: NETWORK ANALYSIS

Introduction- Network diagram representation - Rules for drawing   Network diagram-labeling: Fulkerson's 'I-J' rule- time estimates and
critical path - In Network analysis- Forward pass, Backward pass
computation- Determination of floats and slack times- Determination of
critical path.
Book 2: Chapter 13: Section 13.1 – 13.8   (15 hrs)

UNIT V: PROJECT EVALUATION AND REVIEW TECHNIQUES(PERT)

Optimistic time- most likely Time - Pessimistic time- Expected time-variance- Rules for finding variance of events   problems in PERT
Book 2: Chapter 13: Section 13.9, 13.10   (25 hrs)

RECOMMENDED TEXTS:

R.K. Gupta, Operations Research, 12th edition, Krishna Prakash

REFERENCE BOOKS:

1. Taha , , Operations Research, Printice Hall, New Delhi.
2. Springer series in Operations Research ,George S. Fishman, Monte Carlo
3. Kalavathy .S, Operations Research Vikas Publishing House Pvt Ltd
4. Gupta P.K &Hira D.S (2000) Problems in Operations Research, S.Chand& Co, Delhi
5. S.D. Sharma, Operations Research, 8th edition , KedharNath Ram Nath& co, Meerut
6. V.Sundaresan, K.S. Ganapathy Subramanian, &K.Ganesan, Resource ManagementTechniques (Operations Research), Reprint June 2002, A.R. Publications, Nagapattinum District.
7.

JOURNALS:

International journal of Industrial and Operations Research
American journal of Operations Research

E-LEARNING SOURCES:

https://www.whatissixsigma.net/inventory-model-types/
http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=4959
https://nptel.ac.in/courses/112107142/part3/inventory/lecture2.htm
http://www.zeepedia.com/read.php?inventory_control_order_quantity_with_price-break_operations_research&b=66&c=15
https://www.slideshare.net/goyalrama/queuing-model

http://www.yourarticlelibrary.com/industrial-engineering-2/fulkersons-rule-for-numbering-the-events-with-diagram/90595
https://en.wikipedia.org/wiki/Program_evaluation_and_review_technique

COURSE OUTCOMES: Upon successful completion of Operations Research – II students will be able to

CO No.	CO Statement
CO 1	Study and analyse the concepts of inventory and various inventory models to minimize the cost.
CO 2	Analyse and evaluate the profit using inventory models.
CO 3	Analyse the various queueing models and Evaluate the various system performance measures of Queueing.
CO 4	Analyse and ensure optimum utilization of human and other resources.
CO 5	Compute the minimum time required to complete the complex projects using the PERT Technique.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	3
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	3	3	2	2
AVERAGE	3	3	3	2.4	2.2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER VI

FUZZY SET THEORY AND ITS APPLICATIONS

TOTAL HOURS: 90 hrs　　　　　**COURSE CODE: MC18/6E/FSA**

CREDITS: 5　　　　　　　　　　**L-T-P: 3 3 0**

COURSE OBJECTIVES:

To enable students to
4. Introduce the theory of fuzzy set.
5. Discuss operations on fuzzy sets.
6. Introduce fuzzy arithmetic concepts.
7. Discuss fuzzy logic inferences.
8. Discuss applications of fuzzy in engineering.

COURSE OUTLINE:

UNIT I   : FROM CLASSICAL SETS TO FUZZY SETS　　　　　　　(15 Hrs)

　　　　Introduction, Crisp sets: An overview, Fuzzy Sets: Basic types and concepts, Characteristics and significance of the paradigm shift, Additional properties of α- cuts, representation of Fuzzy sets, Extension principle for fuzzy sets.

UNIT II   : OPERATION ON FUZZY SETS　　　　　　　　　(15 Hrs)
　　　　Types of operations, fuzzy Complements.

UNIT III   : FUZZY ARITHMETIC　　　　　　　　　　　(15 Hrs)
　　　　Fuzzy numbers, Linguistic Variables, Arithmetic Operations on Internal, Arithmetic operations on Fuzzy Numbers.

UNIT IV   : FUZZY LOGIC　　　　　　　　　　　　　(15 Hrs)
　　　　Classical Logic : An Overview, Multivalued logics, Fuzzy Propositions, Fuzzy Quantifiers.

UNIT V   : ENGINEERING APPLICATIONS　　　　　　　　(15 Hrs)
　　　　Civil Engineering, Mechanical Engineering, Industrial Engineering, Computer Engineering.

