MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

Hassan – 573202, Karnataka, India

BACHELOR OF ENGINEERING

DEPARTMENT OF MATHEMATICS

SYLLABUS

I & II Semester (2024 Admitted Batch)

Academic year 2024-25

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Scheme of evaluation (Theory courses)

Assessment	Marks
Three CIE's	30
Integrated LAB	20
SEE	50
Total	100

Scheme of evaluation (lab courses-IPCC)

Assessment	Marks
Manual solving	04
Record writing and observation	03
Executing the Programme with correct output	08
Final CIE	05
Total	20

Examination	Maximum marks	Minimum marks to qualify
CIE	50	20(12 +8)
SEE	50	20

Course Title	Mathematics-I for Computer Science Engineering stream		
Course Code	MAT4S11	**(L-T-P)**	(3-1-2)4
Exam	3hours	**Hours / Week**	06
SEE	50 Marks	**Total Hours**	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute Taylor series, partial derivatives, pedal equation, curvature and solve simple problems connected with multiple integrals, Counting principle, bayes theorem on probability, evolutes, errors and approximation.	PO1	-
CO2	Inspect for extreme values [the maximum output of a function (experimental data)] analyze the region of integration connected with multiple integrals so as to determine the area, volume. (remove add Probability)	PO1, PO2	-
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing in put or output of the given experimental data (interpolation/ extrapolation).	PO1	-
CO4	Model the real-life problems/engineering application problems and solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE –1	**10 Hrs.**

Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability, Statement of Taylor's theorem, Taylor's series for a function of one variable - Illustrative examples. Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations,Curvature and Radius of curvature in polar and pedal form.

Applications : Extreme values of a single variable- cost and revenue.

Self Study: Brief introduction to evolutes and involutes. Indeterminate forms - L'Hospital's rule problems. Extreme values of a single variable. Expansion of a function as a Maclaurin's series for function of one variable.

MODULE –2	10 Hrs.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians, Statement of Taylor theorem for a function of two variables and illustrative examples on Taylor's series. Lagrange's method of undermined multifliers.

Applications -To express the experimental data interms of quadratic equation (function of one variable-curve fitting) and hence to find the maximum value of the experimental data.Application of total derivative- controlling sag in an uniformly loaded beam.

Self Study: Extreme values of functions of two variables. Errors and approximations- Application in Computer Science Engineering. Expansion of a function as a Maclaurin's series for function of two variable.

MODULE –3	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field.

Applications- General applications connected with business cost and revenue. Errors in finite precision.

Self Study: Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula to find the relation between the input and output of an experimental data using suitable interpolation formula. Application of arc length- to make sheets of corrugated iron roofing. Approximate solutions of ODE related to Computer Science Engineering.

MODULE – 4	10 hrs.

Probability Theory: Counting principle - sum rule, product rule, permutation and combination, review of probability- applications of Baye's theorem. Mean, Standard deviation of the experimental data, discrete random variable, Binomial probabilty distribution,Computation of Mean and Standard Deviation of a Binomial distribution. Poisson probabilty distribution. Computation of Mean and Standard Deviation of a Poisson distribution Curve fitting: Linear equation $ax + by = c$,

Quadratic equation $ax^2 + bx + c = y$ by least square method.

Application - Experimental data for applications of probability in Computer science.

Self Study: Contionous random variable. Computation of pdf,cdf,Mean and Standard Deviation.

Tutorial component:

1. Examples on Taylor series for function of two variables(L3)
2. Examples on Extreme values- L3
3. Discussion on the use of extreme values in real life application problems such as predicting the share price in normal conditions. (L4)
4. Activity-Students are instructed to bring experimental data from various engineering department and are asked to fit the curve/equation. Also predicting the future data. - L3 & L4
5. Instructed to write a note on the use/applications of
   i. Root finding
   ii. Interpolation - L4
   iii. Numerical integration
6. Examples on Interpolation and how to predict the data using Interpolation – L4
7. Examples on multiple integrals - L3 & L4
8. Applications to field and wave theory. - L3 & L4
9. Applications of probability in particular(Bayes theorem,Binomial & Poison distributions).
10. Examples on Bayes theorem,Binomial and Poisson distribution. - L3 & L4
11. Examples on root finding- L3
12. Examples on Interpolation- L3
13. Example problems on application of numerical integration - L3
14. Example problems on application of numerical integration connected with L4.

