

**Department of Mathematics**  
**B.Sc., Mathematics**  
**(2020-2021)**

**Program Outcomes:**

<u>S.No</u>	<u>OUTCOMES</u>
<b>PO1</b>	Logical thinking, critical analysis, and reasoning skills will be highly improved.
<b>PO2</b>	Express mathematical ideas clearly and concisely to others
<b>PO3</b>	Ability to apply suitable mathematical techniques to handle problems in physical and related sciences.
<b>PO4</b>	To demonstrate conceptual understanding of basic definitions, and theorems in Mathematics and should be able to describe elaborately with examples.
<b>PO5</b>	Ability to solve mathematical problems by applying the skills such as critical thinking, logical reasoning, and abstraction
<b>PO6</b>	Select appropriate mathematical models and tools to solve the problems including those in real-life contexts.
<b>PO7</b>	Mathematics has its own universal language of symbols and notations. Students are expected to apply the Mathematics language appropriately while expressing mathematical ideas in both oral and written form.
<b>PO8</b>	Problem-solving techniques in mathematics will enhance the knowledge of students to formulate and solve any real-world problems independently.
<b>PO9</b>	Develop the knowledge of abstract mathematical concepts.
<b>P10</b>	Enhance the employability skills in both public and private sector jobs.

**Program Specific Outcomes:**

<u>S.No</u>	<u>OUTCOMES</u>
<b>PSO1</b>	Prepare and Motivate Students for Research Studies in Mathematics and Related Fields.
<b>PSO2</b>	Provide Advanced Knowledge on Topics in Pure Mathematics, Empowering the Students to Pursue Higher Degrees at Reputed Academic Institutions.
<b>PSO3</b>	Having an Ability to use Mathematics in Techniques, Skills, Resources on Real Life
<b>PSO4</b>	Having Problem Solving Ability- to Assess Social Issues (Societal, Health, Safety, Legal and Cultural) as a Mathematician.
<b>PSO5</b>	Having Adaptive Thinking and Adaptability in Relation to Environmental Context and Sustainable Development.
<b>PSO6</b>	Having a Clear Understanding of Professional and Ethical Responsibility.

## Semester: I

**Subject Name:** Algebra

**No. of Hours per Week:** 05

**Subject Code:** CMA11

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
I (Regulation 2020-2021)	Algebra	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to demonstrate the knowledge of the relationship between roots and coefficients of the given equation.</li><li>2. After studied unit -2, the student will be able to carry out the calculations of approximate roots of the given polynomial equation.</li><li>3. After studied unit -3, the student will be able to find the sum to infinity of the given binomial/exponential/logarithmic series.</li><li>4. After studied unit -4, the student will be able to demonstrate the knowledge of matrices and calculate the Eigen values and Eigen vectors of a given square matrix.</li><li>5. After studied unit -5, the student will be able to discuss the basic number theory concepts.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	M	M
CO2	M	M	S	M	M	S	S	S	M	S
CO3	S	S	S	M	M	M	M	M	M	M
CO4	S	M	S	S	M	S	S	M	M	M
CO5	M	M	M	S	S	S	M	S	M	S

PO – Programme Outcome      CO – Course outcome

S – Strong      M-Medium      L – Low (may be avoided)

## Semester: I

**Subject Name:** Trigonometry

**No. of Hours per Week:** 05

**Subject Code:** CMA12

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
I (Regulation 2020-2021)	Trigonometry	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to write the expansions of <math>\cos n\theta</math> and <math>\sin n\theta</math> in powers of <math>\cos\theta</math> and <math>\sin\theta</math>.</li><li>2. After studied unit -2, the student will be able to expand the powers of sines and cosines of <math>\theta</math> in terms of functions of multiples of <math>\theta</math></li><li>3. After studied unit -3, the student will be able to discuss the concepts of hyperbolic functions.</li><li>4. After studied unit -4, the student will be able to demonstrate knowledge of the logarithm of complex quantities.</li><li>5. After studied unit -5, the student will be able to carry out the calculations of summation of trigonometric series</li></ol>