RECOMMENDED TEXT:

1. George J Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic : Theory and Applications", Prentice Hall NJ.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", 3rd Edition, Willey, 2010.

REFERENCE BOOKS:

6. E P Klement, R Mesiar and E. Pap, Triangular norms, Kluwer Academic Press, Dordrecht, 2000.
7. 2. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, New Delhi.
8. 3. Kevin M Passino and Stephen Yurkovich, Fuzzy Control, Addison Wesley Longman,.
9. 4. M Grabisch et al., Aggregation Functions, Series - Encyclopedia Of Mathematics And Its Applications, Cambridge University Press, 2009
10. 5. Michal Baczynski and Balasubramaniam Jayaram, Fuzzy Implications, Springer Verlag, Heidelberg, 2008. Course.

JOURNALS:

1. An International Journal in Information Science and Engineering
2. International Journal of Fuzzy Computation and Modelling.

E-LEARNING RESOURCES:

1. https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_set_theory.htm

2. https://www.tech-wonders.com/2010/07/operations-fuzzy-sets.html

3. https://www.e-bookdownload.net/search/fuzzy-mathematical-concepts

4. https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_applications.htm

5. https://www.guru99.com/what-is-fuzzy-logic.html

Course Outcomes

CO No.	CO Statement
CO 1	Explain about the basic concepts of Crisp Set and Fuzzy Set.
CO 2	Discuss about the operators and Complements.
CO 3	Introduce the concept of fuzzy numbers and arithmetic operators in interval
CO 4	Explain about Fuzzy logic and propositions
CO 5	Discuss about the applications of fuzzy in engineering.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	3	2	2
CO2	2	2	2	2	2
CO3	2	2	3	3	2
CO4	2	3	2	3	2
CO5	2	2	3	3	2
AVERAGE	2	2.4	2.6	2.6	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD)

Flipped Learning/Blended Classroom-Videos-Problem Solving-Group Discussion-Quiz-Seminar-Peer Learning.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

ALLIED COURSE PROFILE-OFFERED TO OTHER DEPARTMENTS

Sem	Course Code	Course Title	Credits	Hrs	Total Hrs	L-T-P	CA	SE	Total
I	MC18/1A/AM1// MA18/1A/AM1	Allied Mathematics I	5	6	90	3-3-0	40	60	100
II	MC18/2A/AM2// MA18/2A/AM2	Allied Mathematics II	5	6	90	3-3-0	40	60	100
I	MC18/1A/STM	Statistical Methods	5	6	90	3-3-0	40	60	100
II	MC18/2A/OPR	Operations Research	5	6	90	3-3-0	40	60	100

SEMESTER I

ALLIED MATHEMATICS I (For 1st year B.Sc., Computer Science)

TOTAL HOURS: 90   **COURSE CODE:MC18/1A/AM1//**
                   MA18/1A/AM1

CREDITS: 5   **L-T-P: 3 3 0**

COURSE OBJECTIVES

Enable the students

1. Get equip with the knowledge of matrices and its applications.
2. Understand the concept of reduction formula and integral calculus.
3. Know the principle and concepts of trigonometry.

COURSE OUTLINE:

UNIT I: Matrices:
  Eigen values and Eigen vectors, Cayley Hamilton Theorem (No
  proof) verification of Cayley Hamilton theorem, Inverse of a Matrix using
  Cayley Hamilton Theorem.   (15hrs)

UNIT II: Theory of Equations:
  Roots of polynomial Equations, Symmetric functions of roots terms of coefficients,
  Transformation of equations, Formation of equations, Reciprocal Equations.
                      (22hrs)

UNIT III: Trigonometry:
  Expansions of Cos nθ, Sin nθ, Expressions of Cos θ, Sin θ, Tan θ in powers of θ,
  Hyperbolic functions and Inverse Hyperbolic functions. Real and imaginary parts of
  sin (α+iβ) , cos (α+iβ), tan (α+iβ), $tan^{-1}(\alpha + i\beta)$.   (18 hrs)

UNIT IV: Integral Calculus:
  Bernoulli's formula Reduction formulae $\int e^{ax}$ cosbx dx, $\int e^{ax}$ sinbx dx-
  $\int sin^{m}x \ cos^{n}x \ dx$ (m, n being positive integers),$\int x^{m}(\log x)^{n} dx$, $\int cos^{m}x \ cosnx \ dx$,
  $\int cos^{m}x$ sinnx dx.   (20 hrs)