Practical component:

List of Programmes:

1. Computation of roots using - bisection method, Newton Raphson method.
2. To compute the extreme values of a function of two variables.
3. Interpolation by- Newton's forward & Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule)
6. Finding angle between polar curves & computing the curvature of a given curve.
7. Finding partial derivatives, Jacobians.
8. Computing probability distribution(Binomial & Poisson).
9. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Text Books :

1.Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

2.Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India P.V.T Ltd. 8th Edition, (Wiley student edition) 2004.

3.Thomas Finney, Calculus, 9th edition, Pearson education, 2002

Discrete mathematics by J.K. Sharma.

Reference Books:

1.R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age International p.v.t. Publishers, 6th edition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

MOOC Course:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**													
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics-I for Civil Engineering stream		
Course Code	MAT4C11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute Taylor series, partial derivatives, pedal equation, curvature, and solve simple problems connected with multiple integrals, evolutes, errors and approximation.	PO1	-
CO2	Inspect for extreme values [the maximum output of a function (experimental data-)], analyze the region of integration connected with multiple integrals so as to determine the area, volume.	PO1, PO2	-
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input or output of the given experimental data (interpolation/ extrapolation).	PO1	-
CO4	Model the real-life problems/engineering application problems and solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability, Statement of Taylor's theorem, Taylor's series for a function of one variable - Illustrative examples. Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations. Curvature and Radius of curvature in polar and pedal form.

Applications -Stiffness of a beam, strength of a beam.

Self Study: Brief introduction to evolutes and involutes. Indeterminate forms - L'Hospital's rule, problems. Extreme values of a single variable. Expansion of a function as a Maclaurin's series for function of one variable.

MODULE - 2	10 Hrs.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiationand Illustrative examples. Evaluation of Jacobians, Statement of Taylor theorem, Taylor's series for a function of two variables and illustrative examples. Lagrange's method of undermined multifliers.

Applications - To express the experimental data in terms of quadratic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting). Application of total derivative- controlling sag in an uniformly loaded beam.

Self Study: Extreme values of functions of two variables. Errors and approximations- Application in Civil engineering. Expansion of a function as a Maclaurin's series for function of two variable.

MODULE - 3	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, **Finite differences**: Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule, Illustrative examples from engineering field.

Applications - Finding projectile height from its acceleration, initial velocity and initial position. Estimation of discharge in a stream – an application to hydrology, an application to surveying. Moment, mass and center of mass of a thin rod.

Self Study: Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula to find the relation between the input and output of an experimental data using suitable interpolation formula. Application of arc length- to make sheets of corrugated iron roofing. Approximate solutions of ODE related to Civil Engineering.

MODULE - 4	10 hrs.

Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form. Application to find area and volume. Evaluation of triple integrals in Cartesian co-ordinate system. Evaluation of triple integrals in cylindrical and Spherical co-ordinate system.

Applications - To find mass and moment for the thin plate covering the region in the xy plane. Mass and moment for the object in space. Moment of inertia of a circle about its diametrical axis- an application to engineering Mechanics, computation of deflection of beams using double integral.

Self-Study: Definitions and properties of Beta and gamma functions, Simple Problems.

Tutorial component:

1. Examples on Taylor series for function of two variables(L3)
2. Examples on Extreme values- L3
3. Discussion on the use of extreme values in real life application problems such as predicting the share price in normal conditions. (L4)
4. Activity-Students are instructed to bring experimental data from various engineering department and are asked to fit the curve/equation. Also predicting the future data. - L3 & L4
5. Instructed to write a note on the use/applications of
   i. Root finding
   ii. Interpolation - L4
   iii. Numerical integration
6. Examples on Interpolation and how to predict the data using Interpolation – L4
7. Examples on multiple integrals - L3 & L4
8. Applications to field and wave theory. - L3 & L4
9. Applications of probability in particular(Bayes theorem,Binomial & Poison distributions).
10. Examples on Bayes theorem,Binomial and Poisson distribution. - L3 & L4
11. Examples on root finding- L3
12. Examples on Interpolation- L3
13. Example problems on application of numerical integration - L3
14. Example problems on application of numerical integration connected with L4.

Practical component:

List of Programmes:

1. Computation of roots using - bisection method, Newton Raphson method.
2. To compute the extreme values of a function of two variables.
3. Interpolation by- Newton's forward & Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule)
6. Finding angle between polar curves & computing the curvature of a given curve.
7. Finding partial derivatives, Jacobians.
8. Computing probability distribution(Binomial & Poisson).
9. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

NOTE:

1.Proofs are not required for any theorems and properties.

