`

ETHIRAJ COLLEGE FOR WOMEN

(AUTONOMOUS)

CHENNAI-600 008

COLLEGE WITH POTENTIAL FOR EXCELLENCE

DEPARTMENT OF MATHEMATICS WITH COMPUTER APPLICATIONS

(Self Supporting)

SYLLABUS

Choice Based Credit System

Outcome Based Education

(Offered from the academic year 2021-22)

Ethiraj College for Women (Autonomous)

Department of Mathematics with Computer Applications

Revised Syllabus with effect from June 2021

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 .

The Department of Mathematics with Computer Applications is revising syllabi with effect from the academic year 2021- 2022, 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 a 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 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, ROTARACT, 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 took a Non Tamil language under Part I shall take Advanced Tamil comprising 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 fulfill 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 examinations (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 solutions 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 phenomena and their applications in day-to-day life.

PO4- Cultivate unparalleled 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 OUTCOMES

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 programmes.

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 programs 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 in an environment conducive in cultivating skills for successful,career,Entrepreneurship.

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS) CHENNAI -08

CURRICULUM TEMPLATE (2021-22 ONWARDS)

UNDERGRADUATE PROGRAMME PROFILE

DEPARTMENT OF MATHEMATICS WITH COMPUTER APPLICATIONS

COURSE CODES AND CREDITS

TOTAL MINIMUM CREDITS: 140 **TOTAL TEACHING HOURS: 180**

PART	CORE/ALLIED/ ELECTIVE/	TITLE OF THE PAPER	CODE	L	T	P	H	C	CA	SE	MM
	I SEMESTER										
I	Language	Tamil/Hindi/French/Sanskrit					6	3	**40**	**60**	**100**
II	English	Communicative English					4	3	**40**	**60**	**100**
III	Core 1	Trigonometry & Analytical Geometry	MC21/1C/TAG	3	2	0	5	4	**40**	**60**	**100**
III	Core 2(Theory & Practical)	Object Oriented Programming with C++(Theory)	MC21/1C/C++	2	1	0	3	4	**40**	**60**	**100**
III		Object Oriented Programming with C++(Practical)	MC21/1C/PR1	0	0	2	2		**40**	**60**	**100**
III	Allied	Calculus of Finite Differences-I	MC21/1A/FD1	3	3	0	6	5	**40**	**60**	**100**
IV	EVS	Environmental Studies					2	2	**-**	**50**	**50**
IV	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences					2	3	**-**	**50**	**50**
	II SEMESTER										
I	Language	Tamil/Hindi/French/Sanskrit					6	3	**40**	**60**	**100**
II	English	Communicative English					4	3	**40**	**60**	**100**
III	Core 3	Calculus	MC21/2C/CAL	3	1	0	4	4	**40**	**60**	**100**
III	Core 4(Theory & Practical)	Java and Data Structures(Theory)	MC21/2C/JDS	2	2	0	4	4	**40**	**60**	**100**
III		Java and Data Structures (Practical)	MC21/2C/PR2	0	0	2	2		**40**	**60**	**100**
III	Allied	Calculus of Finite Differences-II	MC21/2A/FD2	3	3	0	6	5	**40**	**60**	**100**
IV	Val. Ed	Value Education					2	2	**-**	**50**	**50**
IV	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences					2	3	**-**	**50**	**50**
	III SEMESTER										
I	Language	Tamil/Hindi/French/Sanskrit					6	3	**40**	**60**	**100**
II	English	Communicative English					4	3	**40**	**60**	**100**
III	Core 5	Classical Algebra	MC21/3C/CLA	3	2	0	5	4	**40**	**60**	**100**
III	Core 6	Differential equations & Fourier series	MC21/3C/DEF	3	2	0	5	4	**40**	**60**	**100**
III	Allied	Mathematical Statistics& R Software –I	MC21/3A/MS1	3	2	1	6	5	**40**	**60**	**100**
IV	NME/1C	Office Management	MC21/3N/OFM// MC21/3N/OFMH				2	2	**-**	**50**	**50**
IV	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences					2	3	**-**	**50**	**50**

	IV SEMESTER										
I	Language	Tamil/Hindi/French/Sanskrit					6	3	**40**	**60**	**100**
II	English	Communicative English					4	3	**40**	**60**	**100**
III	Core 7	Operating Systems	MC21/4C/OPS	3	2	0	5	4	**40**	**60**	**100**
III	Core 8	Vector Calculus & Transform Techniques	MC21/4C/VCT	3	2	0	5	4	**40**	**60**	**100**
III	Allied	Mathematical Statistics& R Software –II	MC21/4A/MS2	3	2	1	6	5	**40**	**60**	**100**
IV	NME	Web Designing	MC21/4N/WEB// MC21/4N/WEBH				2	2	**-**	**50**	**50**
IV	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences					2	3	**-**	**50**	**50**
	V SEMESTER										
III	Core 9	Algebraic Structures	MC21/5C/ALS	3	2	0	5	4	**40**	**60**	**100**
III	Core 10	Real analysis	MC21/5C/RAN	3	2	0	5	4	**40**	**60**	**100**
III	Core 11(Theory & Practical)	Web Technology (Theory)	MC21/5C/WET	2	3	0	5	4	**40**	**60**	**100**
III		Web Technology(Practical)	MC21/5C/PR3	0	0	3	3		**40**	**60**	**100**
III	Elective I	Discrete Mathematics	MC21/5E/DIM	3	3	0	6	5	**40**	**60**	**100**
III	Elective II	Operations Research-I (or) Elementary Number Theory	MC21/5E/OR1 (or) MC21/5E/ENT	3	3	0	6	5	**40**	**60**	**100**
	VI SEMESTER										
III	Core 12	Linear Algebra	MC21/6C/LAL	3	2	0	5	4	**40**	**60**	**100**
III	Core 13	Complex Analysis	MC21/6C/CAN	3	2	0	5	4	**40**	**60**	**100**
III	Core 14	Mechanics	MC21/6C/MEC	3	3	0	6	4	**40**	**60**	**100**
III	Core 15(Theory & Practical)	Python Programming(Theory)	MC21/6C/PYT	2	3	0	5	4	**40**	**60**	**100**
III		Python Programming(Practical)	MC21/6C/PR4	0	0	3	3		**40**	**60**	**100**
III	Elective III	Operations Research-II (or) Fuzzy set theory and its applications	MC21/6E/OR2 (or) MC21/6E/FSA	3	3	0	6	5	**40**	**60**	**100**
V		Extension Activity (Sports/NCC/NSS/CSS/ YRC/RRC/Retract/Yoga) (Min 60 hours)		**-**	**-**	**-**		**1**	**-**	**-**	**-**
		OPTIONAL EXTRA CREDITS									
IV	Extra Credits	Self-Study (Semester V) Graph Theory (or) Visual Basic.Net	MC21/5SS/GRT (or) MC21/5SS/VBN	**-**	**-**	**-**	**-**	**2**	**-**	**100**	**100**
		Internship (Summer Vacation after IV Semester) (Min.14 days)	MC21/2I/INP	**-**	**-**	**-**		**1**	**-**	**-**	**-**
		Project (Semester VI)	MC21/6P/PRO				**-**	**2**	**-**	**100**	**100**

EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT

INTERNAL VALUATION BY COURSE TEACHERS

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

RUBRICS FOR CONTINUOUS ASSESSMENT

Assignment	Content/Originality/Presentation/Schematic Representation and Diagram/Bibliography
Seminar	Organization/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

SEMESTER: 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

SEMESTER:

I/II/III/IV

SINGLE VALUATION

ORAL TEST/WRITTEN TEST

MAXIMUM MARKS: 50

PASSING MARK: 25

PRACTICAL PAPERS

PART III

SEMESTER:

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	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
Part I	Tamil/Hindi/French/ Sanskrit	3	6			40	60	100
Part II	English	3	4			40	60	100
MC21/1C/TAG	Trigonometry & Analytical Geometry	4	5	75	3-2-0	40	60	100
MC21/1C/C++	Object Oriented Programming with C++(Theory)	4	3	45	2-1-0	40	60	100
MC21/1C/PR1	Object Oriented Programming with C++(Practical)		2	30	0-0-2	40	60	100
MC21/1A/FD1	Calculus of Finite Differences-I	5	6	90	3-3-0	40	60	100
PART IV	Environmental Studies	2	2			-	50	50
	Soft Skill (Offered by English Department)	3	2			-	50	50

SEMESTER I
TRIGONOMETRY AND ANALYTICAL GEOMETRY

TOTAL HOURS: 75 **COURSE CODE: MC21/1C/TAG**

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 the knowledge of polar co-ordinate gained, to solve various problems

COURSE OUTLINE:

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

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

UNIT II: Hyperbolic Functions: Definitions, 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: Planes: Equation of a plane, Angle between two planes, Equation of a plane through line of interSections of two planes, length of perpendicular, To find the equation of the plane which bisects the angle between two given planes-simple problems.

Polar Co ordinates: Distance between the points, area of Triangle- Equation of straight line.

Book 2- Chapter II Sectionss 1-11 (15 hrs)

RECOMMENDED TEXT:

1. S. Narayan and T.K. ManicavachagomPillay (2013), Trigonometry, S.Viswanathan printers and publishers Pvt. Ltd, Chennai.
2. T.K. Manicavachagam Pillay & others, Revised edition, Reprint 2001, Analytical Geometry (Part II-Three dimensions), S.Vishwanathan Printers and publishers pvt.ltd, Chennai.
3. P. Kandasamy and K. Thigavathi, Mathematics for B.Sc- Volume I- 2004, S.Chand and Co, New Delhi

REFERENCE BOOKS:

1. S.L.Loney, Plane Trigonometry – Part-II (1982), Cambridge University Press London.
2. Dr. M.D. Raisinghania, H.C.Saxena, H. K. Dass, Trigonometry (1999), S. Chand & Company Pvt. Ltd., New Delhi.
3. B.S. Grewal Higher Engineering Mathematics (2002), Khana Publishers, New Delhi.