UNIT V: Fourier Series:
  Definition- Finding Fourier coefficients for a given periodicfunctions withperiod 2π-
  Odd and Even function- Half range series.   (15hrs)

RECOMMENDED TEXT:
1. Narayanan and ManicavachagomPillay, Ancillary Mathematics Book I,II, and III Viswanathan Printers and publishers Private limited, Chennai.
2. Dr. A. Singaravelu, Allied Mathematics, 3rd revisied edition, 2011, Meenakshi Agency, Chennai.

REFERENCE BOOKS:

1. P.R.Vittal (2003), Allied Mathematics, Margham Publications,,Chennai.
2. P.Duraipandian and S.Udayabaskaran, (1997) Ancillary Mathematics, vol I &II Muhil Publisher, Chennai.
3. A.Singaravelu and Ramaa, Algebra and Trigonometry, Volume 1, first edition, Menakshi agency.
4. P.Kandasamy and K. Thilagavathy, Mathematics for B.Sc, Volume 2, First edition, S.Chand and co, New Delhi.
5. T.K.Manikavasagam pillai, T.Narayanaa, K.S.Ganapathy, Algebra, Volume 1, Viswanathan Pvt. Ltd.

JOURNALS:
Journals of Mathematical Analysis & Applications-Science Direct
Applied Mathematics & Statistics-Allied Academies

E-LEARNING SOURCES:
http:// www.mathsisfun.com/algebra
http: //m.jagranjosh.com/theory-of-equation
http://www.khanacademy.org/trigonometry
http://www.britannica.com/science/integral-calculus
http://www.math24.net/fourier-series-definitions-typical-example

COURSE OUTCOMES: Upon successful completion of Allied Mathematics – I students will be able to

CO No.	CO Statement
CO 1	Compute Eigen values and Eigen vector of a square matrix and find inverse of matrix using Cayley -Hamilton theorem.
CO 2	Evaluate the roots of the polynomial equation solving the transformation of equation and Reciprocal equation.
CO 3	Evaluate $\cos n\theta, \sin n\theta, \cos \theta, \sin \theta, \tan \theta$ in power of θ. Compute hyperbolic and inverse hyperbolic function.
CO 4	Derive reduction formula and thereby evaluate standard integral
CO 5	Find Fourier series expansion for the given function and evaluate Fourier series for odd and even function.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	2	2	2
CO5	3	3	2	2	2
AVERAGE	3	3	2.4	2	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER II

ALLIED MATHEMATICS II (For 1st year B.Sc., Computer Science)

TOTAL HOURS: 90   **COURSE CODE:MC18/2A/AM2//**

                                             MA18/2A/AM2

CREDITS: 5   **L-T-P: 3 3 0**

COURSE OBJECTIVES

Enable the students to

1. Solve the difference types of linear differential equations
2. Apply Laplace Transform to solve differential equation.
3. Interpolate a value from a given set of data.

COURSE OUTLINES:

UNIT I: Ordinary Differential Equations:
Linear differential equations with constant co-efficient, particular integral of polynomial and Ve^{mx}, where V is a polynomial or sin x or cos x.

(20 hrs)

UNIT II:Partial Differential Equations:
Formation, Complete Integral, Four standard types, Lagrange's Equation, simple problems. (20hrs)

UNIT III:Laplace Transforms:
Laplace Transforms of Standard functions, Simple theorems. (noproof) Inverse Laplace Transforms, solving first order differential equations with constant coefficients using Laplace transform. (20 hrs)

UNIT IV:Vector Analysis:
Introduction, operator∇, Gradient, Directional derivative, unit Normal to surface. Divergence and curl of vectors, solenoidal and irrotational vectors, the operator ∇^2 ,Harmonic functions. (15 hrs)

UNIT V: Interpolation :
Newton's forward and backward formulae for interpolation (no proof) Lagrange's formula for interpolation (No Proof) – Simple problems.

(15 hrs)

RECOMMENDED TEXT:

1. Narayanan and Manicavachagom Pillay, Ancillary Mathematics Book I, II, and III Viswanathan Printers and publishers Private limited, Chennai.
2. Dr.A.Singaravelu, Allied Mathematics, 3rd Revised edition, Meenakshi Agency, Chennai.