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**													
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics -I for Electrical and Electronics Engineering stream		
Course Code	MAT4E11	**(L-T-P)**	(3-1-2)4
Exam	3hours	**Hours / Week**	06
SEE	50 Marks	**Total hours**	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute Taylor series, partial derivatives, pedal equation, curvature, and solve simple problems connected with multiple integrals, Counting principle, bayes theorem on probability, evolutes, errors and approximation.	PO1	-
CO2	Inspect for extreme values [the maximum output of a function (experimental data-)], analyze the region of integration connected with multiple integrals so as to determine the area, volume.	PO1, PO2	-
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input, or output of the given experimental data (interpolation/extrapolation).	PO1	-
CO4	Model the real-life problems/engineering application problems and solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1	**10 Hrs.**

Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability, Statement of Taylor's theorem, Taylor's series for a function of one variable - Illustrative examples.Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in polar and pedal form.

Applications -Extreme values of a single variable- to find the peak current in an circuit.

Self Study: Brief introduction to evolutes and involutes. Indeterminate forms - L'Hospital's rule, problems. Extreme values of a single variable. Expansion of a function as a Maclaurin's series for function of one variable.

MODULE - 2	10 Hrs.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians, Statement of Taylor theorem , Taylor's series for a function of two variables and illustrative examples.Lagrange's method of undermined multifliers.

Applications - To express the experimental data in terms of quadratic equation (function of one variable) and hence to find the maximum value of the experimental data (curve fitting). Application of total derivative- controlling sag in an uniformly loaded beam.

Self Study: Extreme values of functions of two variables. Errors and approximations- Application in Electrical Engineering.Expansion of a function as a Maclaurin's series for function of two variable.

MODULE - 3	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule, Illustrative examples from engineering field.

Applications- Application of root finding- ion concentration, Forcing electrons together, To estimate the total amount of pollutant produced due to production of electricity by burning oil.

Self Study: Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula to find the relation between the input and output of an experimental data using suitable interpolation formula. Application of arc length- to make sheets of corrugated iron roofing. Approximate solutions of ODE related to Electrical Engineering.

MODULE - 4	10 hrs.

Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form. Application to find area and volume. Evaluation of triple integrals in Cartesian co-ordinate system.

Probability Theory: Brief introduction to probability, applications of Baye's theorem, discrete random variable, binomial probability distribution.Computation of Mean and Standard Deviation of a Binomial distribution.

Application - Brief note on the applications connected with field and wave theory. Calculation optimal power in an electrical circutes.

Self-Study: Definitions and properties of Beta and gamma functions, Simple Problems. Poisson probability distribution. Computation of Mean and Standard Deviation of a Poisson distribution.

Tutorial component:

1. Examples on Taylor series for function of two variables(L3)
2. Examples on Extreme values- L3
3. Discussion on the use of extreme values in real life application problems such as predicting the share price in normal conditions. (L4)
4. Activity-Students are instructed to bring experimental data from various engineering department and are asked to fit the curve/equation. Also predicting the future data. - L3 & L4
5. Instructed to write a note on the use/applications of
   i. Root finding
   ii. Interpolation - L4
   iii. Numerical integration
6. Examples on Interpolation and how to predict the data using Interpolation – L4
7. Examples on multiple integrals - L3 & L4
8. Applications to field and wave theory. - L3 & L4
9. Applications of probability in particular(Bayes theorem,Binomial & Poison distributions).
10. Examples on Bayes theorem,Binomial and Poisson distribution. - L3 & L4
11. Examples on root finding- L3
12. Examples on Interpolation- L3
13. Example problems on application of numerical integration - L3
14. Example problems on application of numerical integration connected with L4.

Practical component:

List of Programmes:

1. Computation of roots using - bisection method, Newton Raphson method.
2. To compute the extreme values of a function of two variables.
3. Interpolation by- Newton's forward & Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule)
6. Finding angle between polar curves & computing the curvature of a given curve.
7. Finding partial derivatives, Jacobians.
8. Computing probability distribution(Binomial & Poisson).
9. Expressing the function of one variable & two variables using Taylor's & Maclaurin's series.

NOTE:

1.Proofs are not required for any theorems and properties.

