BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

BE FIRST SEMESTER SYLLABI

CS STREAM-I

2022-2023

BVV'S

BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

DEPARTMENT OF MATHEMATICS

Syllabl for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Code:22UMA103C	**Mathematics for Computer Sciences-I**	**Credits 04 (3 : 0 : 2)**
Hours / Week: 03 + 02		Total Hours : 40
Branch: **CS,IS,AIML,BT**		CIE Marks : 50
Course Type: Integrated (Theory/Practical)		SEE Marks : 50
Total Hours of Pedagogy: 40 hours Theory + 10 to12 Lab slots		SEE: 03 Hours
BoS:		Total Marks: 100

Teaching-Learning Process Pedagogy (General Instructions):
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:

- As an introduction to new topics (pre-lecture activity).
- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).
- As a model solution of some exercises (post-lecture activity).

UNIT-I Calculus	**10 Hrs.**

Introduction to polar coordinates and curvature relating to Computer Science and engineering.

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two Curves. Pedal equations. Curvature and Radius of curvature (no proof) - Cartesian, Parametric, Polar and Pedal forms Problems.

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Computer graphics, Image processing.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Introduction to Polar coordinates : Unit-I
   https://youtu.be/aSdaT62ndYE
2. Polar Equation to Rectangular equation
   https://youtu.be/flTz_pSzVFI
3. Rectangular equation to polar wquation
   https://youtu.be/fTBkr27r3pw
4. How to Graph polar equations
   https://youtu.be/jO4lwddfeDA
5. Examples on angle between radius vector and tangent
   https://youtu.be/_RZx377w4nc
6. Curvature
   https://youtu.be/EMo0vaphXpU
   https://youtu.be/ugtUGhBSeE0
   https://youtu.be/gspjhwSNMWs

UNIT-II Series Expansion and Multivariable Calculus	10 Hrs.

Introduction of series expansion and partial differentiation in Computer Science & Engineering applications.

Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L' Hospital's (0/0,∞/∞,∞-∞) rule-Problems.

Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

Applications: Series expansion in computer programming, Errors and approximations, calculators.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Why Taylors and Maclaurins series UNIT-II
   https://youtu.be/eX1hvWxmJVE
   https://youtu.be/LDBnS4c7YbA
2. Indeteminate forms
   https://youtu.be/oEEXnyupzdo

https://youtu.be/Gh48aOvWcxw

3. Partial differentiation and its visualization
   https://youtu.be/AXqhWeUEtQU
   https://youtu.be/dfvnCHqzK54

UNIT-III Ordinary Differential Equations (ODEs) of first and Higher order	10 Hrs.

Introduction to first and higher-order ordinary differential equations pertaining to the applications for Computer Science engineering.
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\partial x)$ *and* $1/M\ (\partial N/\partial x - \partial M/\partial y)$. Orthogonal trajectories and Newton's law of cooling.
Higher-order linear ODEs with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems.
Self-Study: Applications of ODEs .
Applications: Rate of Growth or Decay, Conduction of heat. Oscillations of a spring, Transmission lines, Highway engineering.
(RBT Levels: L1, L2 and L3)
Web links and Video Lectures (e-Resources):

1. Linear and Bernouli's equation
   https://youtu.be/gd1FYn86P0c
   https://youtu.be/BoI_ej-T0V4
   https://youtu.be/Ez8_t8X2bAI
   https://youtu.be/mcjchG4q2Yk

2. Second order DE
   https://youtu.be/uI2xt8nTOlQ
   https://youtu.be/AYMPeaYz0Tg?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/u5h0pQC9xmc?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/L8dAVcRC1b8?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/wkSjoYHatww?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/q2cJPho-qx0
   https://youtu.be/O-9-IXO923o

3. How to solve second order DE using scilab
   https://youtu.be/tOL5ErEOK90
   https://youtu.be/tg_QM9b1bdA
   https://youtu.be/UkZmROLRzRA

UNIT-IV Modular Arithmetic and Linear Algebra	10 Hrs.

Introduction of modular arithmetic and its applications in Computer Science and Engineering:
Introduction to Congruences, Linear Congruences, The Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm.

Introduction of linear algebra related to Computer Science & Engineering :
Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

Self-Study: Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic. Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square Matrix by Cayley- Hamilton theorem.

Applications: Cryptography, encoding and decoding, RSA applications in public key encryption. Boolean matrix, Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):
Madular Arithmatic: https://youtu.be/2tpSU7BJFMI

1. Linear Algebra : Introduction
https://youtu.be/0oGJTQCy4cQ?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
2. system of equations
https://youtu.be/TD069mR-AF0
https://youtu.be/EC2mgUZyzoA?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/AUqeb9Z3y3k?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/GeDEr4Px2yc
https://youtu.be/Rks9llk1w2o
3. Reduced row echelon form
https://youtu.be/ccadWg3ZwEg
https://youtu.be/L0CmbneYETs?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
4. Rank of a Matrix
https://youtu.be/JahgX2Bi6cQ

Suggested Learning Resources:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011

2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
5. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press,3rd Ed., 2016.
6. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
7. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
8. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
9. H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
10. James Stewart: "Calculus" Cengage Publications, 7th Ed., 2019.
11. David C Lay: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
12. Gareth Williams: "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
13. William Stallings: "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed., 2013.
14. David M Burton: "Elementary Number Theory" Mc Graw Hill, 7th Ed., 2010.