### Mapping with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	M	M	M	M
CO2	M	M	M	S	S	S	M	S	S	M
CO3	S	S	S	S	M	M	S	S	M	S
CO4	M	S	S	S	S	M	M	M	M	M
CO5	S	S	S	M	M	M	M	M	M	M

PO – Programme Outcome

CO – Course outcome

S – Strong M-Medium

L – Low (may be avoided)

## Semester: I

**Subject Name:** Numerical Methods - I

**No. of Hours per Week:** 06

**Subject Code:** CAMA13A

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
I (Regulation 2020-2021)	Numerical Methods - I	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to solve simultaneous linear equations by Gauss elimination method, Gauss-Jordan Method, and Gauss-Seidel method.</li><li>2. After studied unit -2, the student will be able to calculate interpolation values by applying Gregory-Newton's forward and backward formulae.</li><li>3. After studied unit -3, the student will be able to calculate the central interpolation values by applying central differences formulae.</li><li>4. After studied unit -4, the student will be able to estimate one or more missing terms of the given set of data.</li><li>5. After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Lagrange's formula of inverse interpolation</li></ol>

### Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	M	S	S	S	S
CO2	S	S	S	S	M	S	S	S	M	S
CO3	M	S	S	S	S	S	M	S	M	M
CO4	S	S	M	S	S	M	S	S	S	S
CO5	S	M	S	M	S	S	S	M	M	S

PO – Programme Outcome

CO – Course outcome

S – Strong M – Medium

L – Low (may be avoided)

## Semester: II

**Subject Name:** Calculus

**No. of Hours per Week:** 04

**Subject Code:** CMA21

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
II (Regulation 2020-2021)	Calculus	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to determine the extreme values of the given function.</li><li>2. After studied unit -2, the student will be able to demonstrate knowledge of Cartesian and polar coordinates.</li><li>3. After studied unit -3, the student will be able to gain knowledge of curvature, evolutes, and envelope concepts.</li><li>4. After studied unit -4, the student will be able to evaluate definite integration problems and able to apply reduction formulae.</li><li>5. After studied unit -5, the student will be able to evaluate double and triple integrals.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	S	M	S
CO2	M	S	S	S	S	S	M	M	S	M
CO3	M	M	M	S	S	S	S	S	M	M
CO4	M	S	S	S	S	S	S	S	M	S
CO5	S	M	M	S	M	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome  
S – Strong, M – Medium, L – Low (may be avoided)

## Semester: II

**Subject Name:** Analytical Geometry of three dimensions

**No. of Hours per Week:** 04

**Subject Code:** CMA22

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
II (Regulation 2020-2021)	Analytical Geometry of three dimensions	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to demonstrate knowledge of the plane and its applications.</li><li>2. After studied unit -2, the student will be able to gain knowledge of straight lines and their applications.</li><li>3. After studied unit -3, the student will be able to carry out sphere-related problems.</li><li>4. After studied unit -4, the student will be able to know the concepts of the cone, right circular cone, and enveloping cone.</li><li>5. After studied unit -5, the student will be able to carry out the calculations of the problems related to the cylinder.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	S	S	S	S	M
CO2	M	M	M	S	S	S	S	S	M	M
CO3	M	M	M	S	S	S	S	S	S	S
CO4	S	S	S	S	M	M	M	M	S	S
CO5	S	M	M	M	M	M	M	M	M	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: II

**Subject Name:** Numerical Methods - II

**No. of Hours per Week:** 04

**Subject Code:** CAMA23A

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
II (Regulation 2020-2021)	Numerical Methods - II	03	<p>1. After studied unit -1, the student will be able to evaluate derivatives by applying Newton's forward and backward differences formulae.</p> <p>2. After studied unit -2, the student will be able to evaluate integrations by applying the trapezoidal rule, Simpson's rules, and Weddle's rule.</p> <p>3. After studied unit -3, the student will be able to find a complete solution to linear difference equations</p> <p>4. After studied unit -4, the student will be able to estimate approximate numerical solutions of algebraic and transcendental equations.</p> <p>5. After studied unit -5, the student will be able to estimate approximate numerical solutions of ordinary differential equations by Euler, Picard, Taylor, and RungeKutta methods.</p>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	M	S	S	S	M	M	S	S	M	S
CO3	M	S	S	S	S	S	M	S	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	M	S	M	S	S	S	M	M	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: III