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 Analytical Geometry 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	Discuss the Geometrical concepts of Planes. Apply the concept of Polar coordinates to find the Distance between the Points, Area of a triangle and Solve problems on Straight 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	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 CORRELATED-3 MODERATELY CORRELATED-2**W**EAKLY CORRELATED-1

NO CORRELATION-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	Sections	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20	100	-
K1, K 2	B-5/8x7marks	200	35		
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER I

OBJECT –ORIENTED PROGRAMMING WITH C++ (THEORY)

TOTAL HOURS: 45 **COURSE CODE: MC21/1C/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 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.

Chapter 1 – Sections 1.3,1.4,1.5,1.6,1.8,
Chapter 3 – Sections 3.14 to 3.18,3.20 (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

Chapter 4 – Sections 4.2 to 4.6,4.10
Chapter 5 – Sections 5.9,5.13,5.15 (10hrs)

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

Chapter 6 – Sections 6.4,6.5,6.7,6.8,6.11 & Chapter 7 (11hrs)

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

Chapter 8 – Sections – 8.3,8.5 to 8.8 (9 hrs)

UNIT – V: Working with files – Classes for file stream operations – Opening and Closing of a file.

Chapter 11 – Sections 11.2,11.3,11.10 (8 hrs)

(Case Studies are Excluded in **ALL 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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER I

OBJECT –ORIENTED PROGRAMMING WITH C++ - PRACTICAL

TOTAL HOURS: 30 **COURSE CODE: MC21/1C/PR1**

CREDIT: 1 **LTP: 0 0 2**

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 clear knowledge on constructors, destructors and operator overloading.
4. Study the various inheritances 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++ - Practical 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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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 and one external should be appointed to conduct the examination

SEMESTER I
CALCULUS OF FINITE DIFFERENCES – I

TOTAL HOURS: 90 **COURSE CODE: MC21/1A/FD1**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES:

Enable the students to

1. Solve Mathematical problem using difference operators and find the sum of series.
2. Compute Numerical solutions of 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 – Simple Problems only **(Proof of theorems in finite differences are excluded)**

Book 1 : Chapter 2 Section 2.1 (20hrs)

UNIT II: SUMMATION OF SERIES

Use of forward difference operators – Summation Using Euler – Maclaurin's formula

Book 1 : Chapter 10 Section 10.1 to 10.3,10.4[A]
Chapter 6 Section 6.2[I] (15 hrs)

UNIT III: INTERPOLATION

Newton's Forward and Backward formulae for Interpolation- Central difference formulae-Gauss Forward, Gauss Backward, Stirling's and Bessel's formulae-

Simple Problems only.**(Derivations of Formulae and Proof of theorems are excluded)**

Book 1 : Chapter 3 Section 3.1,3.2[A],[B],[C],3.6[A],[C],[E],[F]. (15hrs)

UNIT IV: INTERPOLATION (contd)

Largange's Formula for Interpolation – Newton's Divided Differences formula.

Largange's inverse interpolation -Simple Problems only.**(Derivations of Formulae and Proof of theorems are excluded)**

Book 1 : Chapter 3 Section 3.3,3.5[C]
Chapter 3 Section 4.2 (20hrs)

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-Simple Problems only.**(Derivations of Formulae are excluded)**

Book 1 Chapter 6 Section 6.1,6.2[A][B][C][D]. (20 hrs)

RECOMMENDED TEXTBOOKS:

1. B.D.Gupta (2001) Numerical Analysis Konark publications Ltd., Delhi
2. Dr. M.K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition, The National Publishing Company, Chennai.
3. H.C. Saxena , Finite difference and numerical analysis S.Chand&Co.Delhi.

REFERENCE BOOKS:

1. S.Arumugham, Numerical Methods, New Gamma Publishing, Palayamkottai.
2. 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.
3. E.Balagurusamy, Numerical Methods ,Tata Mc.Graw Hill, New Delhi.
4. T.K.Manicavachagam Pillai & Prof. S. Narayanan, Numerical Analysis, New Edition S. Viswanathan Printers & publishers Pvt Ltd, Chennai.
5. S.G.Venkatachalapathy,Calculus of finite differences and Numerical analysis, Margham publications, 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://en.wikipedia.org/wiki/Euler%E2%80%93Maclaurin_formula

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_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	Compute the summation of series by applying Numerical operators and Euler Maclaurin Method
CO 3	Applying the Methods of interpolation to compute the missing value in real life problems.
CO 4	Compute the missing values for unequal intervals using Divided differences and Lagrange Method.
CO 5	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	3	3	3	2	2
CO3	2	3	2	3	2
CO4	3	3	2	2	3
CO5	3	3	3	3	2
AVERAGE	2.6	2.8	2.4	2.4	2.2

KEY: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2 WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	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		

SEMESTER –II

COURSE CODE	COURSE TITLE	Credits	Hrs	Total	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
Part I	Tamil/Hindi/French/ Sanskrit	3	6			40	60	100
Part II	English	3	4			40	60	100
MC21/2C/CAL	Calculus	4	4	60	3-1-0	40	60	100
MC21/2C/JDS	Java and Data Structures(Theory)	4	4	60	2-2-0	40	60	100
MC21/2C/PR2	Java and Data Structures(Practical)		2	30	0-0-2	40	60	100
MC21/2A/FD2	Calculus of Finite Differences-II	5	6	90	3-3-0	40	60	100
Part IV	Value Education	2	2			-	50	50
	Soft Skill (Offered by English Department)	3	2			-	50	50

SEMESTER-II

CALCULUS

TOTAL HOURS: 60 **COURSE CODE: MC21/2C/CAL**

CREDITS: 4 **L-T-P: 3 1 0**

COURSE OBJECTIVES:

Enable students to

1. Provide understanding of the existence of *nth* order derivatives.
2. Find the radius of curvature in Cartesian form and in parametric form.
3. Apply the reduction formula to evaluate definite integrals.
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 Sections 1.1 -1.6 & Sections 2.1 -2.2 (12hrs)

UNIT II: **ENVELOPES -** Methods of finding envelopes- Curvature – Circle, radius, Centre of Curvature- Involutes-Evolutes- Cartesian and Polar formula for the radius of curvature. Co-ordinates of Centre of Curvature Maxima and Minima functions of two variables, - Jacobians,.

Calculus- Vol I – Chap – 5 Sections 1.1 to 1.5,
Chap -10, Sections1.1 – 1.3, 2.1-2.4 & 2.6

(15hrs)

UNIT III: INTEGRAL CALCULUS: Reduction formulae:Bernoulli's formula, $\int e^{ax}\cos bx\,dx$, $\int e^{ax}\sin bx\,dx$- $\int \sin^m x\cos^n x\,dx$ (m, n being positive integers), $\int x^m(\log x)^n\,dx$, $\int \cos^m x\cos nx\,dx$, $\int \cos^m x\sin nx\,dx$,

Calculus –Vol II - Chapter 1 Sec 1.3, 13.1 – 13.10 (13 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 (10 hrs)

UNIT-V: Beta and Gamma functions (Applications to simple problems)

Calculus – Vol II - Chapter 7 Sec 2.1-2.3, 3, 4. (10 hrs)

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. P. Kandasamy and K. Thigavathi, Mathematics for B.Sc- Volume II- 2004, S.Chand and Co, New Delhi.
2. Shanti Narayan, Dr. P.K.Mittal, Differential Calculus, Rajendra Ravindra Printers, 2012.
3. George Yankovsky, Differential and integral Calculus (Vol –II), MIR Publishers.
4. 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: STRONGLY CORRELATED-3 **M**ODERATELY CORRELATED-2 WEAKLY 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	Sections	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		

SEMESTER II

JAVA AND DATA STRUCTURES (THEORY)

TOTAL HOURS: 60 **COURSE CODE: MC21/2C/JDS**

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

COURSE OBJECTIVES:

Enable students to

1. Learn the basic concepts of Java programming
2. Use class and objects to create applications
3. Overview the concepts of interfaces, packages, multithreading and exceptions.
4. Familiarize the concepts of basic data structures and their use in algorithms.

COURSE OUTLINE

UNIT I History and Evolution of Java - Features of Java - Overview of Java Language Data Types – Variables- Type Conversion and Casting- Operators – Arithmetic Operators - Bitwise –Relational Operators - Assignment Operator – The conditional Operator – Operator Precedence.

Book 1 Chapter 2 Sections 2.1 &2.2, Chapter 3
Chapter 4 Sections 4.4, 4.5, 4.6 & 4.9
Chapter 5 Sections 5.2,5.7,5.14 (10 hrs)

UNIT II Control Statements – Arrays.-Classes - Objects - Constructors - Overloading method – String Class- Overriding.

Book 1 Chapter 6 and 7
Chapter 8 Sections 8.1 to 8.8
Chapter 9 Sections 9.1 to 9.5 (13 hrs)

UNIT III Packages -Exception Handling - Throw and Throws-The Java Thread Model- Creating a Thread and Multiple Threads - Thread Priorities Synchronization- Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads – Multithreading- Applets Programming

Book 1 Chapter 11 Sections 11.1 to 11.8
Chapter 12 13 and 14 (13 hrs)

UNIT IV Data Structures: Definition of a Data structure –Arrays, Operations on Arrays, Order lists. Stacks – Operations on stack - Applications of Stack - Infix to Postfix Conversion – Evaluation of postfix expression; Recursion. Queues - Circular Queue – Operations on Queues, Queue Applications.

Book 2 Chapter 1 Sections 1.3&1.4,
Chapter 4 Sections 4.2 to 4.6
Chapter 6 Sections 6.2 to 6.4 &6.6,6.7,6.10,6.11 (12 hrs)

UNIT –V Linked List – Representation of Linked List in memory – Insertion and Deletion from Linked List.

Book 2 Chapter 5 Sections 5.2,5.3,5.7 (12hrs)

RECOMMENDED TEXT:

1. E. Balagurusamy , Programming with Java, Sixth edition, Tata- McGraw-hill publishing co. Ltd.
2. Seymour Lipschutz Datastructures, Edition2006,TataMcGraw hill 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. Tushar B. Kute, Core Java Programming A Practical Approach
4. L. MathuKrithigaVenkatesh Data Structures and Algorithms , , Margham Publications.
5. R. Kruse C.L. Tondo and B. Leung ,1997, Data Structures and Program design in C, PHI.