REFERENCE BOOKS:

1. P.R.Vittal (2003), Allied Mathematics, Margham Publications, Chennai
2. P.Duraipandian and S.Udayabaskaran, (1997) Ancillary Mathematics, vol I &II Muhil Publisher, Chennai.
3. A.Singaravelu & R.Ramaa, Algebra and Trigonometry, Volume I, First edition, Meenakshi Agency, Chennai.
4. S.Arumugham, Numerical methods, 2nd edition,New Gamma publishing, Palayamkottai.
5. P.R.Vittal,Differential equation and Laplace Transformation, First edition,Margham Publications,Chennai.

JOURNALS:

Journals of Mathematical Analysis & Applications-Science Direct
Applied Mathematics & Statistics-Allied Academies.

E-LEARNING SOURCES:
https://users.math.msu.edu
https://www.maths.ucla.edu
https://www.mathworld.wolfram.com/laplace-transforms
https://www.britannica.com/science/vector-analysis
https://www.britannica.com/science/interpolation

COURSE OUTCOMES: Upon successful completion of Allied Mathematics – II students will be able to

CO No.	CO Statement
CO 1	Solve linear differential equation with constant co-efficient.
CO 2	Recognize the major classification of PDE'S and solve four standard type of PDE.
CO 3	Solve first order differential equation using Laplace and inverse Laplace transform.
CO 4	Determine gradient, divergence and curl of vectors.
CO 5	Analyse and use Newton's forward, backward and Lagrange's formula for interpolation and apply it in real life problems

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	1
CO2	3	3	3	2	1
CO3	3	3	2	2	1
CO4	3	3	2	2	1
CO5	3	3	3	2	1
AVERAGE	3	3	2.4	2	1

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER I

STATISTICAL METHODS (For 1st year B.C.A)

TOTAL HOURS: 90 **COURSE CODE: MC18/1A/STM**

CREDITS: 5 **L-T-P: 3-3-0**

COURSE OBJECTIVES:

Enable the students to

1. Impart knowledge and skill in probabilities.
2. Study measures of central tendency.
3. Study measures of dispersion.
4. Expose to correlation and regression.
5. Introduce discrete distributions.

COURSE OUTLINE:

UNIT - I: Probability: Trail- Events –Sample spaces-Mutually Exclusive cases- Exhaustive Events- Independent Events-Axiomatic approach to Probability- Additional and Multiplication Theory- Conditional Probability – Baye's theorem (proof Excluded)-Random variables- Discrete and Continuous random   variables (one dimensional).
Part – I   Chapter – 1, 2.   (15 hrs)

UNIT – II: Measures of Central tendency: Arithmetic Mean (Discrete and continuous Series) - Weighted Arithmetic Mean (Discrete and Continuous series)-correcting incorrect Mean –Combined Mean - Median – calculation of Median (Individual and Discrete) – Quartiles(Individual and Discrete) – Mode (Individual and Discrete) – Relation between mean, median and mode.
Part – II   Chapter – 5.   (20 hrs)

UNIT – III: Measures of Dispersion: Range – Quartile Deviation – Mean Deviation – Standard Deviation – Formula for calculating Standard Deviation – Combined Mean and Standard Deviation – Coefficient of Variation.
Part – II   Chapter – 6.   (20 hrs)

UNIT – IV: Correlation (one dimension) – Karl Pearson's Coefficient of Correlation -Rank Coefficient – **Regression** – Regression Equation.
Part – I   Chapter 8,9.   (15 hrs)

UNIT – V: Discrete Distributions – Binomial, Poisson Distribution (Simple
Problems)- Fitting of Binomial Distributions - Fitting of Poisson
Distributions- Continuous Distributions – Normal Distributions
Simple Problems (derivation excluded).
Part - I Chapter 12, 13, 16   (20 hrs)

RECOMMENDED BOOK:

1. Statistics , R.S.N. Pillai Bagavathi, S.Chand& Company Ltd.

REFERENCE BOOKS:

1. Elements of Mathematical Statistics, S.C.Gupta& V.K. Kapoor,Sultan Chand
   Publications.
2. Fundamentals of Applied Statistics, S.C.Gupta& V.K. Kapoor,Sultan Chand
   Publications.
3. Dr.D.C.Sangheti,V.K.Kapor ,Statistics,Sulthan Chand &Sons.
4. J.N.Kapur and H.C.Saxena,Mathematical Statistics,,S.Chand.