**Subject Name:** Differential Equations

**No. of Hours per Week:** 06

**Subject Code:** CMA31

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
III (Regulation 2020-2021)	Differential Equations	04	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to know the various methods of solving the first-order higher degree differential equations.</li><li>2. After studied unit -2, the student will be able to carry out the different methods of solving the second order differential equations.</li><li>3. After studied unit -3, the student will be able to understand the concepts of total differential equations and solve the problems.</li><li>4. After studied unit -4, the student will be able to demonstrate knowledge of Laplace transform and its applications.</li><li>5. After studied unit -5, the student will be able to solve partial differential equations.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	S	S	S
CO2	S	S	S	S	S	M	M	M	S	M
CO3	M	M	M	M	S	S	S	S	S	S
CO4	S	S	S	S	M	M	M	M	M	S
CO5	S	S	S	S	M	M	M	M	M	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)



## Semester: III

**Subject Name:** Mathematical Statistics - I

**No. of Hours per Week:** 04

**Subject Code:** CMA13B

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
III (Regulation 2020-2021)	Mathematical Statistics - I	03	<p>1. After studied unit -1, the student will be able to express the techniques of conditional probability and Baye's theorem with examples</p> <p>2. After studied unit -2, the student will be able to calculate expectation, and distribution function.</p> <p>3. After studied unit -3, the student will be able to express Chebychev's inequality and its applications.</p> <p>4. After studied unit -4, the student will be able to interpret the different types of correlation coefficient and lines of regression with examples.</p> <p>5..After studied unit -5, the student will be able to apply domain knowledge for discrete and continuous distributions with examples.</p>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	M	S	S	S	M	S
CO3	M	S	S	S	S	S	M	S	S	M
CO4	S	S	M	S	S	M	S	S	S	S
CO5	S	M	S	M	S	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Mathematics For Competitive Examinations-I **No. of Hours per Week:** 03

**Subject Code:** CSMA32

**Credit:** 02

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Mathematics For Competitive Examinations-I	02	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to answer the questions related to the number system.</li><li>2. After studied unit-2, the student will be able to answer real-life simple problems by applying the HCF and/or LCM.</li><li>3. After studied unit-3, the student will be able to apply the correct sequence of operations to find out the value of a given mathematical expression.</li><li>4. After studied unit-4, the student will be able to solve the problems involving square roots, cube roots, and average.</li><li>5. After studied unit-5, the student will be able to carry out the problems related to ages, and simplify products and quotients involving surds</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	M	S	S	M
CO2	M	S	S	S	S	S	S	M	M	S
CO3	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	M	S	S	M	M	M	S
CO5	S	M	S	M	M	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome  
S – Strong, M – Medium, L – Low (may be avoided)

### Semester: III

**Subject Name:** Basic Mathematics

**No. of Hours per Week:** 02

**Subject Code:** CNMA33

**Credit:** 02

**Course Outcomes:**

Semester	Course Name	Course Credit	Course Outcomes
III (Regulation 2017-2018)	Basic Mathematics	02	<p>1. After studied unit -1, the student will be able to define subset, proper subset, and equivalent sets and write sets using set notations.</p> <p>2. After studied unit -2, the student will be able to describe various number systems and convert one number system into another.</p> <p>3. After studied unit -3, the student will be able to express logical statements and prepares the truth tables.</p> <p>4. After studied unit -4, the student will be able to find the determinant values <math>2 \times 2</math>, and <math>3 \times 3</math> matrices and solve a system of equations by applying Cramer's rule.</p> <p>5. After studied unit -5, the student will be able to get a strong background in matrices and be able to solve a system of non-homogeneous equation</p>