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Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**													
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics-I for Mechanical Engineering stream		
Course Code	MAT4M11	**(L-T-P)**	(3-1-2)4
Exam	3hours	**Hours / Week**	06
SEE	50 Marks	**Total Hours**	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute Taylor series, partial derivatives, pedal equation, curvature, and solve simple problems connected with multiple integrals, evolutes, errors and approximation	PO1	-
CO2	Inspect for extreme values [the maximum output of a function (experimental data)], analyze the region of integration connected with multiple integrals so as to determine the area, volume.	PO1, PO2	-
CO3	Apply the numerical methods to compute: The area of a region, root (input) of an equation for the given output, missing input, or output of the given experimental data (interpolation/ extrapolation).	PO1	-
CO4	Model the real-life problems/engineering application problems and solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1 — 10 Hrs.

Differential Calculus: Definition of average growth rate and its illustrative examples. Definition of differentiability, Statement of Taylor's theorem, Taylor's series for a function of one variable - Illustrative examples.Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in polar and pedal form.

Applications -Stiffness of a beam, strength of a beam.

Self Study: Brief introduction to evolutes and involutes. Indeterminate forms - L'Hospital's rule, problems. Extreme values of a single variable. Expansion of a function as a Maclaurin's series for function of one variable.

MODULE - 2	10 Hrs.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiationand Illustrative examples. Evaluation of Jacobians, Statement of Taylor theorem, Taylor's series for a function of two variables and illustrative examples, Lagrange's method of undermined multifliers.

Applications-Applications of Optimization (extreme values of a single variable) - metal fabrication. Application of total derivative- controlling sag in an uniformly loaded beam.

Self Study: Extreme values of functions of two variables,Errors and approximations- Application in Mechanical Engineering. Expansion of a function as a Maclaurin's series for function of two variable.

MODULE - 3	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule, Illustrative examples from engineering field.

Applications - Amount of work required to put a satellite in an orbit.To estimate the length of the tank in a design of an aeroplane which has a constant cross sectional area in each wing.

Self Study: Inverse Lagrange's interpolation formula, central difference formula- Bessel's formula to find the relation between the input and output of an experimental data using suitable interpolation formula. Application of arc length- to make sheets of corrugated iron roofing. Approximate solutions of ODE related to Mechanical Engineering.

MODULE - 4	10 hrs.

Multiple Integrals: Introduction to coordinate systems. Double integrals in Cartesian & Polar form. Application to find area and volume. Evaluation of triple integrals in Cartesian co-ordinate system. Evaluation of triple integrals in cylindrical and Spherical co-ordinate system.

Applications - to find mass and moment for the thin plate covering the region in the xy plane. Mass and moment for the object in space. Moment of inertia of a circle about its diametrical axis- an application to engineering Mechanics, computation of deflection of beams using double integral.

Self-Study: Definitions and properties of Beta and gamma functions, Simple Problems.

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Practical component:

List of Programmes:

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Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India P.v.t. Ltd. 8th Edition, (Wiley student edition) 2004.

3. Thomas Finney, Calculus, 9th edition, Pearson education, 2002 Discrete mathematics by J.K. Sharma.

Reference Books:

1.R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age International p.v.t. Publishers, 6th edition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

MOOC Course:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**													
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

Hassan – 573202, Karnataka, India

BACHELOR OF ENGINEERING

DEPARTMENT OF PHYSICS

SYLLABI OF PHYSICS COURSES FOR UG PROGRAMMES

Academic year 2024-25

Vision

To build a foundation for excellence and encourage the development of the Institution as a premier Institution by imparting the quality education in the process of understanding fundamentals of physics based on which the present and future technology is established.

Mission

- To enlighten the students and realize their talents both in theory and experimental Physics, through dedication to teach, commitment towards students and innovative instructional methods.
- To organize and sustain efficient administration in the department to contribute to the development of the Institution.

Scheme of evaluation for theory (Integrated) courses

Assessment	Marks
Three CIE's	30
Lab CIE	20
SEE	50
Total	100

Examination		**Maximum marks**	**Minimum marks to qualify**
CIE	Theory	30	12
	Lab	20	08
SEE		50	20

Scheme of evaluation for open elective course

Assessment	Marks
Three CIE's	50
SEE	50
Total	100

Examination	**Maximum marks**	**Minimum marks to qualify**
CIE	50	20
SEE	50	20

Course Title	PHYSICS FOR CIVIL ENGINEERING		
Course Code	PHY4C12/22	(L-T-P)C	(3-1-2)4
SEE duration	3hour	Hours/Week	06 (4T+2L)
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Course Type	IPCC

Course Objective:

The objective of the course is to make students learn principle sand theories of physics in **civil and allied engineering** fields and to develop effective solutions for engineering problems.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	PO	PSO
1.	Discuss the concepts of vibrations, rigid body dynamics, crystallography, photonics and building acoustics.	1	-
2.	Interpret the dynamics of rigid bodies, applications of crystallography and photonics, and characteristics of building acoustics and ultrasonics.	1	-
3.	Solve problems on rigid body dynamics, crystallography, laser, and sound waves.	1	-
4.	Verify experimentally the laws and concepts of rigid body dynamics, crystallography, photonics, and resonance.	1, 10	-

Course Contents:

MODULE–1	10Hrs.