5. P.R. Vittal, Mathematical Statistics, Margham Publications

JOURNALS:

Journal of Applied Probability and Statistics-www.isoss.net>japs

E-LEARNING SOURCES:

https://www.hitbullseye.com/Probability-Examples.php

https://www.toppr.com/guides/economics/measures-of-central-tendency/calculation-of-mean-median-and-mode

https://sol.du.ac.in/mod/book/view.php?id=1317&chapterid=1066

https://www.pindling.org/Math/Statistics/Textbook/Examples/Chapter3/chapter3_examples.htm

http://makemeanalyst.com/normal-distribution-binomial-distribution-poisson-distribution/

COURSE OUTCOMES: Upon successful completion of Statistical Methods students will be able to

CO No	CO STATEMENT
CO 1	Understanding the basic probability concepts, random variables, conditional probabilities.
CO 2	Analyse data and compute mean, median and mode.
CO 3	Analyse data and compute mean, quartile, standard deviation and co-efficient of variation.
CO 4	Compute correlation and rank correlation and to find the relation between two variables using regression.
CO 5	Discuss the importance of various distribution and solve problems based on real life conditions.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	3	3	2	2
AVERAGE	3	3	3	2	2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER II

OPERATIONS RESEARCH (For 1st Year B.C.A)

TOTAL HOURS: 90   **COURSE CODE: MC18/2A/OPR**

CREDITS: 5   **L-T-P:3-3-0**

COURSE OBJECTIVES:

Enable the students to

   1.Impart knowledge and skill in linear programming.

   2.Study the concept of Transportation problems.

   3.Study Assignment problem.

   4.Expose to sequencing. problems.

   5.Introduce CPM and PERT .

COURSE OUTLINE:

Unit – I: Linear Programming:
   Formulations and Graphical solution (2 variables)-Canonical &Standard terms
   of linear programming problem. Simplex method& Big M method only
   (Two-Phase Method excluded).
    Chapter- 2& 3(omit 3.2.2).   (25 hrs)

Unit –II: Transportation Model:
   Definition- Solution of Transportation Models-Vogel's Approximation Method-
   MODI Method- Variations of Transportation Problems.
   Chapter- 7.   (15 hrs)

Unit –III: Assignment Model:
    Definition- Comparison with transportation model- Solution of Assignment Model
    by Hungarian method- Variations of Assignment problems.
    Chapter-8.   (15 hrs)

Unit-IV: Sequencing Problem:
    Processing each of n jobs through m machines-
    processing n jobs through 2 machines- Processing n jobs through 3
     machines- Processing 2 jobs through m machines.
   Chapter- 14.   (15 hrs)

Unit- V: Pert- CPM:

      Networks- PERT computation- CPM computation.

      Chapter-15   (20hrs)

RECOMMENDEDTEXT:

1. Resource Management Techniques, V.Sundaresan, K.S.Ganapathy Subramaniam& K. Ganesan 9th edition A.R.Publications June 2015.

REFERENCEBOOKS:

1) Operation Research, R. K. Gupta, 4th Edition 2014 Krishna Prakash Media (p) Ltd.
2) Operation Research- An Introduction, Hamdy A. Taha, 5th edition, Prentice Hall of India, Pvt. Ltd., New Delhi, 1996.Prentice Hall of India Pvt Ltd.
3) Dr.P.R.Vittal and V.Malini Operations Research,Margham Publications.
4) Kantiswarp,P.K.Gupta and Manmohan,OperationsResearch,Sultah Chand and Sons.
5) V.K.Kapor,Operations Research,Sultah Chand and Sons.

JOURNALS:

Journal of Operation Research –https://swayam.gov.in>

E-LEARNING SOURCES:

https://www.toppr.com/guides/maths/linear-programming/linear-programming-problem/
https://www.utdallas.edu/~metin/Or6201/network.pdf
http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=4955
http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=90031
https://elearning.nokomis.in>

COURSE OUTCOMES: Upon successful completion of Operations Research students will be able to

CO No	CO STATEMENT
CO 1	Formulate a LPP and solve it by simplex and graphical method.
CO 2	Understand the concepts of different types of transportation model and its application in real life.
CO 3	Understand the concepts of different types of assignment model and its application in real life.
CO 4	To solve sequencing problems for various jobs and machines.
CO 5	Evaluate network oriented problems using CPM & PERT.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	3	2	1
CO3	3	3	3	2	2
CO4	3	3	3	2	3
CO5	3	3	3	2	3
AVERAGE	3	3	3	2	2.2