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	S	M	M	M
CO2	S	S	S	S	M	M	S	S	S	S
CO3	S	M	S	M	S	S	M	S	M	S
CO4	S	S	M	S	S	S	S	M	S	S
CO5	S	M	S	S	M	S	S	S	S	M

PO – Programme Outcome, CO – Course outcome  
 S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Vector Analysis and Fourier analysis

**No. of Hours per Week:** 05

**Subject Code:** CMA41

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Vector Analysis and Fourier Analysis	04	<p>1. After studied unit -1, the student will be able to demonstrate knowledge of the physical and geometrical meaning of the derivative and its applications.</p> <p>2. After studied unit -2, the student will be able to know the concepts of divergence, curl of a vector, and their physical interpretations.</p> <p>3. After studied unit -3, the student will be able to evaluate the line, surface, and volume integrals. 4. After studied unit -4, the student will be able to</p> <p>know the applications of Stoke's, Gauss divergence, and Green's theorems.</p> <p>5. After studied unit -5, the student will be able to express the given function as a Fourier series.</p>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	M
CO3	M	M	M	M	S	S	S	M	S	S
CO4	M	M	M	M	M	S	S	S	S	M
CO5	M	S	S	S	S	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome  
S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Mechanics

**No. of Hours per Week:** 04

**Subject Code:** CMA42

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Mechanics	04	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to know about the forces and equilibrium of a particle.</li><li>2. After studied unit -2, the student will be able to identify the parallel forces and couples and solve related problems.</li><li>3. After studied unit -3, the student will be able to demonstrate knowledge of friction and its applications.</li><li>4. After studied unit -4, the student will be able to carry out problems related to impact and laws of impact.</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge of the central orbits.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	S	S	M	M	M
CO2	M	M	M	M	S	S	M	M	S	S
CO3	S	M	S	S	M	M	M	M	M	M
CO4	S	S	M	M	M	M	M	M	M	M
CO5	M	M	S	S	S	M	M	M	M	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Mathematical Statistics - II

**No. of Hours per Week:** 04

**Subject Code:** CAMA23B

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Mathematical Statistics - II	03	1. After studied unit -1, the student will be able to demonstrate sampling, parameter, and significance with examples.  2. After studied unit -2, the student will be able to know about Chi-square distribution and its applications.  3. After studied unit -3, the student will be able to illustrate Students t-distribution and the applications of F-distribution.  4. After studied unit -4, the student will be able to state null and alternate hypotheses to the given problem and test the hypothesis.  5. After studied unit -5, the student will be able to apply ANOVA techniques

### Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	S	S	M	S	S	S	M
CO2	S	S	S	S	M	S	S	M	M	S
CO3	M	S	S	S	S	S	M	S	S	M
CO4	S	S	M	S	S	M	S	S	S	S
CO5	S	M	S	M	S	M	S	S	M	M

PO – Programme Outcome, CO – Course outcome  
 S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Mathematics for Competitive Examinations – II

**No. of Hours per Week:** 02

**Subject Code:** CSMA43

**Credit:** 02

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Mathematics for Competitive Examinations – II	02	<ol style="list-style-type: none"><li>1. After studied unit-1, the students will be able to solve real-life problems related to percentages.</li><li>2. After studied unit-2, the student will be able to carry out the problems related to profit and loss</li><li>3. After studied unit-3, the student will be able to carry out problems related to ratio and proportion</li><li>4. After studied unit-4, the student will be able to demonstrate knowledge of logarithms, partnership, and chain rule and solve the related problems.</li><li>5. After studied unit-1, the students will be able to solve real-life problems related to time and work.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	S	S	S	M
CO2	M	S	S	M	S	M	S	M	M	S
CO3	S	M	M	S	M	S	M	S	S	M
CO4	M	S	M	M	S	M	S	S	M	S
CO5	S	S	S	M	S	S	M	M	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: IV