Course Objectives: The goal of the course Mathematics-I for Computer Science and Engineering stream (**22UMA103C**) is to

- **Familiarize** the importance of calculus associated with one variable and multivariable for Computer science and engineering.
- **Analyze** computer science and engineering problems by applying Ordinary Differential Equations.
- **Apply** the knowledge of modular arithmetic to computer algorithms.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1: Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions

CO2: Analyze the solution of ordinary differential equations

CO3: Get acquainted and to apply modular arithmetic to computer algorithms

CO4: Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0
CO4	3	2	0	0	0	0	0	0	0	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

CIE and SEE Assessment of Integrated Course(IC)

1.0 Assessment Details (For CIE and SEE)

- The weightage for Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50)
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50)
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE, and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

2.0 Continuous Internal Evaluation (CIE) :

Theory Component : 30 Marks
Practical Component : 20 Marks
Total : 50 Marks

3.0 Theory Component (30 marks):

- Two CIE tests and each test for 40 marks (1½ hours), Totaling to 80Marks, later scale down to 40 Marks
- Assignment/Seminar/Course project/Case study/Quiz etc.: 10 Marks
  (Each Self study component = 1 marks, and Each video component = 1.5 Marks i.e 4 marks + 6 Marks = 10 Marks)

Total marks for CIE theory component: 50
Later scale down to : 30
Minimum marks required for eligibility to SEE : 12

4. 0 Practical Component (20 marks):

- On completion of every experiment/program in the laboratory, the students shall be evaluated & marks shall be awarded on the same day
- The laboratory component for CIE shall be for 50 marks later scale down to 20 marks
- 30 marks for regular conduction and journal write-up/report
- Each experiment shall be evaluated for 3 marks. 10 experiments, 30 marks. Minimum marks to be scored is 12
- 20 marks for lab CIE test (duration 03 hours). 5 marks for write-up, 10 marks for conduction, calculation, result etc. and 5 marks for viva-voce
- The laboratory test shall be conducted at the end of the semester
- Laboratory test shall be conducted with two internal faculty members
- Minimum marks to be scored is 8

Total marks for CIE Practical component: 50
Later scale down to : 20
Minimum marks required for eligibility to SEE : 08

5.0 CIE for integrated course: 50 marks

Eligibility for SEE : 20 marks and satisfactory attendance
Theory component : 30 marks
Minimum : 12 marks
Practical component : 20 marks
Minimum : 8 marks

NOTE:

- If a student fails to score minimum marks and satisfactory attendance either in theory or practical component in course/s, he/she will be

awarded NE grade

- NE grade course/s to be re-registered by the students whenever offered

6.0 Semester End Examination (SEE)

SEE for Integrated course

- Theory SEE will be conducted for 100 marks as per the scheduled time table for a course(duration 03 hours) and later scaled down to 50 marks
- The question paper will have part A and B
- Part A compulsory question (1 or 2 marks) for 20 marks
- Part B shall have 4 units, each unit two questions for 20 marks each, student has to answer any one full question from each unit, 80 marks

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have CIE component only

Note:

- If a student fails in course/s, 'F' grade will be awarded
- 'F' grade awarded course/s, student has to reappear for SEE whenever next conducted

7.0 Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks - 30) in the theory component and 08 (40% of maximum marks -20) in the practical component
- The laboratory component of the IC shall be for CIE only
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

22UMA103L: List of Laboratory experiments (2 hours/week per batch/ batch strength 15)
10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D Plots for Cartesian curves i. Plot of parabola $y = x^2$, $and\ y = sinx$, $y = tanx$ ii. Plot of Perfect parabola $y = x^2$

	iii. Change the color (Green) of perfect color perfect parabola iv. Change the color (Red) of perfect color perfect parabola v. Draw a red color with ' - -' perfect parabola vi. Draw a red color with ' *' perfect parabola vii. Draw a red color with axes label perfect parabola viii. Draw a perfect parabola with animation ix. Draw parametric curves cycloid a. $x = a(t + sint)\,, y = a(1 + cost)$ b. x = a(t – sint); y = a (1-cost) c. x=a(t-sint); y=a(1+cost) d. x=a(t + sint), y=a(1-cost) e. x=t^2 , y=t-(t^3/3)
2	Plotting of polar i) Cardiod r = a+b cosθ ii) Cardiod r=a+bcosθ, if a>b iii) Cardiod r = a+b cosθ, if b>a iv) Draw polar petals r = 2 cos4θ v) R=2cosθ, r=2cos7θ, r=2 cos6θ, r=2cos5θ vi) Cardoid $r = a(1 + cos\theta)$ vii) Cardoid $r = a(1 - cos\theta)$ viii) Draw histogram curves
3	i)Plot 3-d Surface $z = x^2 + y^2$ ii) Plot 3-d color Surface $z = x^2 + y^2$ iii) Plot 3-d Surface $z = x^4 + y^4$ iv) Plot 3-d Surface $z = sintcost$
4	i) To calculate volume of a sphere ii)To Evaluate $\int_0^5 xdx$ and $\int_0^5 sinxdx$
5	i)Solve first order o.d.e.$\frac{dy}{dx} = e^{-x}$ $, x = 0\,, y = 0$ ii) Solve first order o.d.e.$\frac{dy}{dx} + e^{-x}y = x^2$ $, x = 0\,, y = 0$ Note: Change the initial conditions and observe the graph

6	i)Solve $2y'' - 5y' + y = 0\,, y(3) = 6, y'(3) = 1.$ ii)Solve $y'' + 3y' - 10y = 0\,, y(0) = 1, y'(0) = 3$
7	i) Define polynomial and to solve polynomials. ii) Derivatives of polynomials (first, second and higher order)
8	i) Plot Taylor's series of continuous function of single variable. ii)Addition of two matrices iii) Subtraction of two matrices iv) Multiplication of two matrices v)Multiplication by a scalar
9	i) Inverse of a matrix ii) Identity matrix iii) To obtain the sum of diagonal elements of the matrix.
10.	i) Find the rank of a matrix ii) Find the row reduced echelon form of a matrix. iii) Find the rank of a matrix after row reducing the matrix

BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

BE FIRST SEMESTER SYLLABI

ME STREAM-I

2022-2023

BVV'S

BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Code:22UMA104C	**Mathematics for Mechanical Sciences -I**	**Credits 04 (3 : 0 : 2)**
Hours / Week: 03 + 02		Total Hours : 40
Branch: ME, IP		CIE Marks : 50
Course Type: Integrated (Theory/Practical)		SEE Marks : 50
Total Hours of Pedagogy: 40 hours Theory + 10 to12 Lab slots		SEE: 03 Hours
BoS:		Total Marks: 100

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

UNIT-I Calculus	**10 Hrs.**

Introduction to polar coordinates and curvature relating to mechanical engineering.
Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature (No proof) - Cartesian, Parametric, Polar and Pedal
forms. Problems.

Self-study: Center and circle of curvature, evolutes and involutes.
Applications: Applied Mechanics, Strength of Materials, Elasticity.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Introduction to Polar coordinates : Unit-I
   https://youtu.be/aSdaT62ndYE
2. Polar Equation to Rectangular equation
   https://youtu.be/flTz_pSzVFI
3. Rectangular equation to polar wquation
   https://youtu.be/fTBkr27r3pw
4. How to Graph polar equations
   https://youtu.be/jO4lwddfeDA
5. Examples on angle between radius vector and tangent
   https://youtu.be/_RZx377w4nc
6. Curvature
   https://youtu.be/EMo0vaphXpU
   https://youtu.be/ugtUGhBSeE0
   https://youtu.be/gspjhwSNMWs

UNIT-II Series Expansion and Multivariable Calculus	10 Hrs.

Introduction to series expansion and partial differentiation in the field of Mechanical Engineering applications.
Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems.
Indeterminate forms – L'Hospital's rule(0/0,∞/∞,∞-∞), Problems.
Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables-Problems.

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with a single constraint.

Applications: Computation of stress and strain, Errors and approximations in manufacturing process, Estimating the critical points and extreme values, vector calculus.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Why Taylors and Maclaurins series UNIT-II
   https://youtu.be/eX1hvWxmJVE
   https://youtu.be/LDBnS4c7YbA
2. Indeteminate forms
   https://youtu.be/oEEXnyupzdo
   https://youtu.be/Gh48aOvWcxw
3. Partial differentiation and its visualization
   https://youtu.be/AXqhWeUEtQU
   https://youtu.be/dfvnCHqzK54

UNIT-III Ordinary Differential Equations (ODEs) of first and Higher order	**10 Hrs.**

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\partial x)$ *and* $1/M\ (\partial N/\partial x - \partial M/\partial y)$. Orthogonal trajectories and Newton's law of cooling.
Higher-order linear ODEs with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems.
Self-Study: Applications of ODEs: L-R circuits.
Applications: Rate of Growth or Decay, Conduction of heat. Formulation and solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients. Applications to oscillations of a spring, Mechanical systems and Transmission lines.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear and Bernouli's equation
   https://youtu.be/gd1FYn86P0c
   https://youtu.be/BoI_ej-T0V4
   https://youtu.be/Ez8_t8X2bAI
   https://youtu.be/mcjchG4q2Yk

2. Second order DE
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   https://youtu.be/AYMPeaYz0Tg?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/u5h0pQC9xmc?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/L8dAVcRC1b8?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/wkSjoYHatww?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/q2cJPho-qx0
   https://youtu.be/O-9-IXO923o

3. How to solve second order DE using scilab
https://youtu.be/tOL5ErEOK90
https://youtu.be/tg_QM9b1bdA
https://youtu.be/UkZmROLRzRA

UNIT-IV	10 Hrs.

Introduction of linear algebra related to Mechanical Engineering applications: Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigen values and Eigenvectors, Rayleigh's power method to find the dominant Eigen value and Eigenvector.

Self-Study: Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Web links and Video Lectures (e-Resources):

1. Linear Algebra : Introduction
https://youtu.be/0oGJTQCy4cQ?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

2. system of equations
https://youtu.be/TD069mR-AF0
https://youtu.be/EC2mgUZyzoA?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/AUqeb9Z3y3k?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/GeDEr4Px2yc
https://youtu.be/Rks9llk1w2o

3. Reduced row echelon form
https://youtu.be/ccadWg3ZwEg
https://youtu.be/L0CmbneYETs?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

4. Rank of a Matrix
https://youtu.be/JahgX2Bi6cQ

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BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Suggested Learning Resources:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
5. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
6. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
7. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
8. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
9. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
10. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
11. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course objectives:

The goal of the course **Mathematics-I for Mechanical Engineering stream** (**22UMA104C**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables for Mechanical engineering.
- **Analyze** Mechanical engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Course Outcomes:

At the end of the course the student will be able to:

CO1:	Apply the knowledge of calculus to solve problems related to polar curves.
CO2:	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3:	Analyze the solution of ordinary differential equations.
CO4:	Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigen vectors.