E-LEARNING SOURCES:

https://howtodoinjava.com
https://www.programiz.com/java-programming
https://www.theserverside.com/javaprogramming
https://www.technopedia.com/java
https://www.hackerearth.com/practice/algorithms/graphs/graph-representation/tutorial/
https://www.tutorialride.com/data-structures/trees-in-data-structure.htm

COURSE OUTCOMES: Upon successful completion of Java and Data Structures 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 decision making statements like if, if else, else if ladder etc. Use the concept of decision making and looping, classes, objects, methods, and strings to develop programs
CO 3	Analyze and to understand the concepts of interfaces inheritance and packages. Explain and develop programs in applet Programming, Managing errors and Exceptions.
CO 4	Identify the data and apply the suitable concepts of data structure in programming.
CO 5	Demonstrate linked list and its operations for programming.

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:STRONGLY CORRELATED-3 MODERATELY CORRELATED-2 WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	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		

SEMESTER – II
JAVA AND DATA STRUCTURES– PRACTICAL

TOTAL HOURS: 30 **COURSE CODE:MC21/2C/PR2**
CREDITS : 1 **L-T-P : 0 0 2**

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
7. Linked List(Stacks and Queues)

Two or three programs under each heading

RECOMMENDED TEXT:

1. E. Balagurusamy ,Programming with Java, sixth 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. Tushar B. Kute.,Core Java Programming A Practical Approach.
4. L. MathuKrithigaVenkatesh Data Structures and Algorithms , , Margham Publications.
5. R. Kruse C.L. Tondo and B. Leung ,1997, Data Structures and Program design in C, PHI

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 Java and Data Structures – 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 Linked List

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 CORRELATED-3 **M**ODERATELY CORRELATED-2 **W**EAKLY CORRELATED-1 **N**O CORRELATION-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 II
CALCULUS OF FINITE DIFFERENCES – II

TOTAL HOURS: 90 **COURSE CODE: MC21/2A/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: SOLUTION OF ALGEBRAIC AND TRANSCEDENTAL EQUATIONS

Numerical solutions of polynomial and Transcendental equations in one variable.

i. BiSections Method
ii. Method of false position (Regular falsi Method)
iii. Method of Iteration
iv. Newton Raphson Method

(Derivations of the formulae are excluded)

Book 1 : Chapter 15 Section 15.1,15.4[C],15.5,15.8,15.9 (20hrs)

UNIT II: 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 of the formulae are excluded)

Book 2 : Chapter 4 Section 1,note 4,6(1 and 2) (20 hrs)

UNIT III: NUMERICAL DIFFERENTIATION

Methods of Derivatives using Interpolation Formulae (only first order),Maxima and Minima using Newton's forward formula – simple problems only**(Derivations of the formulae are excluded)**

Book 1 Chapter 5 Section 5.1 (15 hrs)

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 ax ii. xm iii.xmax **(Derivations of the formulae are excluded)**

Book 1 Chapter 11 Section 11.1,11.2[A][C][D] (15hrs)

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

i. Euler's Method
ii. Modified Euler Method
iiiPicard's method of successive approximation
ivRunge- Kutta Method of order four.

(Derivations of the formulae are excluded)

Book 1 Chapter16 Section 16.1,16.2,16.4,16.7 (20hrs)

RECOMMENDED TEXTBOOKS:

1. B.D.Gupta (2001) Numerical Analysis Konark publications Ltd., Delhi
2. Dr. M.K.Venkataraman, Numerical Methods in Science & Engineering, Fifth edition (1999), The National Publishing Company, Chennai.
3. H.C. Saxena (1991) Finite difference and numerical analysis S.Chand&Co.Delhi.

REFERENCE BOOKS:

1. S.Arumugham(2003) Numerical Methods, New Gamma Publishing, Palayamkottai.
2. 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.
3. E.Balagurusamy, Numerical Methods (1999),Tata Mc.Graw Hill, New Delhi.
4. 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://www.shodor.org/unchem/math/newton/
https://en.wikipedia.org/wiki/BiSections_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/Numerical_differentiation
https://en.wikipedia.org/wiki/Euler_method
https://www.math24.net/linear-differential-equations-first-orde

COURSE OUTCOMES: Upon successful completion of Java and Data Structures – Practicals students will be able to

CO No.	CO Statement
CO 1	Apply Numerical Methods to evaluate numerical solution of algebraic and transcendental equations.
CO 2	Solve Simultaneous linear equation in three variables.
CO 3	Formulate difference equation for the given problem and solve the equation.
CO 4	Evaluate the approximate values of the first derivative, max and min values of the function using Newton's formula.
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	3
CO5	3	3	3	2	2
AVERAGE	3	2.8	2.8	2.2	2.4

KEY: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2
WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	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		

SEMESTER –III

COURSE CODE	COURSE TITLE	Credits	Hrs	Total	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
Part I	Tamil/Hindi/French/ Sanskrit	3	6			40	60	100
Part II	English	3	4			40	60	100
MC21/3C/CLA	Classical Algebra	4	5	75	3-2-0	40	60	100
MC21/3C/DEF	Differential Equations & Fourier series	4	5	75	3-2-0	40	60	100
MC21/3A/MS1	Mathematical Statistics& R Software –I	5	6	90	3-2-1	40	60	100
Part IV	Soft Skill	3	2	30		-	50	50
	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	L-T-P	MARKS	
					Hrs		SE	TOTAL
I	MC21/3N/OFM// MC21/3N/OFMH/	Office Management	2	2	30	0-0-2	50	50

NB: II B.Com Honours alone, the code for non- major elective is MC21/ 3N / OFMH

SEMESTER III
CLASSICAL ALGEBRA

TOTAL HOURS: 75 **COURSE CODE: MC21/3C/CLA**
CREDITS : 4 **L T P: 3 2 0**

COURSE OBJECTIVES

Enable the students to

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

COURSE OUTLINE:

UNIT I: Symmetric- Skew Symmetric- Hermitian –Skew Hermitian- Orthogonal and Unitary Matrix- Cayley Hamilton Theorem(Without Proof) – Eigen Values- Eigen Vectors – Diagonalization of matrix.
Book 1 Vol II Chapter 2 (10hrs)

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

UNIT-III: Theory of Equation: Polynomial equation – Relation between roots and coefficient – Symmetric function of roots, Formation of equations
Book1:Vol I:Chapter - 6, Sections 1-12. (15hrs)

UNIT-IV: Transformation of equations, Reciprocal equations, Descartes rule of signs, Approximation of roots of cubic equation by Horner's Methods.
Book 1: Vol I: Chapter – 6 Sections: 13 – 17, 24, 30. (15hrs)

UNIT-V: Introduction – Divisibility- Primes. Congruences, Solution of Congruences
Book 2:Chapter 1: Sections - 1.1 to 1.3
Book 2:Chapter: 2: Sections 2.1 (20hrs)

RECOMMENDED TEXT:

1. Algebra Vol I & II, 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 theory

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	Study about the matrices.
CO 2	Evaluate the summation of series using Binomial, Exponential and Logarithmic methods.
CO 3	Compare and identify the polynomial equations
CO 4	Apply the analytical techniques in finding the roots of any polynomial equation.
CO 5	Demonstrate the concept of divisibility and primes and Congruences.

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

KEY: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2
WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	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		

SEMESTER III
DIFFERENTIAL EQUATIONS AND FOURIER SERIES

TOTAL HOURS: 75 **COURSE CODE: MC21/3C/DEF**
CREDITS: 4 **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable the students to

1. Use the method of integrating factors to solve linear, first-order Differential Equations.
2. Find the complete solution of a non homogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. Solve the first order differential equations using variable separable methods.
4. Introduce and solve linear Partial Differential equations with different methods.
5. Identify the function periodically using 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: Sections 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 types of Particular Integrals, Standard types of first order equations.
Chapter 4: Sections 2.1, 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: Sections – 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).
2. M.L.Khanna, & S.K.Pundir, Differential Equations, Jai prakashnath & co, Meerut, (2014).

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:

1. Journal of Differential Equations.
2. International Journal of Differential Equations.

E-LEARNING RESOURCES:

1. https://brilliant.org/wiki/first-order-differential-equations-problem-solving/
2. https://en.wikipedia.org/wiki/Variation_of_parameters.
3. http://mathsfirst.massey.ac.nz/Algebra/SystemsofLinEq.htm.
4. https://en.wikipedia.org/wiki/List_of_partial_differential_equation_topics
5. 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 first order differential equations including separable, homogeneous, exact, and linear.
CO 2	Demonstrate 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	Prepare P.D.E by eliminating arbitrary constants and variables and its standard types.
CO 5	Identify the nature of the Fourier series that represent even and odd functions and examine the derivation 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	2	3	3	2
CO2	3	3	3	2	2
CO3	2	2	3	2	2
CO4	3	3	3	3	2
CO5	3	2	2	3	2
AVERAGE	**2.8**	**2.4**	**2.8**	**2.6**	**2**

KEY: **S**TRONGLY CORRELATED-3 **M**ODERATELY CORRELATED- 2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	**Sections**	**Word Limit**	**Marks**	**Total**
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	

SEMESTER III
MATHEMATICAL STATISTICS &R-SOFTWARE-I

TOTAL HOURS: 90 **COURSE CODE: MC21/3A/MS1**
CREDITS : 5 **L-T-P: 3-2-1**

COURSE OBJECTIVES:

Enable the students to

1. Distinguish between discrete and continuous distribution.
2. Be equipped with the Knowledge of R-Programming and to compute statistical measures by its applications.
3. Understand 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 Sectionss 5.1 - 5.4.1
Chapter 6 Sectionss 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 Sectionss 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 mean, variances and correlation coefficient from regression lines.(Derivation of formulae for correlation and regression lines excluded).