**Subject Name:** Foundation Mathematics for  
Competitive Examinations

**No. of Hours per Week:** 02

**Subject Code:** CNMA44

**Credit:** 02

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
IV (Regulation 2020-2021)	Foundation Mathematics for Competitive Examinations	02	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to solve real-life problems related to percentages.</li><li>2. After studied unit-2, the student will be able to carry out real-world problems related to profit and loss.</li><li>3. After studied unit-3, the student will be able to demonstrate knowledge of real-life problems based on the ratio and proportions.</li><li>4. After studied unit-4, the student will be able to demonstrate knowledge of the work rate formula and apply this technique to solve several real-life problems.</li><li>5. After studied unit-5, the students will be able to solve real-life problems based on simple and compound interest.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	S	S	M	S	S	S
CO2	M	S	S	S	M	S	S	M	M	S
CO3	S	M	S	S	S	S	M	S	S	M
CO4	S	S	S	M	S	S	M	M	M	S
CO5	S	M	S	M	M	M	S	S	M	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)



## Semester: V

**Subject Name:** Abstract Algebra

**No. of Hours per Week:** 06

**Subject Code:** CMA51

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Abstract Algebra	04	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to determine whether a given set is a group under a binary operation and find its subgroup.</li><li>2. After studied unit-2, the student will be able to demonstrate knowledge of normal subgroup, homomorphism, and isomorphism.</li><li>3. After studied unit-3, the student will be able to carry out the problems based on permutation.</li><li>4. After studied unit-4, the student will be able to demonstrate knowledge of rings, ideals, and integral domain.</li><li>5. After studied unit-5, the student will be able to understand the concepts of ideals and Euclidean rings.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	M	S	S	M
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	M	S	S	M	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	M	S	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: V

**Subject Name:** Real Analysis - I

**No. of Hours per Week:** 06

**Subject Code:** CMA52

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Real Analysis - I	04	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to identify countable sets, the limit of a sequence, and its convergence.</li><li>2. After studied unit -2, the student will be able to demonstrate knowledge of divergent sequence, bounded sequence, monotone sequence, and Cauchy sequence.</li><li>3. After studied unit -3, the student will be able to carry out convergence and divergence of series and related problems.</li><li>4. After studied unit -4, the student will be able to express metric spaces and convergent and divergent sequences in a metric space</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge of open sets and closed sets with suitable examples.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	S	S	M	M	M	S
CO2	S	S	M	M	M	M	M	M	M	S
CO3	S	S	S	M	M	S	S	M	S	S
CO4	M	M	M	S	S	S	M	M	M	M
CO5	M	S	S	M	M	M	M	S	S	M

PO – Programme Outcome, CO – Course outcome  
S – Strong, M – Medium, L – Low (may be avoided)

## Semester: V

**Subject Name:** Complex Analysis-I

**No. of Hours per Week:** 06

**Subject Code:** CMA53

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Complex Analysis - I	04	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to gain knowledge about complex functions and their nature, continuous functions, necessary and sufficient conditions of an analytic function</li><li>2. After studied unit-2, the student will be able to demonstrate knowledge of elementary transformations, conformal and bilinear transformations with examples.</li><li>3. After studied unit-3, the student will be able to evaluate contour integrals using Cauchy's integral formula.</li><li>4. To Find Cauchy-Riemann equations in polar form-properties of Analytic functions-.</li><li>5. To Solve Necessary and sufficient conditions for Analytic functions-problems</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	M	S	M	S	M
CO2	M	S	M	M	S	M	S	M	M	S
CO3	S	M	S	S	M	S	S	M	S	M
CO4	M	M	M	S	S	S	M	M	S	S
CO5	M	S	S	M	M	M	M	S	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: V