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DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0
CO4	3	2	0	0	0	0	0	0	0	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

CIE and SEE Assessment of Integrated Course(IC)

1.0 Assessment Details (For CIE and SEE)

- The weightage for Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50)
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50)
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE, and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

2.0 Continuous Internal Evaluation (CIE) :

Theory Component : 30 Marks
Practical Component : 20 Marks
Total : 50 Marks

3.0 Theory Component (30 marks):

- Two CIE tests and each test for 40 marks (1½ hours), Totaling to 80Marks, later scale down

to 40 Marks
Assignment/Seminar/Course project/Case study/Quiz etc.: 10 Marks (Each Self study component = 1 marks, and Each video component = 1.5 Marks i.e 4 marks + 6 Marks = 10 Marks)

Total marks for CIE theory component: 50
Later scale down to : 30
Minimum marks required for eligibility to SEE : 12

4. 0 Practical Component (20 marks):

- On completion of every experiment/program in the laboratory, the students shall be evaluated & marks shall be awarded on the same day
- The laboratory component for CIE shall be for 50 marks later scale down to 20 marks
- 30 marks for regular conduction and journal write-up/report
- Each experiment shall be evaluated for 3 marks. 10 experiments, 30 marks. Minimum marks to be scored is 12
- 20 marks for lab CIE test (duration 03 hours). 5 marks for write-up, 10 marks for conduction, calculation, result etc. and 5 marks for viva-voce
- The laboratory test shall be conducted at the end of the semester
- Laboratory test shall be conducted with two internal faculty members
- Minimum marks to be scored is 8

Total marks for CIE Practical component: 50
Later scale down to : 20
Minimum marks required for eligibility to SEE : 08

5.0 CIE for integrated course: 50 marks

Eligibility for SEE : 20 marks and satisfactory attendance
Theory component : 30 marks
Minimum : 12 marks
Practical component : 20 marks
Minimum : 8 marks

NOTE:

- If a student fails to score minimum marks and satisfactory attendance either in theory or practical component in course/s, he/she will be

awarded NE grade

- NE grade course/s to be re-registered by the students whenever offered

a. Semester End Examination (SEE)

SEE for Integrated course

- Theory SEE will be conducted for 100 marks as per the scheduled time table for a course(duration 03 hours) and later scaled down to 50 marks
- The question paper will have part A and B
- Part A compulsory question (1 or 2 marks) for 20 marks
- Part B shall have 4 units, each unit two questions for 20 marks each, student has to answer any one full question from each unit, 80 marks

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have CIE component only

Note:

- If a student fails in course/s, 'F' grade will be awarded
- 'F' grade awarded course/s, student has to reappear for SEE whenever next conducted

7.0 Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks - 30) in the theory component and 08 (40% of maximum marks -20) in the practical component
- The laboratory component of the IC shall be for CIE only
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D Plots for Cartesian curves

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BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

	i. Plot of parabola $y = x^2$, $and\ y = sinx$, $y = tanx$ ii. Plot of Perfect parabola $y = x^2$ iii. Change the color (Green) of perfect color perfect parabola iv. Change the color (Red) of perfect color perfect parabola v. Draw a red color with ' - -' perfect parabola vi. Draw a red color with ' *' perfect parabola vii. Draw a red color with axes label perfect parabola viii. Draw a perfect parabola with animation ix. Draw parametric curves cycloid a. $x = a(t + sint)$, $y = a(1 + cost)$ b. x = a(t – sint); y = a (1-cost) c. x=a(t-sint); y=a(1+cost) d. x=a(t + sint), y=a(1-cost) e. x=t^2 , y=t-(t^3/3)
2	Plotting of polar i) Cardiod r = a+b cosθ ii) Cardiod r=a+bcosθ, if a>b iii) Cardiod r = a+b cosθ, if b>a iv) Draw polar petals r = 2 cos4θ v) R=2cosθ, r=2cos7θ, r=2 cos6θ, r=2cos5θ vi) Cardoid $r = a(1 + cos\theta)$ vii) Cardoid $r = a(1 - cos\theta)$ viii) Draw histogram curves
3	i)Plot 3-d Surface $z = x^2 + y^2$ ii) Plot 3-d color Surface $z = x^2 + y^2$ iii) Plot 3-d Surface $z = x^4 + y^4$ iv) Plot 3-d Surface $z = sintcost$
4	i) To calculate volume of a sphere ii)To Evaluate $\int_0^5 xdx$ and $\int_0^5 sinxdx$
5	i)Solve first order o.d.e.$\frac{dy}{dx} = e^{-x}$, $x = 0$, $y = 0$ ii) Solve first order o.d.e.$\frac{dy}{dx} + e^{-x}y = x^2$, $x = 0$, $y = 0$

	Note: Change the initial conditions and observe the graph
6	i)Solve $2y'' - 5y' + y = 0\,, y(3) = 6, y'(3) = 1.$ ii)Solve $y'' + 3y' - 10y = 0\,, y(0) = 1, y'(0) = 3$
7	i) Define polynomial and to solve polynomials. ii) Derivatives of polynomials (first,second and higher order)
8	i) Plot Taylor's series of continuous function of single variable. ii)Addition of two matrices iii) Subtraction of two matrices iv) Multiplication of two matrices v)Multiplication by a scalar
9	i) Inverse of a matrix ii) Identity matrix iii) to obtain the sum of diagonal elements of the matrix.
10.	i) Find the rank of a matrix ii) Find the row reduced echelon form of a matrix. iii) Find the rank of a matrix after row reducing the matrix

BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

BE FIRST SEMESTER SYLLABI

EEE STREAM-I

2022-2023

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DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Code:22UMA101C	**Mathematics for Electrical Sciences - I**	**Credits 04 (3 : 0 : 2)**
Hours / Week: 03 + 02		Total Hours : 40
Branch: **EC, EEE**		CIE Marks : 50
Course Type: Integrated (Theory/Practical)		SEE Marks : 50
Total Hours of Pedagogy: 40 hours Theory + 10 to12 Lab slots		SEE: 03 Hours
BoS:		Total Marks: 100

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self−study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

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DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

UNIT-I Calculus	**10 Hrs.**

Introduction to polar coordinates and curvature relating to EC & EE Engineering Applications :

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature (No proof) - Cartesian, Parametric, Polar and Pedal forms. Problems.