Book 1 Chapter 10 Sectionss 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 Practical 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,Chennai.
Discrete Mathematical Science & Cryptography.

E-LEARNING SOURCES:

http://faculty.arts.ubc.a>notes_exp
https://www.probabi;itycourse.com>
https://cimt.org.uk>stats_ch6
http://www.probabilityformula.org>

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

CO NO.	CO STATEMENT
CO 1	Differentiate between discrete and continuous random variables and compute the mathematical expectation of a 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 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: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20	100	**No Questions from Unit-V**
K1, K 2	B-5/8x7 marks	200	35		
K2, K 3	C-3/5x15 marks	500	45		

SEMESTER III

OFFICE MANAGEMENT

TOTAL HOURS: 30 **COURSE CODE:MC21/3N/OFM// MC21/3N/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 worksheets, 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 Editing data in Excel function(Date- Time- Statistical Constants -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/IaiZc0jom4
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 documents 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 analyzing 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: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2 WEAKLY CORRELATED-1 NO CORRELATION-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 –IV

COURSE CODE	COURSE TITLE	Credits	Hrs	Total	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
Part I	Tamil/Hindi/French/ Sanskrit	3	6			40	60	100
Part II	English	3	4			40	60	100
MC21/4C/OPS	Operating Systems	4	5	75	3-2-0	40	60	100
MC21/4C/VCT	Vector Calculus and Transform Techniques	4	5	75	3-2-0	40	60	100
MC21/4A/MS2	Mathematical Statistics& R Software –II	5	6	90	3-2-1	40	60	100
Part IV	Soft Skill	3	2	30		-	50	50
	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	L-T-P	MARKS	
					Hrs		SE	TOTAL
II	MC21/4N/WEB// MC21/4N/WEBH/	Web Designing	2	2	30	0-0-2	50	50

SEMESTER IV
OPERATING SYSTEM

TOTAL HOURS: 75 **COURSE CODE: MC21/4C/OPS**
CREDITS: 4 **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable the students to

1. Understand the fundamental concepts and role of Operating System.
2. Learn the Process Management and Scheduling Algorithms
3. Understand the Memory Management policies
4. Gain insight on I/O and File management techniques

COURSE OUTLINE:

UNIT- I Introduction: Views – Types of System – OS Structure – Operations – Services– Interface System Calls- System Structure – System Design and Implementation. Process Management: Process – Process Scheduling- Inter-process Communication. CPU Scheduling: CPU Schedulers-Scheduling Criteria-Scheduling Algorithms.

Chapter 2 Sections 2.1 to2.4,2.6,2.7
Chapter 3 Sections 3.1,3.2,3.4
Chapter 6 Sections 6.1 to6.3 (15 hrs)

UNIT- II Process Synchronization: Critical-Sections Problem-Synchronization Hardware Semaphores Classical Problems of Synchronization-Monitors. Deadlocks: Characterization-Methods for Handling Deadlocks-Deadlock Prevention-Avoidance-Detection-Recovery.

Chapter 5 Sections 5.2,5.4,5.6,5.7,5.8
Chapter 7 Sections 7.2 to 7.7 (15 hrs)

UNIT- III Memory Management: Hardware – Address Binding– Address Space – Dynamic Loading and Linking– Swapping – Contiguous Allocation-Segmentation - Paging– Structure of the Page Table.

Chapter 8 Sections 8.1 to 8.6 (15 hrs)

UNIT- IV Virtual Memory Management: Demand Paging-Page Replacement Algorithms Thrashing. File System: File Concept-.Access Methods-Directory and Disk Structure-Protection File System Structures- Allocation Methods-Free Space Management.

Chapter 9 Sections 9.2,9.4,9.6
Chapter 11 Sections 11.1,11.2,11.3,11.6
Chapter 12 Sections 12.1,12.4,12.5 (15 hrs)

UNIT- V I/O Systems: Overview- I/O Hardware - Application I/O Interface-Kernel I/O Subsystem Transforming 1/0 Requests to Hardware Operations - Performance. System Protection: Goals Domain-Access matrix. System Security: The Security Problem-Threats–Encryption- User Authentication

Chapter 13 Sections 13.1 to13.5,13.7
Chapter 14 Sections 14.1,14.3,14.4
Chapter 15 Sections 15.1, 15.2,15.4,15.5 (15 hrs)

RECOMMENDED TEXT:

Abraham Silberschatz, Peter B Galvin, Gerg Gagne, "Operating System Concepts", Wiley India Pvt.Ltd. 2018, 9th Edition.

REFERENCES:

1. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9 th Edition.
2. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems", Pearson 2014, 4th Edition.

WEB REFERENCES:

NPTEL¬ & MOOC courses titled Operating Systems
https://nptel.ac.in/courses/106106144/

COURSE OUTCOMES: Upon successful completion of Operating System **s**tudents will be able to

CO No	CO STATEMENT
CO 1	Understand the structure and functions of Operating
CO 2	Compare the performance of Scheduling Algorithms
CO 3	Understand the Concept of Memory management
CO 4	Analyze resource management techniques
CO 5	Identify the features of I/O and File handling methods

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	2	3	3	3	2
CO3	2	3	3	2	2
CO4	2	2	3	2	2
CO5	3	3	3	3	2
AVERAGE	2.4	2.8	3	2.6	2.2

KEY: **S**TRONGLY CORRELATED-3 **M**ODERATELY CORRELATED-2**W**EAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER IV
VECTOR CALCULUS & TRANSFORM TECHNIQUES

TOTAL HOURS: 75 **COURSE CODE: MC21/4C/VCT**
CREDITS: 4 **L-T-P: 3 2 0**

COURSE OBJECTIVES:

Enable the students to

1. Understand the fundamental concepts of vector differentiation.
2. Compute line ,Surface and Volume integrals by Green's,Stokes & Gauss divergence theorem.
3. Apply Laplace Transforms to solve differential linear equations.
4. Compute the Fourier Transforms 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, Laplacian Differential operators.
Book 1 - Chapter 2 Sections 2.1-2.13 (15 hrs)

UNIT-II: Vector Integration: Evaluation of line integral, surface integral and volume integrals. Application of Green's theorem, Gauss-Divergence theorem, Stokes theorem (proofs of theorems not included)- simple problems
Book 1- Chapter 3 Sections 3.1-3.6
Book 1- Chapter 4 Sections 4.1-4.8 (15hrs)

UNIT-III: Laplace Transforms: Definition and properties-Laplace transforms of elementary functions-Laplace Transforms of Integrals- Laplace transforms of Periodic functions-Simple Problems
Book 2 -Chapter -7 Sections 1-3 (15 hrs)

UNIT-IV: Inverse Laplace Transforms-Properties-Applications of Laplace Transforms to Solution of the First and Second Linear Differential Equations (with constant coefficients)-Simple Problems
Book 2-Chapter -7 Sections 4-5 (15hrs)

UNIT-V: Fourier Transforms: Fourier Integral Theorem (Without proof), Fourier sine and cosine integrals (Only Formulae) ,Complex form of Fourier Integral, Fourier transforms (Fourier sine transforms and cosine transforms of elementary functions)
Book 2- Chapter -8 -Simple Problems (15hrs)

RECOMMENDED TEXT:

1. Duraipandian, P., LaxmiDuraipandian, Vector Analysis (2003) Emerald Publishers.
2. P.R.Vittal, Differential Equations, Fourier and Laplace Transforms,Probability.

REFERENCE BOOKS:

1. Shanthi Narayan and P.K.Mittal, A text book of Vector Calculus, S.Chand Publishing House, Chennai.
2. J.G. Chakraborty and P.R. Ghosh, Analytical Geometry and Vector Calculus, U.N.Dhur and sons, private Limited, Kolkata.

JOURNALS:

1. Global Journal of Science Frontier Research
2. 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 and Transform Techniques **s**tudents 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 integrals and Apply Green's theorem, Gauss-Divergence theorem, Stoke's theorem to evaluate Area and Volume
CO 3	Apply Laplace Transforms to solve problems.
CO 4	Apply Inverse Laplace Transforms to solve problems of linear differential equations.
CO 5	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	1
CO2	3	3	3	3	1
CO3	3	3	3	2	1
CO4	3	2	3	2	1
CO5	3	3	3	3	1
AVERAGE	3	2.8	3	2.6	1

KEY: **S**TRONGLY CORRELATED-3 **M**ODERATELY CORRELATED -2 WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	Word Limit	Marks	Total
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	

SEMESTER IV
MATHEMATICAL STATISTICS &R-SOFTWARE-II

TOTAL HOURS: 90 **COURSE CODE: MC21/4A/MS2**
CREDITS :5 **L -T- P : 3 - 2- 1**

COURSE OBJECTIVES:

Enable the students to

1. Understand the concepts of sampling, testing of hypothesis, critical region and standard error.
2. Be familiarized with the applications of various test of significance.
3. Equip the students with the knowledge of R-Programming and tto compute statistical measures by its applications.

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 freedom, Simple and Composite Hypothesis, Size and Power of a test,.

Book 1 Chapter 12 Sectionss 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 ofsignificance for difference of two proportions, Confidence Intervals.

Book 1, Chapter 12 Sectionss 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 Sectionss 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 Sectionss 11.7 – 11.8
Chapter 13 Sectionss 13.5.2& 13.5.3 (10 hrs)

UNIT IV : ANALYSIS OF VARIANCE:

ANOVA – One way classification, Two way classification

Chapter 17 Sectionss17.1 – 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 Significance 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.

E-LEARNING SOURCES:

https://math.ucdenver.edu>~ssantori
https://www.slideshare.net>mobile
https://websupport1.citytech.cuny.edu>
http://www.cimt.org.uk>
http://www.r-project.org

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 tests of hypothesis problems.
CO 3	Apply and examine the chi-square goodness of fit, test for independence and homogeneity
CO 4	Analyse the principles of designs of experiments to yield valid conclusions.
CO 5	Effectively use 'R' software to find averages and derive statistical inference from various distributions.