**Subject Name:** Programming in C Language

**No. of Hours per Week:** 03

**Subject Code:** CMA54

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Programming in C Language	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to demonstrate „c“ tokens, keywords, the basic structure of C programs and the execution of a „C“ Program.</li><li>2. After studied unit -2, the student will be able to express the nature of constants, variables, data types, declaration of variables, and assigning values to variables.</li><li>3. After studied unit -3, the student will be able to describe valuation of expressions and usage of various operators.</li><li>4. After studied unit -4, the student will be able to express the logic using control statements.</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge pertaining to arrays.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	M	M	S	M	S	M	M
CO2	M	S	M	M	S	S	M	S	M	M
CO3	M	S	M	M	M	S	S	M	M	S
CO4	S	M	S	S	S	M	M	S	S	M
CO5	S	S	M	S	M	S	M	S	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: V

**Subject Name:** Linear Programming

**No. of Hours per Week:** 03

**Subject Code:** CEMA55A

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Linear Programming	03	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to formulate a real-world problem into an LPP and carry out the calculations of the simplex method.</li><li>2. After studied unit-2, the student will be able to solve transportation problems.</li><li>3. After studied unit-3, the student will be able to understand analogies between transportation problems and assignment models.</li><li>4. After studied unit-4, the student will be able to demonstrate knowledge of game theory and its applications.</li><li>5. After studied unit-5, the student will be able to know the concept of simulation and solve the problems by applying the Monte Carlo simulation technique.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	M
CO2	M	S	S	M	S	S	S	S	S	S
CO3	S	S	M	S	M	S	M	S	S	S
CO4	S	M	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	S	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: V

**Subject Name:** Mathematics For Competitive Examinations-III **No. of Hours per Week:** 03

**Subject Code:** CSMA56

**Credit:** 02

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
V (Regulation 2020-2021)	Mathematics For Competitive Examinations-III	02	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to solve the problems related to time and distance.</li><li>2. After studied unit -2, the student will be able to carry out the boat and stream, train, and speed- based questions.</li><li>3. After studied unit -3, the student will answer the questions based on alligation or mixture. Aspirants preparing for the upcoming competitive examinations will be able to answer such questions in a faster way.</li><li>4. After studied unit -4, the student will be able to carry out problems related to compound interest.</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge of area-related problems.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	M	S	S	M
CO2	M	S	S	S	S	S	S	M	M	S
CO3	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	M	S	S	M	M	M	S
CO5	S	M	S	M	M	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: VI

**Subject Name:** Linear Algebra

**No. of Hours per Week:** 05

**Subject Code:** CMA61

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Linear Algebra	04	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to identify linear dependent and independent vectors.</li><li>2. After studied unit -2, the student will be able to classify orthogonal and orthonormal vectors.</li><li>3. After studied unit -3, the student will be able to know about the algebra of linear transformations.</li><li>4. After studied unit -4, the student will be able to know about the matrix of a linear transformation and its properties.</li><li>5. After studied unit -5, the student will be able to solve a system of linear equations</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	S	S	M
CO2	S	S	S	S	M	S	S	M	M	S
CO3	M	S	S	S	M	S	M	S	S	M
CO4	S	S	M	S	S	M	S	M	M	S
CO5	S	M	S	M	S	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: VI

Subject Name: Real Analysis- II

No. of Hours per Week: 06

Subject Code: CMA62

Credit: 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Real Analysis II	04	<p>1. After studied unit-1, the student will be able to demonstrate knowledge of connected sets and complete metric spaces with suitable examples.</p> <p>2. After studied unit-2, the student will be able to identify the functions which are continuous and uniformly continuous.</p> <p>3. After studied unit-3, the student will be able to express about Riemann integration and its properties.</p> <p>4. After studied unit-4, the student will be able to carry out the problems related to Rolle's theorem and the law of mean.</p> <p>5. After studied unit-5, the student will be able to demonstrate knowledge of pointwise convergence, uniform convergence of sequences of functions, and of series of functions.</p>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	S	S	M	S
CO2	M	S	S	S	M	M	S	S	S	M
CO3	S	S	M	S	S	S	S	S	S	S
CO4	M	S	S	S	S	S	M	S	S	S
CO5	S	M	S	S	S	S	S	M	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)