Self-study: Center and circle of curvature, evolutes and involutes.
Applications: Communication signals, Manufacturing of microphones, and Image processing.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Introduction to Polar coordinates : Unit-I
   https://youtu.be/aSdaT62ndYE
2. Polar Equation to Rectangular equation
   https://youtu.be/flTz_pSzVFI
3. Rectangular equation to polar wquation
   https://youtu.be/fTBkr27r3pw
4. How to Graph polar equations
   https://youtu.be/jO4lwddfeDA
5. Examples on angle between radius vector and tangent
   https://youtu.be/_RZx377w4nc
6. Curvature
   https://youtu.be/EMo0vaphXpU
   https://youtu.be/ugtUGhBSeE0
   https://youtu.be/gspjhwSNMWs

UNIT-II Series Expansion and Multivariable Calculus	**10 Hrs.**

Introduction of series expansion and partial differentiation in EC & EE Engineering Applications :

Taylors and Maclaurins series expansion for one variable (Statement only) − problems.
Indeterminate forms – L'Hospitals rule(0/0,∞/∞,∞-∞) - Problems.
Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems.
Self-study: Euler's Theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.
Applications: Series expansion in communication signals, Errors and approximations, and vector calculus.
(RBT Levels: L1, L2 and L3)
Web links and Video Lectures (e-Resources):

1. Why Taylors and Maclaurins series UNIT-II
   https://youtu.be/eX1hvWxmJVE

   https://youtu.be/LDBnS4c7YbA
2. Indeteminate forms
   https://youtu.be/oEEXnyupzdo
   https://youtu.be/Gh48aOvWcxw

3. Partial differentiation and its visualization
   https://youtu.be/AXqhWeUEtQU
   https://youtu.be/dfvnCHqzK54

UNIT-III Ordinary Differential Equations (ODEs) of first order and Infite Series	**10 Hrs.**

Introduction to first-order ordinary differential equations pertaining to the applications for EC& EE engineering.
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\partial x)$ *and* $1/M\ (\partial N/\partial x - \partial M/\partial y)$. Orthogonal trajectories, L-R and C-R circuits.Problems.
Infinite Series: Introduction, convergence, divergence and oscillation of an infinite series, comparison test, p-series, D'Alemberts ratio test and Raabes test(all tests without proof).

Self-Study: Applications of ODEs, Alternating Series.
Applications of ordinary differential equations: Rate of Growth or Decay, Conduction of heat.
(RBT Levels: L1, L2 and L3)
Web links and Video Lectures (e-Resources):

1. Linear and Bernouli's equation
   https://youtu.be/gd1FYn86P0c
   https://youtu.be/BoI_ej-T0V4
   https://youtu.be/Ez8_t8X2bAI
   https://youtu.be/mcjchG4q2Yk

2. Second order DE
   https://youtu.be/uI2xt8nTOlQ
   https://youtu.be/AYMPeaYz0Tg?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/u5h0pQC9xmc?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/L8dAVcRC1b8?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC

https://youtu.be/wkSjoYHatww?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
https://youtu.be/q2cJPho-qx0
https://youtu.be/O-9-IXO923o

3. How to solve second order DE using scilab
https://youtu.be/tOL5ErEOK90
https://youtu.be/tg_QM9b1bdA
https://youtu.be/UkZmROLRzRA

UNIT-IV Integral Calculus and Linear Algebra	10 Hrs.

Introduction to Integral Calculus in EC & EE Engineering applications.
Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems.
Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions with proof. Problems. (Discuss two types of Problems: Limits 0 to 1 and 0 to pi / 2)

Introduction of linear algebra related to EC & EE engineering applications.
Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

Self-Study: Volume by triple integration, Center of gravity. Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications: Antenna and wave propagation, Calculation of optimum power in electrical circuits, field theory. Network Analysis, Markov Analysis, Critical point of a network system. Optimum solution.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear Algebra : Introduction
https://youtu.be/0oGJTQCy4cQ?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

2. system of equations
https://youtu.be/TD069mR-AF0
https://youtu.be/EC2mgUZyzoA?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/AUqeb9Z3y3k?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/GeDEr4Px2yc

https://youtu.be/Rks9llk1w2o

3. Reduced row echelon form
https://youtu.be/ccadWg3ZwEg
https://youtu.be/L0CmbneYETs?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

4. Rank of a Matrix
https://youtu.be/JahgX2Bi6cQ

Suggested Learning Resources:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
5. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
6. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
7. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
8. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
9. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
10. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
11. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course objectives:

The goal of the course **Mathematics-I for Electrical sciences** (**22UMA101C**) is to

- **Familiarize** the importance of calculus associated with one variable and multivariable for Electrical science and engineering.
- **Analyze** Electrical science and engineering problems by applying Ordinary Differential Equations.
- **Apply** the knowledge of Multiple Integrals and beta Gamma functions to Solve Electrical science Problems.