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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	Word Limit	Marks	Total	Special Instructions if any
K 1	A-10X2 marks	50	20	100	**No Questions from unit-V**
K1, K 2	B-5/8x7 marks	200	35		
K2, K 3	C-3/5x15marks	500	45		

SEMESTER IV

WEB DESIGNING

TOTAL HOURS: 30 **COURSE CODE: MC21/4N/WEB// MC21/4N/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 students 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 CORRELATED-3 ,**M**ODERATELY CORRELATED-2, **W**EAKLY CORRELATED-1, **N**O CORRELATION-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 –V

COURSE CODE	COURSE TITLE	Credits	Hrs	Total	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
MC21/5C/ALS	Algebraic Structures	4	5	75	3-2-0	40	60	100
MC21/5C/RAN	Real analysis	4	5	75	3-2-0	40	60	100
MC21/5C/WET	Web Technology(Theory)	4	5	75	2-3-0	40	60	100
MC21/5C/PR3	Web Technology(Practical)		3	45	0-0-3	40	60	100
MC21/5E/DIM	Discrete Mathematics	5	6	90	3-3-0	40	60	100
MC21/5E/OR1 or MC21/5E/ENT	Operations Research-I or Elementary Number Theory	5	6	90	3-3-0	40	60	100
OPTIONAL EXTRA CREDITS								
MC21/5SS/GRT or MC21/5SS/VBN	Graph Theory or Visual Basic .Net	2					100	100
MC21/5I/INP	Internship (Minimum 14 days)	1						

SEMESTER V

ALGEBRAIC STRUCTURES

TOTAL HOURS: 75 **COURSE CODE: MC21/5C/ALS**
CREDITS: 4 **L-T-P: 3-2-0**

COURSE OBJECTIVES

Enable the students to

1. Establish the relationships between abstract algebraic structure groups &subgroup with familiar number systems 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: Introduction of Groups –Subgroups – cyclic groups and properties of cyclic Groups – Lagrange's Theorem.
Chapter-2: Sec 2.1 to 2.4 (15 hrs)

UNIT II: A Counting Principle –Normal subgroups –Quotient groups.
Chapter-2: Sec2.5 to 2.6 (15 hrs)

UNIT III: Homomorphism –Isomorphism- Automorphism - Cayley's theorem. Permutation group
Chapter-2: Sec2.7 to 2.10 (except applications1 and 2 of Sections 2.7, Examples 2.8.1 & 2.8.2 and applications of Sections 2.9) (15hrs)

UNIT IV: Rings: Definitions- Examples - Some Special Classes of rings- Homomorphism of rings- Isomorphism.
Chapter-3: Sec 3.1 to 3.3 (15hrs)

UNIT V: Ideals and Quotient Rings-Maximal Ideals, Principal Ideals, Definition of Euclidean Ring, Unique Factorization Theorem – The particular Euclidean ring (Theorem 3.7.2 only)
Chapter-3: Sec 3.4 to 3.8 (definition and theorem 3.7.2 only) (15hrs)

RECOMMENDED TEXT:

I.N.Herstein (1989) Topics in Algebra(2^{nd} edition) Wiley Eastern Ltd. New Delhi.

REFERENCE BOOKS:

1. Joseph Gallian, Contemporary Abstract Algebra 8th Edition, Brooks/Cole, Cengage Learning, USA
2. John B Fraleigh, A First Course in Abstract Algebra 7th Edition, Pearson Education in South Asia.
3. S. Arumugam, A.ThangapandiIssac, Modern algebra, New Gamma Publishinghouse, Palayamkottai.
4. K. ViswanathaNaik, Modern algebra, Emerald Publishers.
5. Santiago.M.L, Modern Algebra, McGraw Hill Education India 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 analyze the basic theoretical proofs.
CO 5	Formulate any given integer either as prime or product of primes in a 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 CORRELATED-3, MODERATELY CORRELATED-2, WEAKLY CORRELATED-1, NO CORRELATION-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	Sections	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		

SEMESTER V
REAL ANALYSIS

TOTAL HOURS: 75 **COURSE CODE: MC21/5C/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. Study 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: Connectedness, Completeness and Compactness: More about Open sets-Connected Sets-Complete Metric Spaces- Compact Metric Spaces.
Chapter 6: Sections 6.1-6.2, 6.4, 6.5 (15hrs)

UNIT V: Sets of measure Zero- Definition of the Riemann Integral – Existence of the Riemann Integral(statement only)- Properties of Riemann Integral.
Chapter 7: Sections 7.1-7.4 (15hrs)

RECOMMENDED TEXT:

1. "Methods of Real Analysis" by "Richard R Goldberg" Oxford and IBH Publishing Co.Pvt.Ltd, New Delhi.
2. Tom.M.Apostal , 'Mathematical Analysis' Narosa Publishing house ,II edition Addison-Wesley Publishing company,New Delhi.

REFERENCE BOOKS:

1. Rudin W.,1976, Principles of Mathematical Analysis , Tata McGraw Hill company ,New York.
2. Malik .S.C &Savita Arora ,1991 , Mathematical Analysis , Wiley eastern Limited, New Delhi
3. Sanjay Arora&Bansi Lai,19991,Introduction to Real Analysis, SatyaPrakashan , NewDelhi
4. Gelbaum .B.R & Olmsted, 1964, Counter Examples in Analysis, Holden Day, San Fransis Co.
5. 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 their uses 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 CORRELATED-3 ,**M**ODERATELY CORRELATED-2, **W**EAKLY CORRELATED-**N**O CORRELATION-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	Sections	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		

SEMESTER V
WEB TECHNOLOGY (THEORY)

TOTAL HOURS: 75 **COURSE CODE: MC21/5C/WET**
CREDITS: 3 **L T P: 2 3 0**

COURSE OBJECTIVES:

Enable the students to

1. Use PHP and MYSQL to develop dynamic website for user on the internet.
2. Get exposed to the concepts of operators and control statements for decision making.
3. Introduce the loopings for working with string and numeric functions.
4. Study the Array functions and creating classes to develop the website.
5. Gain the knowledge on file management in PHP.

COURSE OUTLINE:

UNIT I : Introducing PHP – Basic development Concepts – Creating first PHP Scripts – Using Variable and Operators – Storing Data in variable – Understanding Data types – Setting and Checking variables.
Chapter 1 and 2 (15 hrs)

UNIT II: Data types – Using Constants – Manipulating Variables with Operators.Controlling Program Flow: Writing Simple Conditional Statements - Writing More Complex Conditional Statements.
Chapter 2 and 3 (15 hrs)

UNIT III: Repeating Action with Loops – Working with String and Numeric Functions. Working with Arrays: Storing Data in Arrays – Processing Arrays with Loops and Iterations..
Chapter 3 and 4 (15 hrs)

UNIT IV: Using Arrays with Forms - Working with Array Functions – Working with Dates and Times Using Functions and Classes: Creating User-Defined Functions - Creating Classes – Using Advanced OOP Concepts.
Chapter 4 and 5 (15 hrs)

UNIT V: Working with Files and Directories: Reading Files-Writing Files- Processing Directories.
Chapter 6 (15 hrs)

RECOMMENDED TEXT

VikramVaswani, "*PHP A Beginner's Guide*", Tata McGraw Hill 2008.

REFERENCE BOOKS:

1. Steven Holzner , "*The PHP Complete Reference*", Tata McGraw Hill, 2007.
2. Steven Holzer , "*Spring into PHP*", Tata McGraw Hill 2011, 5thEdition.

JOURNALS:

PHP 5 CMS Framework Development: Access Control **By DatabaseJournal.com**
PHP - International Journal of Interactive Mobile Technologies (iJIM)

E-LEARNING SOURCES :

https://www.w3schools.com/php/
https://www.phptpoint.com/php-tutorial-pdf/
http://www.xmlsoftware.com/
https://www.php.com/e-learning-video-library/
https://t4tutorials.com/e-learning-management-system-project-in-php-mysql-projects-for-mcs-mit/

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

CO No.	CO Statement
CO 1	Analyze data and understand the basic developing concepts in PHP.
CO 2	Apply the concept simple control statements of PHP for Web development.
CO 3	Analyze the strings and numeric functions to work with Arrays.
CO 4	Apply the knowledge of creating classes as done in OOP.
CO 5	Formulate the file management in PHP.

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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER V
WEB TECHNOLOGY (PRACTICAL)

TOTAL HOURS: 45 **COURSE CODE: MC21/5C/PR3**
CREDITS: 1 **L T P: 0 0 3**

COURSE OBJECTIVES

Enable the students to

1. Understand to write PHP code to solve problems.
2. Display and insert data using PHP and MySQL.
3. Test, debug, and deploy web pages containing PHP and MySQL.
4. Develop simple applications using PHP and MySQL.

PRACTICAL PROGRAMS

Implement the following programming concepts using PHP

1. Write a PHP program to find the Even and Odd numbers.
2. Write a PHP program to find the Leap year.
3. Write a PHP program to swapping of two numbers.
4. Write a PHP program which adds up columns and rows of given table
5. Write a PHP program to compute the sum of first n given prime numbers
6. Write a PHP program to find valid an email address
7. Write a PHP program to convert a number written in words to digit.
8. Write a PHP script to delay the program execution for the given number of seconds.
9. Write a PHP script, which changes the colour of the first character of a word
10. Write a PHP program to find multiplication table of a number.
11. Write a PHP program to calculate Factorial of a number.
12. Write a PHP program on file handling.

RECOMMENDED TEXT:

VikramVaswani, "*PHP A Beginner's Guide*", Tata McGraw Hill 2008.

REFERENCE BOOKS:

1. Steven Holzner , "*The PHP Complete Reference*", Tata McGraw Hill, 2007.
2. Steven Holzer , "*Spring into PHP*", Tata McGraw Hill 2011, 5thEdition.