## Semester: VI

**Subject Name:** Complex Analysis II

**No. of Hours per Week:** 05

**Subject Code:** CMA63

**Credit:** 04

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Complex Analysis II	04	<ol style="list-style-type: none"><li>1. After studied unit-1, the student will be able to gain knowledge about complex functions and their nature, continuous functions, necessary and sufficient conditions of an analytic function</li><li>2. After studied unit-2, the student will be able to demonstrate knowledge of elementary transformations, conformal and bilinear transformations with examples.</li><li>3. After studied unit-3, the student will be able to evaluate contour integrals using Cauchy's integral formula.</li><li>4. After studied unit-4, the student will be able to express a function as Taylor series or Laurent's series at the given domain, and also determine the circle or annulus of convergence power series expansions of analytic functions.</li><li>5. After studied unit-5, the student will be able to carry out the problems related to the evaluation of improper integrals.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	M	S	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	S	M	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: VI

**Subject Name:** Graph Theory

**No. of Hours per Week:** 03

**Subject Code:** CEMA64A

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Graph Theory	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to know various graph structures and isomorphism between graphs.</li><li>2. After studied unit -2, the student will be able to know the representation of the graphs in matrix form.</li><li>3. After studied unit -3, the student will be able to know the concepts of connected graph, component, cut point, and bridge of a graph.</li><li>4. After studied unit -4, the student will be able to know about trees and their applications.</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge of Eulerian and Hamiltonian graphs.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	M	M	M	S	S	S	S
CO2	M	M	M	S	M	M	S	S	M	S
CO3	M	M	M	S	M	S	S	S	S	S
CO4	S	S	M	M	S	M	M	S	M	S
CO5	S	S	S	M	S	S	M	M	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: VI

**Subject Name:** Fuzzy Mathematics

**No. of Hours per Week:** 03

**Subject Code:** CEMA65A

**Credit:** 03

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Fuzzy Mathematics	03	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to know fuzzy sets and their operations.</li><li>2. After studied unit -2, the student will be able to know the addition and product of two fuzzy sets.</li><li>3. After studied unit -3, the student will be able to demonstrate knowledge of fuzzy relations and logic-connectives.</li><li>4. After studied unit -4, the student will be able to express about fuzzy subgroup, homomorphic image, and pre-image of subgroupoid.</li><li>5. After studied unit -5, the student will be able to demonstrate knowledge of fuzzy invariant subgroups and subrings.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	S	S	S	M
CO2	M	M	M	S	M	M	S	M	S	M
CO3	M	M	M	M	M	S	M	S	S	M
CO4	S	M	M	S	M	M	M	S	M	S
CO5	M	S	M	S	S	S	M	M	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

## Semester: VI

**Subject Name:** Operations Research

**No. of Hours per Week:** 03

**Subject Code:** CSMA66

**Credit:** 02

### Course Outcomes:

Semester	Course Name	Course Credit	Course Outcomes
VI (Regulation 2020-2021)	Operations Research	02	<ol style="list-style-type: none"><li>1. After studied unit -1, the student will be able to determine the critical activities of a repeated project and its completion time.</li><li>2. After studied unit -2, the student will be able to determine the duration of activities of a new project based on three-time estimates.</li><li>3. After studied unit -3, the student will be able to carry out the EOQ level of various inventory control models.</li><li>4. After studied unit -4, the student will be able to calculate processing times of sequencing of jobs through 2, 3, and m machines.</li><li>5. After studied unit -5, the student will be able to find out the length of the queue, and waiting time in the queue under single and multi-channel queuing models.</li></ol>

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	S	S	M	S
CO2	M	S	S	S	M	M	S	S	S	M
CO3	S	S	M	S	S	S	S	S	S	S
CO4	M	S	S	S	S	S	M	S	S	S
CO5	S	M	S	S	S	S	S	M	S	M

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)