- **Develop** the knowledge of Linear Algebra to solve the system of equations.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions

CO2 : Analyze the solution of ordinary differential equations and Infinite series

CO3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume

CO4: Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0
CO4	3	2	0	0	0	0	0	0	0	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

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CIE and SEE Assessment of Integrated Course(IC)

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- The weightage for Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50)
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50)
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE, and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

2.0 Continuous Internal Evaluation (CIE) :

Theory Component : 30 Marks
Practical Component : 20 Marks
Total : 50 Marks

3.0 Theory Component (30 marks):

- Two CIE tests and each test for 40 marks (1½ hours), Totaling to 80Marks, later scale down to 40 Marks
  Assignment/Seminar/Course project/Case study/Quiz etc.: 10 Marks (Each Self study component = 1 marks, and Each video component = 1.5 Marks i.e 4 marks + 6 Marks = 10 Marks)

Total marks for CIE theory component: 50
Later scale down to : 30
Minimum marks required for eligibility to SEE : 12

4. 0 Practical Component (20 marks):

- On completion of every experiment/program in the laboratory, the students shall be evaluated & marks shall be awarded on the same day
- The laboratory component for CIE shall be for 50 marks later scale down to 20 marks
- 30 marks for regular conduction and journal write-up/report
- Each experiment shall be evaluated for 3 marks. 10 experiments, 30 marks. Minimum marks to be scored is 12
- 20 marks for lab CIE test (duration 03 hours). 5 marks for write-up, 10

marks for conduction, calculation, result etc. and 5 marks for viva-voce

- The laboratory test shall be conducted at the end of the semester
- Laboratory test shall be conducted with two internal faculty members
- Minimum marks to be scored is 8

Total marks for CIE Practical component: 50
Later scale down to : 20
Minimum marks required for eligibility to SEE : 08

5.0 CIE for integrated course: 50 marks

Eligibility for SEE : 20 marks and satisfactory attendance
Theory component : 30 marks
Minimum : 12 marks
Practical component : 20 marks
Minimum : 8 marks

NOTE:

- If a student fails to score minimum marks and satisfactory attendance either in theory or practical component in course/s, he/she will be awarded NE grade
- NE grade course/s to be re-registered by the students whenever offered

a. Semester End Examination (SEE)

SEE for Integrated course

- Theory SEE will be conducted for 100 marks as per the scheduled time table for a course(duration 03 hours) and later scaled down to 50 marks
- The question paper will have part A and B
- Part A compulsory question (1 or 2 marks) for 20 marks
- Part B shall have 4 units, each unit two questions for 20 marks each, student has to answer any one full question from each unit, 80 marks

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have CIE component only

Note:

- If a student fails in course/s, 'F' grade will be awarded
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7.0 Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks - 30) in the theory component and 08 (40% of maximum marks -20) in the practical component
- The laboratory component of the IC shall be for CIE only
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D Plots for Cartesian curves i. Plot of parabola $y = x^2$, $and\ y = sinx$, $y = tanx$ ii. Plot of Perfect parabola $y = x^2$ iii. Change the color (Green) of perfect color perfect parabola iv. Change the color (Red) of perfect color perfect parabola v. Draw a red color with ' - -' perfect parabola vi. Draw a red color with ' *' perfect parabola vii. Draw a red color with axes label perfect parabola viii. Draw a perfect parabola with animation ix. Draw parametric curves cycloid a. $x = a(t + sint)$, $y = a(1 + cost)$ b. x = a(t – sint); y = a (1-cost) c. x=a(t-sint); y=a(1+cost) d. x=a(t + sint), y=a(1-cost) e. x=t^2 , y=t-(t^3/3)
2	Plotting of polar i) Cardiod r = a+b cosθ ii) Cardiod r=a+bcosθ, if a>b iii) Cardiod r = a+b cosθ, if b>a iv) Draw polar petals r = 2 cos4θ

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	v) R=2cosθ, r=2cos7θ, r=2 cos6θ, r=2cos5θ vi) Cardoid $r = a(1 + cos\theta)$ vii) Cardoid $r = a(1 - cos\theta)$ viii) Draw histogram curves
3	i)Plot 3-d Surface $z = x^2 + y^2$ ii) Plot 3-d color Surface $z = x^2 + y^2$ iii) Plot 3-d Surface $z = x^4 + y^4$ iv) Plot 3-d Surface $z = sintcost$
4	i) To calculate volume of a sphere ii)To Evaluate $\int_0^5 xdx$ and $\int_0^5 sinxdx$
5	i)Solve first order o.d.e.$\frac{dy}{dx} = e^{-x}$, $x = 0$, $y = 0$ ii) Solve first order o.d.e.$\frac{dy}{dx} + e^{-x}y = x^2$, $x = 0$, $y = 0$ Note: Change the initial conditions and observe the graph
6	i)Solve $2y'' - 5y' + y = 0$, $y(3) = 6, y'(3) = 1.$ ii)Solve $y'' + 3y' - 10y = 0$, $y(0) = 1, y'(0) = 3$
7	i) Define polynomial and to solve polynomials. ii) Derivatives of polynomials (first,second and higher order)
8	i) Plot Taylor's series of continuous function of single variable. ii)Addition of two matrices iii) Subtraction of two matrices iv) Multiplication of two matrices v)Multiplication by a scalar
9	i) Inverse of a matrix ii) Identity matrix iii) to obtain the sum of diagonal elements of the matrix.
10.	i) Find the rank of a matrix ii) Find the row reduced echelon form of a matrix.

	iii) Find the rank of a matrix after row reducing the matrix

BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

BE FIRST SEMESTER SYLLABI

CIVIL STREAM-I

2022-2023

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BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE

DEPARTMENT OF MATHEMATICS

Syllabus for B.E. I semester for academic Year 2022-2023 (Draft copy)

(For students admitted to I year in 2022-2023)

Code:22UMA102C	Mathematics for Civil Sciences-I	Credits 04 (3 : 0 : 2)
Hours / Week: 03 + 02		Total Hours : 40
Branch: CV		CIE Marks : 50
Course Type: Integrated (Theory/Practical)		SEE Marks : 50
Total Hours of Pedagogy: 40 hours Theory + 10 to12 Lab slots		SEE: 03 Hours
BoS:		Total Marks: 100

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

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5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:

- As an introduction to new topics (pre-lecture activity).
- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).
- As a model solution of some exercises (post-lecture activity).