JOURNALS:

PHP 5 CMS Framework Development: Access Control By DatabaseJournal.com
PHP - International Journal of Interactive Mobile Technologies (iJIM)

E-LEARNING SOURCES :

https://www.w3schools.com/php/
https://www.phptpoint.com/php-tutorial-pdf/
http://www.xmlsoftware.com/
https://www.php.com/e-learning-video-library/
https://t4tutorials.com/e-learning-management-system-project-in-php-mysql-projects-for-mcs-mit/

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 developing concepts in PHP.
CO 2	Apply the concept simple control statements of PHP for Web development.
CO 3	Analyze the strings and numeric functions to work with Arrays.
CO 4	Apply the knowledge of creating classes as done in OOP.
CO 5	Formulate the file management in PHP.

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: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2 WEAKLY CORRELATED-1 NO CORRELATION-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 V
DISCRETE MATHEMATICS

TOTAL HOURS: 90 **COURSE CODE: MC21/5E/DIM**
CREDITS: 5 **L-T-P: 3 3 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.

Book 1 Chapter 6 (15 hrs)

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

Book 1 Chapter 7, 8 and 9 (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 Boolean Algebra. Boolean expression – Definition – Boolean function – Literal – Minterm and Maxterm, Normal forms and Canonical forms.

Book 1 Chapter 10 and 11 (20 hrs)

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

Book 2 Chapter 2 Sections 2.1 to 2.4
Chapter 4 Sections 4.1 to 4.4 (20 hrs)

UNIT V: Eulerian and Hamiltonian Graphs Introduction -Eulerian graphs – Hamiltonian graphs

Book 2 Chapter 5 (20 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 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. Seymour Lipschutz , Marc Laras Lipson , Varsha H. Patil, Discrete Mathematics (Schaum's Outlines) Seymour Lipschutz(2017).Trembley
3. J.P. Tremblay & R. Manohar , "Discrete Mathematical Structures with Applications to Computer Science", Tata Mcgraw – Hill Publication Co., limited, New Delhi, 2003.
4. 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 CORRELATED-3 **M**ODERATELY CORRELATED-2**W**EAKLY CORRELATED-1
NO CORRELATION-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	**Sections**	**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		

SEMESTER V
OPERATIONS RESEARCH – I

TOTAL HOURS: 90 **COURSE CODE: MC21/5E/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(CONTD.)

Artificial Variable Technique- Big-M Method (Charner's Penalty Method) – Two-Phase method

Chapter 6: Sections 6.23- 6.28 (20hrs)

UNIT III: LINEAR PROGRAMMING(CONTD.)

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: Sections 6.31,6.33, 6.34 (15hrs)

UNIT IV: TRANSPORTATION PROBLEMS & ASSIGNMENT PROBLEMS

Mathematical formulation- North-West corner Rule - Least cost Method- Vogel's approximation method- Optimality test

Hungarian method of solving an assignment problem – Unbalanced assignment problems.

Chapter 8 : Sections 8.1 – 8.5, Chapter 10 : Sections 10.9 (20hrs)

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 n or m x 2 games

Chapter 12 : Sections 12.1 – 12.16 (15 hrs)

RECOMMENDED TEXTS:

1. R.K. Gupta, Operations Research, Krishna Prakash
2. Kanti Swarup, P.K.Gupta and Man Mohan Operations Research, S.Chand& Co, Delhi

REFERENCE BOOKS:

1. Springer series in Operations Research ,George S. Fishman, Monte Carlo.
2. Kalavathy, Operations Research Vikas Publishing House Pvt .Ltd.
3. Gupta P.K & Hira D.S ,Problems in Operations Research, S.Chand& Co, Delhi
4. 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/

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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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-3/5x15marks	500	45		

SEMESTER V

ELEMENTARY NUMBER THEORY

TOTAL HOURS: 90 **COURSE CODE: MC21/5E/ENT**
CREDITS: 5 **L-T-P: 3 - 3- 0**

COURSE OBJECTIVES:

Enable the students to

1. Understand 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. Know the connections of number theory with other branches.
5. 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: Sectionss 1.3 to 1.6 (18hrs)

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. (18hrs)

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 (18hrs)

UNIT IV: Quadratic Residues: Introduction, quadratic residues, Elementary Properties.
Chapter -9: Sections 9.1 – 9.3. (18hrs)

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. (18hrs)

RECOMMENDED TEXT:

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

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. Theory of Numbers, Dr. Sudhir, K.Pundir, Pragati Prakashan Publications**.**
5. 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 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 analyze 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: STRONGLY CORELATED-3 MODERATELY CORELATED-2WEAKLY CORELATED-1 NO 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	Sections	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		

SEMESTER V
SELF STUDY PAPER
GRAPH THEORY

CREDITS : 2 **COURSE CODE : MC21/5SS/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. Provide structural characterization of graphs with matching, perfect matching and graph colouring.
2. Give structural understanding of planar graphs.

COURSE OUTLINE

UNIT – I: MATCHING

Matching – Matching and covering of bipartite graph – Perfect matching

UNIT – II: COVERING

Covering – Independent sets.

UNIT –III: COLORING

Coloring – Vertex chromatic number - *k*- critical graphs.

UNIT – VI: COLORING(COND.)

Brook's theorem – Chromatic polynomials – Girth and Chromatic number.

UNIT –V: PLANAR GRAPHS

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

RECOMMENDED TEXT:

Bondy. J. A and Murthy U.S.R., "Graph theory with Applications", Elsevier North – Holland, New York, 1976.

Dougalas B.West, Introduction to Graph Theory", Pearson, Second Edition, New York, 2015.

REFERENCE BOOKS:

Balakrishnan R. And Ranganathan K. A Text Book of Graph Theory, Springer – Verlag.

Chartrand G. And Lesneik Foster L., " Graphs and Digraphs", CRC Press, 4th Edition. Boca Raston, 2006.

Harary F., "Graph Theory", Narosa Publishing House, New Delhi, 2001

SEMESTER V
SELF STUDY PAPER
VISUAL BASIC.NET

CREDITS: 2 **COURSE CODE: MC21/5SS/VBN**

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 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:

1. Bill Evjen. jason Beres, Visual Basic .NET Programming Bible, Wiley, 2002.
2. Steve Holzner, Visual Basic .NET Programming Black Book, Paraglyph Press,2005.
3. Vijay K Khanna, S K Bhambri, A Course in Abstract Algebra 4th Edition, Vikas Publishing House P

INTERNSHIP

Course Code: MC21/5I/INP

Credits: 1 **Duration: 14 days**

Students have to undergo an Internship Programme during the summer vacation immediately after the FOURTH semester and are required to submit a project report.

Viva Voce will be conducted and students will be awarded **ONE** credit.

SEMESTER –VI

COURSE CODE	COURSE TITLE	Credits	Hrs	Total	L-T-P	MARKS		
				Hrs		CA	SE	TOTAL
MC21/6C/LAL	Linear Algebra	4	5	75	3-2-0	40	60	100
MC21/6C/CAN	Complex Analysis	4	5	75	3-2-0	40	60	100
MC21/6C/MEC	Mechanics	4	6	90	3-3-0	40	60	100
MC21/6C/PYT	Python Programming (Theory)	4	5	75	2-3-0	40	60	100
MC21/6C/PR4	Python Programming (Practical)		3	45	0-0-3	40	60	100
MC21/6E/OR2 or MC21/6E/FSA	Operations Research-II or Fuzzy set theory and its Applications	5	6	90	3-3-0	40	60	100
OPTIONAL EXTRA CREDITS								
MC21/6P/PRO	Project	2					100	100

SEMESTER VI

LINEAR ALGEBRA

TOTAL HOURS: 75 **COURSE CODE: MC21/6C/LAL**
CREDITS: 4 **L-T-P: 3-2-0**

COURSE OBJECTIVES:

Enable the students to

1. Learn the concept of vector spaces and subspaces.
2. Explore the dimension of vector space using bases and linear dependence concepts.
3. Understand the concept of Inner product space and its properties.
4. Impart the knowledge of linear transformation & its regularity and also its rank.
5. 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.
Chapter 4: Section 4.1 (15hrs)

UNIT II: VECTOR SPACES (CONTD): Linear dependence and independence of vectors, Linear Span, Bases, Dimension of Vector Spaces. Dual spaces.
Chapter 4: Section 4.2 - 4.3 **(**15 hrs)

UNIT III: INNER PRODUCT SPACES: Inner Product Space, Definition, Examples, Schwarz inequality, Orthogonal Set, Orthonormal Set, Gram Schmidt Orthogonalization Process
Chapter 4: Section 4.4 (15hrs)

UNIT IV: LINEAR TRANFORMATIONS: Algebra of Linear transformations, Regular and Singular Linear Transformations, Rank of Linear Transformation.
Chapter 6: Section 6.1 (15hrs)

UNIT V: LINEAR TRANSFORMATIONS (CONTD): Characteristic Roots, Characteristic Vectors & Matrices – Canonical forms – triangular forms.
Chapter 6: Sec 6.2 – 6.4 (15hrs)

RECOMMENDED TEXT:

I.N.Herstein (2012) Topics in Algebra (2^{nd} edition) Wiley Eastern Ltd. New Delhi.

REFERENCE BOOKS:

1. Gilbert Strang, Introduction to Linear Algebra 5th edition, Wellesley-Cambridge Press, 2016
2. Vijay K Khanna, S K Bhambri, A Course in Abstract Algebra 4th Edition, Vikas Publishing House Pvt Ltd.
3. Sheldon Axler, Linear Algebra Done Right 2nd Edition, Springer Science+ Business Media, LLC
4. S.Arumugam ,A.ThangapandiIsaac,.ModernAlgebra,New Gamma Publishing House Palayamkottai.

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

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/Sections-LT.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 distinguish 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 help 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 analyzing the given data.