KEY:**S**TRONGLY CORELATED-3 **M**ODERATELY CORELATED-2**W**EAKLY CORELATED-1 **N**O CORELATION-0

TEACHING METHODOLOGY:

Lecture (Chalk and Talk-LCD), Flipped Learning/Blended Classroom-E Content, Videos, Problem Solving-Group Discussion, Quiz-Seminar, Peer Learning, Field Visits, Self-Study Papers.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20		-
K1, K 2	B-5/8x7 marks	200	35	100	
K2, K 3	C-3/5x15 marks	500	45		

SELF STUDY PAPER

GRAPH THEORY

CREDITS : 2   **COURSE CODE : MC18/5SS/GRT**

(Prerequisite – Knowledge of: - Graphs and Simple graphs – Graph isomorphism – Incidence and adjacency matrices – subgraphs – types of graphs – vertex degrees – Path and Connection – Cycles - Trees – Cut vertices and cut edges – connectivity)

COURSE OBJECTIVES

Enable students to

1. To Provide structural characterization of graphs with matching, perfect matching and graph colouring.
2. To give structural understanding of planar graphs.

COURSE OUTLINE

UNIT - I   **MATCHING**

Matching – Matching and covering of bipartite graph – Perfect matching – Covering – Independent sets.

UNIT –II   **COLORING**

Coloring – Vertex chromatic number - k- critical graphs – Brook's theorem – Chromatic polynomials – Girth and Chromatic number.

UNIT –III   **PLANAR GRAPHS**

Planar graphs – Euler's formula – Kurtowki's theorem – Five colour theorem.

RECOMMENDED TEXT:

1. Bondy. J. A and Murthy U.S.R., "Graph theory with Applications", Elsevier North – Holland, New York, 1976.
2. Dougalas B.West, Introduction to Graph Theory", Pearson, Second Edition, New York, 2015.

REFERENCE BOOKS:

1. Balakrishnan R. And Ranganathan K. A Text Book of Graph Theory, Springer – Verlag.
2. Chartrand G. And Lesneik Foster L., " Graphs and Digraphs", CRC Press, 4th Edition. Boca Raston, 2006.
3. Harary F., "Graph Theory", Narosa Publishing House, New Delhi, 2001.

SEMESTER V

SELF STUDY PAPER

VISUAL BASIC.NET

COURSE CODE: MC18/5SS/VBN   **CREDITS: 2**

COURSE OBJECTIVES:

Enable students to
1. Develop the fundamentals of modular application.
2. Design, debug and deploy web applications using VB.NET.
3. Impart the knowledge of configure programming environment and to develop a data driven web application.

COURSE OUTLINE:

UNIT I : Introduction - .NET – the Visual Basic.NET development Environment – Elements Of VB.NET.

UNIT II: Lexical Elements – Preprocessing directives.General Concepts – Option, Imports, Namespace Directives – Types – Type members. Statement and Blocks .

UNIT III: Expressions - VB.NET operators. Interfacing with End user – Windows forms.

UNIT IV: MDI Applications - Components and controls – Menus and Toolbars.

UNIT V: Responding to user Input – collecting user Input –   Presentation and Informational controls – Drag and Drop operations.

RECOMMENDED TEXT:

Jeffrey R. Shapiro. The complete Reference Visual Basic .NET, Tata McGraw Hill. 2002.

REFERENCE BOOKS:

6. Bill Evjen. jason Beres, Visual Basic .NET Programming Bible, Wiley, 2002.
7. Steve Holzner, Visual Basic .NET Programming Black Book, Paraglyph Press,2005.
8. Vijay K Khanna, S K Bhambri, <u>A Course in Abstract Algebra 4th Edition</u>, Vikas Publishing House Pvt Ltd.

COURSE OUTCOMES :

CO No.	CO Statement
CO 1	Analyze the basic concepts on VB.Net environment.
CO 2	Explain the type members and statement blocks in the programme
CO 3	Apply the interfacings and open window using VB.NET
CO 4	Identify the components and controls to be used in the programme
CO 5	Formulate the user inputs to informational controls in the programme

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20	100	-
K1, K 2	B-5/8x7 marks	200	35		
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