UNIT-I Calculus	10 Hrs.
Introduction to polar coordinates and curvature relating to Civil engineering. Polar coordinates, Polar curves, angle between the radius vector and the tangent, and angle between two curves. Pedal equations. Curvature and Radius of curvature (No proof) - Cartesian, Parametric, Polar and Pedal forms. Problems. **Self-study:** Center and circle of curvature, evolutes and involutes. **Applications:** Structural design and paths, Strength of materials, Elasticity. **(RBT Levels: L1, L2 and L3)** Web links and Video Lectures (e-Resources):	

1. Introduction to Polar coordinates : Unit-I
   https://youtu.be/aSdaT62ndYE
2. Polar Equation to Rectangular equation
   https://youtu.be/flTz_pSzVFI
3. Rectangular equation to polar wquation
   https://youtu.be/fTBkr27r3pw

4. How to Graph polar equations
   https://youtu.be/jO4lwddfeDA
5. Examples on angle between radius vector and tangent
   https://youtu.be/_RZx377w4nc
6. Curvature
   https://youtu.be/EMo0vaphXpU
   https://youtu.be/ugtUGhBSeE0
   https://youtu.be/gspjhwSNMWs

UNIT-II Series Expansion and Multivariable Calculus	10 Hrs.

Introduction to series expansion and partial differentiation in the field of Civil engineering applications.
Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems.
Indeterminate forms - L'Hospital's rule (0/0,∞/∞,∞-∞), problems.
Partial differentiation, total derivative - differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables - Problems.
Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.
Applications: Computation of stress and strain, Errors and approximations, Estimating the critical points and extreme values.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Why Taylors and Maclaurins series UNIT-II
   https://youtu.be/eX1hvWxmJVE
   https://youtu.be/LDBnS4c7YbA
2. Indeteminate forms
   https://youtu.be/oEEXnyupzdo
   https://youtu.be/Gh48aOvWcxw
3. Partial differentiation and its visualization
   https://youtu.be/AXqhWeUEtQU
   https://youtu.be/dfvnCHqzK54

UNIT-III Ordinary Differential Equations (ODEs) of first and Higher order	10 Hrs.

Introduction to first and higher-order ordinary differential equations pertaining to the applications for Civil engineering.

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\partial x)$ and $1/M\ (\partial N/\partial x - \partial M/\partial y)$. Orthogonal trajectories and Newton's law of cooling.

Higher-order linear ODEs with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems.

Self-Study: Applications of ODEs in Civil Engineering problems like bending of the beam, whirling of shaft. Formulation and solution of Cantilever beam. Finding the solution by the method of Undetermined coefficients.

Applications: Rate of Growth or Decay, Conduction of heat. Oscillations of a spring, Transmission lines, Highway engineering.

(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear and Bernouli's equation
   https://youtu.be/gd1FYn86P0c
   https://youtu.be/BoI_ej-T0V4
   https://youtu.be/Ez8_t8X2bAI
   https://youtu.be/mcjchG4q2Yk

2. Second order DE
   https://youtu.be/uI2xt8nTOlQ
   https://youtu.be/AYMPeaYz0Tg?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/u5h0pQC9xmc?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/L8dAVcRC1b8?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/wkSjoYHatww?list=PLX2gX-ftPVXVQkHNzmZGsdSaZt7GExpmC
   https://youtu.be/q2cJPho-qx0
   https://youtu.be/O-9-IXO923o

3. How to solve second order DE using scilab
   https://youtu.be/tOL5ErEOK90
   https://youtu.be/tg_QM9b1bdA
   https://youtu.be/UkZmROLRzRA

UNIT-IV Linear Algebra	10 Hrs.

Introduction of linear algebra related to Civil Engineering applications.
Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.
Self-Study: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.
Applications: Structural Analysis, Balancing equations.
(RBT Levels: L1, L2 and L3)

Web links and Video Lectures (e-Resources):

1. Linear Algebra : Introduction
https://youtu.be/0oGJTQCy4cQ?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

2. system of equations
https://youtu.be/TD069mR-AF0
https://youtu.be/EC2mgUZyzoA?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/AUqeb9Z3y3k?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng
https://youtu.be/GeDEr4Px2yc
https://youtu.be/Rks9llk1w2o

3. Reduced row echelon form
https://youtu.be/ccadWg3ZwEg
https://youtu.be/L0CmbneYETs?list=PLi5giWKc4eO1G8oX3ft8ZuLQr4Y4idgng

4. Rank of a Matrix
https://youtu.be/JahgX2Bi6cQ

Suggested Learning Resources:

1. Maurice D weir, Joel Hass and Frank R. Giordano, "Thomas calculus", Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing's Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014
5. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
6. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
7. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and

II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
8. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
9. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
10. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
11. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course Objectives:

The goal of the course **Mathematics-I for Civil Engineering stream** (**22UMA102**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables for Civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Apply the knowledge of calculus to solve problems related to polar curves.
CO2: Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3: Analyze the solution of ordinary differential equations.
CO4: Make use of matrix theory for solving for system of linear equations and compute Eigen values and eigenvectors.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	0	0	0	0	0	0
CO3	3	2	0	0	0	0	0	0	0	0	0	0

CO4	3	2	0	0	0	0	0	0	0	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

CIE and SEE Assessment of Integrated Course(IC)