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	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 CORRELATED-3 , **M**ODERATELY CORRELATED-2, **W**EAKLY CORRELATED-1, **N**O CORRELATION-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	Sections	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		

SEMESTER VI
COMPLEX ANALYSIS

TOTAL HOURS: 75 **COURSE CODE: MC21/6C/CAN**
CREDITS : 4 **L-T-P:3-2-0**

COURSE OBJECTIVES:

Enable the students to

1. Study the concept and consequences of analytic functions 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 integrations.
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- Uniform Continuity- Analytic Functions- Cauchy-Riemann equations. -(Simple Problems)

Chapter 2: Section 12-26 (15hrs)

UNIT II: Transformations- Definitions of Conformal Mapping- Necessary and Sufficient condition for a Conformal Mapping- The Bilinear Transformations $w = \frac{az+b}{(cz+d)}$, $w = \frac{1}{Z}$ (Simple Problems)

Chapter 8: Section 90-94 & Chapter 9: Section 101 (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) Morera's Theorem, Liouville's Theorem, Fundamental Theorem of Algebra. (Simple problems)

Chapter 4: Section 39-41, 46, 48-53 (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)

Chapter 6: Sec 68-76(omit 71) & Chapter 7: 86-87 (15 hrs)

UNIT V: Contour integration: Evaluation of Definite Integrals

(i) $\int f(\cos x, \sin x)\, dx$ where $f(\cos x, \sin x)$ is a rational function of $\cos x$ and $\sin x$.

(ii) $\int f(x)\, dx$ where $f(x) = \frac{g(x)}{h(x)}$ and $g(x), h(x)$ are polynomials in x and the degree of $h(x)$ exceeds that of $g(x)$ by atleast two and having no poles on the real axis .

(iii) $\int f(x) \sin mx\, dx$ & $\int f(x) \cos mx\, dx$, where $f(x) = \frac{g(x)}{h(x)}$ and $g(x), h(x)$ are real polynomials such that degree of $h(x)$ exceeds that of $g(x)$ by atleast one and $m > 0$ and having no poles on the real axis.

Chapter 7: 78-81, 85 (15 hrs)

RECOMMENDED TEXTS:

R.V. Churchill and J.W.Brown(1990), Complex Variables and applications (5^{th} edition) McGraw Hill International Book Co., New York

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.Arumugam, A.Thangapandianissac, A.Somasundaram, Complex Analysis, Scitech publications, Chennai.
3. S. Ponnusamy, Foundation of Complex analysis, Narosa Publications: New Delhi
4. P. Duraipandian and LaxmiDuraipandian, Complex Analysis (Emerald Publishers) Chennai.
5. S.G.Venkatachalapathy,ComplexAnalysis,Margham Publications.

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/Trapp e 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 functions and use appropriate techniques for solving problems using C-R equations.
CO 2	Construct conformal mapping between many kinds of domain and be 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 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	PSO1	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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION.

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	Sections	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-3/5x15marks	500	45		

SEMESTER- VI
MECHANICS

TOTAL HOURS: 90 **COURSE CODE: MC21/6C/MEC**
CREDITS : 4 **L-T-P:3-3-0**

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. 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 – Direct 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: Sections 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)

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RECOMMENDED TEXTBOOKS:

Duraipandian, P. LaxmiPandian, Muthamizh Jayapragasam. (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 varignon's 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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	**Sections**	**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		

SEMESTER VI
PYTHON PROGRAMMING (THEORY)

TOTAL HOURS: 75 **COURSE CODE: MC21/6C/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-functions 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 knowledge on file management in Python Programming.

COURSE OUTLINE:

UNIT I : 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.

Chapter 1 Section 1.1 to 1.6,
Chapter 2 Section 2.1,2.2
Chapter 3 Section 3.1 to 3.3 (15hrs)

UNIT II: Sequences: Strings, Lists and Tuples – Sequences – Strings – Strings and Operators – String-Only Operators – Built-in Functions – String Built-in Method – 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.

Chapter 6 Section 6.1 to 6.6,6.11,6.12,6.13,6.16,6.17
Chapter 7 Section 7.1 to 7.5 (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.

Chapter 8 Section 8.1 to 8.9
Chapter 11 Section 11.1 to 11.6 (15 hrs)

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

Chapter 10 Section 10.2 to 10.4 & 10.6
Chapter 12 Section 12.2 to 12.8 (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.

Chapter 9 Section 9.1 to 9.4 &9.6
Chapter 13 Section 13.1 to 13.7& 13.10,13.11 (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-function 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 CORRELATED-3 **M**ODERATELY CORRELATED-2 **W**EAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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	C3/5x15marks	500	45		

SEMESTER VI
PYTHON PROGRAMMING (PRACTICAL)

TOTAL HOURS: 45 **COURSE CODE: MC21/6C/PR4**
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 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 beginners using Python, Louie Stowell, kindle publishing pvt.ltd.

JOURNALS:

Python to learning-IOPScience
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-function 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 CORRELATED-3 **M**ODERATELY CORRELATED-2 **W**EAKLY CORRELATED-1 **N**O CORRELATION-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.

SEMESTER VI

OPERATIONS RESEARCH – II

TOTAL HOURS: 90 **COURSE CODE: MC21/6E/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 optimality using queueing theory.
4. Plan to 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 ofdemand (Q to be fulfilled in constant time) infinite rate of production and having shortages to be fulfilled.

Book 1: Chapter 3: Sections 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) : (a/ FCFS)

ii. (M/M/1) : (N/ FCFS)

iii. (M/M/S) : (a/ FCFS)

Book 1 : Chapter 5: Sections 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: Sections 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: Sections 13.9, 13.10 (25 hrs)

RECOMMENDED TEXTS:

1. R.K. Gupta, Operations Research, Krishna Prakash
2. Kanti Swarup, P.K.Gupta and Man Mohan Operations Research, S.Chand& Co, Delhi

REFERENCE BOOKS:

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

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:STRONGLY CORRELATED-3 **M**ODERATELY CORRELATED-2 WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER VI
FUZZY SET THEORY AND ITS APPLICATIONS

TOTAL HOURS: 90 **COURSE CODE: MC21/6E/FSA**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES:

Enable the students to

1. Introduce the theory of fuzzy set.
2. Discuss operations on fuzzy sets.
3. Introduce fuzzy arithmetic concepts.
4. Discuss fuzzy logic inferences.
5. Discuss applications of fuzzy in engineering.

COURSE OUTLINE:

UNIT I : FROM CLASSICAL SETS TO FUZZY SETS

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.

Book 1 Chapter 1 Section 1.1 to 1.5
Chapter 2 Section 2.1 to 2.3 (20 hrs)

UNIT II : OPERATION ON FUZZY SETS

Types of operations, fuzzy Complements.

Book 1 Chapter 3 Section 3.1 & 3.2 (20 hrs)

UNIT III : FUZZY ARITHMETIC

Fuzzy numbers, Linguistic Variables, Arithmetic Operations on Internal, Arithmetic operations on Fuzzy Numbers.

Book 1 Chapter 4 Section 4.1 to 4.4 (20 hrs)

UNIT IV : FUZZY LOGIC

Classical Logic : An Overview, Multivalued logics, Fuzzy Propositions, Fuzzy Quantifiers.

Book 1 Chapter 8 Section 8.1 to 8.4 (15 hrs)

UNIT V : ENGINEERING APPLICATIONS

Civil Engineering, Mechanical Engineering, Industrial Engineering, Computer Engineering.

Book 1 Chapter 16 Section 16.1 to 16.5 (15 hrs)

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:

1. E P Klement, R Mesiar and E. Pap, Triangular norms, Kluwer Academic Press, Dordrecht, 2000.
2. 2. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, New Delhi.
3. 3. Kevin M Passino and Stephen Yurkovich, Fuzzy Control, Addison Wesley Longman,.
4. 4. M Grabisch et al., Aggregation Functions, Series - Encyclopedia Of Mathematics And Its Applications, Cambridge University Press, 2009
5. 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:

https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_set_theory.htm
https://www.tech-wonders.com/2010/07/operations-fuzzy-sets.html
.https://www.e-bookdownload.net/search/fuzzy-mathematical-concepts
https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_applications.htm
.https://www.guru99.com/what-is-fuzzy-logic.html

COURSE OUTCOMES: Upon successful completion of fuzzy set theory and its applications students will be able to

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 CORRELATED-3 **M**ODERATE CORRELATED-2
WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER VI
PROJECT

CREDIT: 2 **COURSE CODE: MC21/6P/PRO**

COURSE OBJECTIVES:

Enable the students to

1. Give exposure about the software industry.
2. Develop interpersonal and communication skills.
3. Make the students develop critical thinking and problem solving skills.
4. Get knowledge about document preparation.
5. Develop software projects.

COURSE OUTLINE:

Project : Any Computer related software has to be developed and presented for viva-voce at the end of the semester.

COURSE OUTCOMES:

CO No.	CO Statement
CO 1	Identify , select and learn about a specific domain
CO 2	Analyze, design and implement algorithms
CO 3	Interpret results using Statistical measures

MAPPING: Course Outcome with Programme Specific Outcome:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
Average	**3**	**3**	**3**	**3**	**3**	**3**

KEY:**S**TRONGLY CORRELATED-3 **M**ODERATE CORRELATED-2 WEAKLY CORRELATED-1 **N**O CORRELATION-0

VIVA –VOCE :

Viva - Voce will be conducted internally.

Knowledge Level	Marks	Total
K2,K3,K4,K5,K6	100	100

ALLIED COURSE PROFILE-OFFERED TO OTHER DEPARTMENTS

Sem	Course Code	Course Title	Credits	Hrs	Total	L-T-P	Marks		
					Hrs		CA	SE	Total
I	MC21/1A/IM1	Integrated Mathematics - I	5	6	90	3-3-0	40	60	100
II	MC21/2A/IM2	Integrated Mathematics - II	5	6	90	3-3-0	40	60	100
I	MC21/1A/MC1	Mathematics for Computer Applications - I	5	6	90	3-3-0	40	60	100
II	MC21/2A/MC2	Mathematics for Computer Applications - II	5	6	90	3-3-0	40	60	100

SEMESTER I
INTEGRATED MATHEMATICS - I
(For 1st year B.Sc., Computer Science)

TOTAL HOURS: 90 **COURSE CODE: MC21/1A/IM1**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES:

Enable the students to

1. Get equipped with the knowledge of matrices and its applications.
2. Understand the concepts and formulae in differential calculus.
3. Know the principles and concepts of trigonometry.