1.0 Assessment Details (For CIE and SEE)

- The weightage for Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50)
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50)
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE, and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together

2.0 Continuous Internal Evaluation (CIE) :

Theory Component : 30 Marks
Practical Component : 20 Marks
Total : 50 Marks

3.0 Theory Component (30 marks):

- Two CIE tests and each test for 40 marks (1½ hours), Totaling to 80Marks, later scale down to 40 Marks
- Assignment/Seminar/Course project/Case study/Quiz etc.: 10 Marks
  (Each Self study component = 1 marks, and Each video component = 1.5 Marks i.e 4 marks + 6 Marks = 10 Marks)

Total marks for CIE theory component: 50
Later scale down to : 30
Minimum marks required for eligibility to SEE : 12

4. 0 Practical Component (20 marks):

- On completion of every experiment/program in the laboratory, the students shall be evaluated & marks shall be awarded on the same day
- The laboratory component for CIE shall be for 50 marks later scale down to 20 marks
- 30 marks for regular conduction and journal write-up/report

- Each experiment shall be evaluated for 3 marks. 10 experiments, 30 marks. Minimum marks to be scored is 12
- 20 marks for lab CIE test (duration 03 hours). 5 marks for write-up, 10 marks for conduction, calculation, result etc. and 5 marks for viva-voce
- The laboratory test shall be conducted at the end of the semester
- Laboratory test shall be conducted with two internal faculty members
- Minimum marks to be scored is 8

Total marks for CIE Practical component: 50
Later scale down to : 20
Minimum marks required for eligibility to SEE : 08

5.0 CIE for integrated course: 50 marks

Eligibility for SEE : 20 marks and satisfactory attendance
Theory component : 30 marks
Minimum : 12 marks
Practical component : 20 marks
Minimum : 8 marks

NOTE:

- If a student fails to score minimum marks and satisfactory attendance either in theory or practical component in course/s, he/she will be awarded NE grade
- NE grade course/s to be re-registered by the students whenever offered

a. Semester End Examination (SEE)

SEE for Integrated course

- Theory SEE will be conducted for 100 marks as per the scheduled time table for a course(duration 03 hours) and later scaled down to 50 marks
- The question paper will have part A and B
- Part A compulsory question (1 or 2 marks) for 20 marks
- Part B shall have 4 units, each unit two questions for 20 marks each, student has to answer any one full question from each unit, 80 marks

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have CIE component only

Note:

- If a student fails in course/s, 'F' grade will be awarded
- 'F' grade awarded course/s, student has to reappear for SEE whenever next conducted

7.0 Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks - 30) in the theory component and 08 (40% of maximum marks -20) in the practical component
- The laboratory component of the IC shall be for CIE only
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 40% (20 marks out of 50) in CIE, 35% (18 Marks out of 50) in the SEE and a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

List of Laboratory experiments (2 hours/week per batch/ batch strength 15)10 lab sessions + 1 repetition class + 1 Lab Assessment

1	2D Plots for Cartesian curves i. Plot of parabola $y = x^2$, $and\ y = sinx$, $y = tanx$ ii. Plot of Perfect parabola $y = x^2$ iii. Change the color (Green) of perfect color perfect parabola iv. Change the color (Red) of perfect color perfect parabola v. Draw a red color with ' - -' perfect parabola vi. Draw a red color with ' *' perfect parabola vii. Draw a red color with axes label perfect parabola viii. Draw a perfect parabola with animation ix. Draw parametric curves cycloid a. $x = a(t + sint)$, $y = a(1 + cost)$ b. x = a(t – sint); y = a (1-cost) c. x=a(t-sint); y=a(1+cost) d. x=a(t + sint), y=a(1-cost) e. x=t^2 , y=t-(t^3/3)
2	Plotting of polar i) Cardiod r = a+b cosθ

	ii) Cardiod r=a+bcosθ, if a>b iii) Cardiod r = a+b cosθ, if b>a iv) Draw polar petals r = 2 cos4θ v) R=2cosθ, r=2cos7θ, r=2 cos6θ, r=2cos5θ vi) Cardoid $r = a(1 + cos\theta)$ vii) Cardoid $r = a(1 - cos\theta)$ viii) Draw histogram curves
3	i)Plot 3-d Surface $z = x^2 + y^2$ ii) Plot 3-d color Surface $z = x^2 + y^2$ iii) Plot 3-d Surface $z = x^4 + y^4$ iv) Plot 3-d Surface $z = sintcost$
4	i) To calculate volume of a sphere ii)To Evaluate $\int_0^5 xdx$ and $\int_0^5 sinxdx$
5	i)Solve first order o.d.e.$\frac{dy}{dx} = e^{-x}$, $x = 0$, $y = 0$ ii) Solve first order o.d.e.$\frac{dy}{dx} + e^{-x}y = x^2$, $x = 0$, $y = 0$ Note: Change the initial conditions and observe the graph
6	i)Solve $2y'' - 5y' + y = 0$, $y(3) = 6, y'(3) = 1.$ ii)Solve $y'' + 3y' - 10y = 0$, $y(0) = 1, y'(0) = 3$
7	i) Define polynomial and to solve polynomials. ii) Derivatives of polynomials (first,second and higher order)
8	i) Plot Taylor's series of continuous function of single variable. ii)Addition of two matrices iii) Subtraction of two matrices iv) Multiplication of two matrices v)Multiplication by a scalar
9	i) Inverse of a matrix ii) Identity matrix iii) to obtain the sum of diagonal elements of the matrix.

10.	i) Find the rank of a matrix ii) Find the row reduced echelon form of a matrix. iii) Find the rank of a matrix after row reducing the matrix