COURSE OUTLINE:

UNIT I: Interpolation :

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

Book 1 Chapter 4.1, 4.3 (15 hrs)

UNIT II: Matrices:

Symmetric and skew symmetric-Eigen values and Eigen vectors - Cayley Hamilton Theorem (No proof) verification of Cayley Hamilton's theorem - Inverse of a Matrix using Cayley Hamilton Theorem- simple problems

Book 1 Chapter 3 3.1,3.4,3.5 (15 hrs)

UNIT III: Theory of Equations:

Roots of polynomial Equations - Symmetric functions of roots terms of coefficients Transformation of equations - Formation of equations - Reciprocal Equations.

Book 1 Chapter 2 2.1 to 2.4 (22hrs)

UNIT IV: Trigonometry:

Expansions of Cos nθ, Sin nθ in a series of powers of sin $\theta$and cos θ- 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(α +iβ) .

Book 1 Chapter 5 Sections 5.1 to 5.5 (18 hrs)

UNIT V: Differential Calculus:

Successive differentiation- nth derivatives, jacobians-curvature and radius of Curvature in cartesian co – ordinates – simple problems.

Book 1 Chapter 6 Sections 6.1,6.2,6.4 (20 hrs)

RECOMMENDED TEXT:

1. Narayanan and ManicavachagomPillay, Ancillary Mathematics Book I,II, and III Viswanathan Printers and publishers Private limited, 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	Analyze and use Newton's forward, backward and Lagrange's formula for interpolation and apply it in real life problems
CO 2	Compute Eigen values and Eigen vector of a square matrix and find inverse of matrix using Cayley -Hamilton theorem.
CO 3	Evaluate the roots of the polynomial equations solving the transformation of equations and Reciprocal equations.
CO 4	Evaluate in power of θ .Compute hyperbolic and inverse hyperbolic functions.
CO 5	Compute the derivatives and curvature and radius of curvature of Cartesian coordinates.

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 CORRELATED-3 **M**ODERATELY CORRELATED-2
WEAKLY CORELATED-1 **N**O CORRELATION-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	Sections	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		

SEMESTER II

INTEGRATED MATHEMATICS - II

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

TOTAL HOURS: 90 **COURSE CODE: MC21/2A/IM2**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES

Enable the students to

1. Solve the different types of linear differential equations
2. Apply Laplace Transforms to solve differential equations.
3. Understand the concept of Reduction formulae in Integral Calculus.

COURSE OUTLINES:

UNIT I: Ordinary Differential Equations:

Second order non – homogeneous differential equations with constant co-efficients of the form $ay'' + by' + cy = X$ where X is of the form $e^{ax}\cos Qx$ and $e^{ax}\sin Qx$.

Book 2 Chapter 8 Sections 8.1 (20 hrs)

UNIT II:Partial Differential Equations:

Formation of differential equations, Complete Integral, Four standard types, Lagrange's Equation, simple problems.

Book 1 Chapter 6 (20hrs)

UNIT III:Laplace Transforms:

Laplace Transforms of Standard functions, Simple theorems. (no proof) Inverse Laplace Transforms, solving first order differential equations with constant coefficients using Laplace transforms.

Book 1 Chapter 7 (20 hrs)

UNIT IV: Integral Calculus:

Bernoulli's formula 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), $\int x^m (\log x)^n\, dx$, $\int \cos^m x \cos nx\, dx$ $\int x \sin nx\, dx$.

Book 1 Chapter 1 (15 hrs)

UNIT V: 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.

Book 1 Chapter 8 (15 hrs)

RECOMMENDED TEXT:

1. Narayanan and Manicavachagom Pillay, Ancillary Mathematics Book I, II, and III Viswanathan Printers and publishers Private limited, 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 equations with constant co-efficients.
CO 2	Recognize the major classification of PDE'S and solve four standard types of PDE.
CO 3	Solve first order differential equations using Laplace and inverse Laplace transforms.
CO 4	Derive reduction formula and thereby evaluate standard integral
CO 5	Determine gradient, divergence and curl of vectors.

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: STRONGLY CORRELATED-3 MODERATELY CORRELATED-2WEAKLY CORRELATED-1 NO CORRELATION-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	Sections	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		

SEMESTER I
MATHEMATICS FOR COMPUTER APPLICATIONS - I (For B.C.A)

TOTAL HOURS:90 **COURSE CODE: MC21/1A/MC1**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES

Enable the students to

1. Get equipped with the knowledge of matrices and its applications.
2. Interpolate a value from a given set of data.
3. Know the principle and concepts of Trigonometry
4. Understand the concept of differential calculus and integral calculus

COURSE OUTLINE:

UNIT- I: MATRICES: Symmetric, Skew-Symmetric, Eigen values and Eigen-vectors, Cayley-Hamilton theorem (without proof) – verification- Computation of inverse matrix using Cayley - Hamilton theorem.

Book 1 Chapter 3 Sections 3.4 & 3.5 (15 hrs)

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

Book 1 Chapter 4 Sections 4.1 to 4.3 (15 hrs)

UNIT III :TRIGONOMETRY: Expansions of $\sin n\theta$,$\cos n\theta$ and $\tan n\theta$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin^n\theta$, $\cos^n\theta$ in a series of sines, cosines of multiples of "θ" - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of "θ"

Book 1 Chapter 5 Sections 5.1 to 5.3 (20 hrs)

UNIT IV: DIFFERENTIAL CALCULUS: Successive differentiation, n^{th} derivatives, maxima and minima of functions of two variables, Jacobians, Lagrange's multipliers – (Simple problems).

Book 1 Chapter 6 Sections 6.1 to 6.2, 6.5(Formation of equations excluded) (20 hrs)

UNIT-V: INTEGRAL CALCULUS: Bernoulli's formula- Reduction formulae- $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int e^{ax}\cos bx\,dx$, $\int e^{ax}\sin bx\,dx$, $\int \sin^m x \cos^n x\,dx$ (m, n being positive integers)- (Simple problems).

Book 2 Chapter 1 Sections 13 to 15 (20 hrs)

RECOMMENDED TEXT:

1. Narayanan and ManicavachagomPillay, Ancillary Mathematics VOl I, Viswanathan Printers and publishers Private limited, Chennai
2. Narayanan and ManicavachagomPillay, Ancillary Mathematics Vol II, Viswanathan Printers and publishers Private limited, 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.

JOURNALS:

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

E-LEARNING SOURCES:

http:// www.mathsisfun.com/algebra
http://www.britannica.com/science/interpolation
http://www.khanacademy.org/trigonometry
http://www.britannica.com/science/differential-calculus
http://www.britannica.com/science/integral-calculus

COURSE OUTCOMES: Upon successful completion of 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	Analyse and use Newton's forward, backward and Lagrange's formula for interpolation and apply it in real life problems
CO 3	Evaluate $\sin^n\theta$, $\cos^n\theta$, in a series of sines, cosines and tangents of multiples of "θ" also $\cos\theta$,$\sin\theta$,$\tan\theta$ in power of θ.
CO 4	Find the n^{th} derivatives of a function and use lagrange multipliers in finding the extreme values of a function.
CO 5	Derive reduction formula and thereby evaluate standard integral.

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	3	2	1
CO4	3	3	2	2	1
CO5	3	3	2	2	1
AVERAGE	3	3	2.4	2	1

KEY: **S**TRONGLY CORRELATED-3 **M**ODERATELY CORRELATED-WEAKLY CORRELATED-1 **N**O CORRELATION-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	Sections	Word Limit	Marks	Total
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	

SEMESTER II
MATHEMATICS FOR COMPUTER APPLICATIONS - II (For B.C.A)

TOTAL HOURS: 90 **COURSE CODE: MC21/2A/MC2**
CREDITS: 5 **L-T-P: 3 3 0**

COURSE OBJECTIVES

Enable the students

1. Impart knowledge and skill in probabilities.
2. Study measures of central tendency.
3. Expose to correlation and regression.
4. Define index numbers-explain its uses and methods.
5. Understand the concepts of sampling, testing of hypothesis, critical region and standard error.

COURSE OUTLINES:

UNIT I : Probability: Trail- Events –Sample spaces-Mutually Exclusive cases- Exhaustive Events- Independent Events-Axiomatic approach to Probability- Addition and Multiplication Theorem- Conditional Probability – Baye's theorem (proof Excluded) – Simple Problems.

Book– 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.

Book – II Chapter – 5. (15 hrs)

UNIT III: Correlation: (one dimension) – Karl Pearson's Coefficient of Correlation -Rank Coefficient – Regression – Regression Equation.

Book – I Chapter 8, 9. (15 hrs)

UNIT IV: Index Numbers: Definition – Types of Index Numbers – Quantity Index Numbers – Test of Consistency of Index Numbers – Chain Base Method – Consumer Price Index Numbers (Simple Problems)

Book – I Chapter -14. (20 hrs)

UNIT- V: 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 freedom, Simple and Composite Hypothesis, Size and Power of a test.

F-test- ANOVA – One way classification, Two way classification.

Book 3 Chapter 12 Sectionss 12.1 - 12.7
Chapter 14 Sections 14.3.2 (25hrs)

RECOMMENDED TEXT:

1. Statistics, R.S.N. Pillai, Bagavathi, S.Chand& Company Ltd.
2. S.P.Gupta Statistical Methods.
3. Elements of Mathematical Statistics, S.C.Gupta & V.K. Kapoor,Sultan Chand Publications.

REFERENCEBOOKS:

1. Business Statistics, S. P. Rajagopalan, R. Sattananthan,Vijay Nicole Imprints Pvt. Ltd.
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 Mathematics - II students will be able to

CO No.	CO Statement
CO 1	Demonstrate the understanding of the basic probability concepts including random variable, conditional probability.
CO 2	Gain knowledge about the importance of central tendency and use them to analyse data.
CO 3	Analyse how correlation is used to identify relationship between variables. Compute rank correlation and find the relation between two variables using regression.
CO 4	Gain knowledge about the concept and the method of constructing index numbers.
CO 5	Determine the basic concepts of sampling, test statistics and critical region.Analyse the principles of designs of experiments to yield valid conclusion.

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

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CO2	3	3	3	2	1
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