Vibrations and Rigid Body Dynamics

Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency, Resonance. Condition for amplitude resonance. Applications of resonance.

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time period of oscillation. Mention its uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever.

Numerical problems on amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.

MODULE–2	10Hrs.

Crystallography

Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. 7 basic crystal systems. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg's law. Bragg's X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. De Broglie's concept of matter waves. Exploitation of wave nature of electrons in SEM, list of other applications

Numerical problems on Miller indices, Interplanar space, Bragg's law.

MODULE–3	10 Hrs.

Photonics

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser – construction and working, Qualitative discussion of measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE– 4	10 hrs.

Acoustics and ultrasonics

Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (No derivation), Eyring's formula (No derivation). Comparison of Eyring's and Sabine's formula, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Insulation,

Ultrasonics. Non-destructive testing of materials using ultrasonics. Measurement of velocity of ultrasonic waves and elastic constants in solids and liquids.

Numerical Problems on reverberation time, absorption power and absorption coefficient, Sabine's formula, Eyring's formula.

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011

2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.

ReferenceBooks:

1. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998.

2. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.

Massive Open Online Courses (MOOC) :

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview

2. https://onlinecourses.nptel.ac.in/noc23_ar11/preview

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3											
CO4	3									1		

Plan for tutorial classes (PHY4C12/22)

Every fourth hour of physics in a week is scheduled for tutorial class in the timetable.

Week	Topic
1	Numerical problems on amplitude and phase of forced vibrations and summarization of the topics taught during preceding three classes.
2	Numerical problems on time-period of oscillationand summarization of the topics taught during preceding three classes.
3	Numerical problems on bending moment and Young's Modulus/depression of a cantileverand summarization of the topics taught during preceding three classes.
4	Summarization of the topics of MODULE 1.
5	Numerical problems on Miller indicesand summarization of the topics taught during preceding three classes.
6	Numerical problems on Interplanar spaceand summarization of the topics taught during preceding three classes.
7	Numerical problems on Bragg's lawand summarization of the topics taught during preceding three classes.
8	Summarization of the topics of MODULE 2.
9	Numerical problems on Boltzmann factorand summarization of the topics taught during preceding three classes.
10	Numerical problems on V-number, Numerical apertureand summarization of the topics taught during preceding three classes.
11	Numerical problems on attenuationand summarization of the topics taught during preceding three classes.

12	Summarization of the topics of MODULE 3.
13	Numerical problems on reverberation timeand summarization of the topics taught during preceding three classes.
14	Numerical problems on absorption power and absorption coefficientand summarization of the topics taught during preceding three classes.
15	Numerical problems on Sabine's formula, Eyring's formulaand summarization of the topics taught during preceding three classes.
16	Summarization of the topics of MODULE 4.

Course Title	**PHYSICS FOR MECHANICAL ENGINEERING**		
Course Code	PHY4M12/22	**(L-T-P)C**	**(**3-1-2)4
SEE duration	3hour	**Hours/Week**	06 (4T+2L)
CIE (Theory) marks	30	**CIE (Practicals) marks**	20
SEE marks	50	**Type of Course**	IPCC

Course Objective:

The objective of the course is to make students learn principle sand theories of physics in **mechanical and allied engineering** fields and to develop effective solutions for engineering problems.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	PO	PSO
1.	Discuss the concepts of vibrations, rigid body dynamics, crystallography, photonics and thermoelectricity	1	-
2.	Interpret the dynamics of rigid bodies, applications of crystallography and photonics, and characteristics of thermoelectric materials.	1	-
3.	Solve problems on rigid body dynamics, crystallography, lasers and thermoelectric materials and devices.	1	-
4.	Verify experimentally the laws and concepts of rigid body dynamics, crystallography, photonics and resonance.	1,10	-

Course Contents

MODULE– 1	10Hrs

Vibrations and Rigid Body Dynamics

Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency. Resonance. Condition for amplitude resonance. Applications of resonance.

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time of oscillation. Mention of uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever.

Numerical problems on Amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.

MODULE– 2	10Hrs

Crystallography

Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. 7 basic crystal systems. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg's law. Bragg's X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. De Broglie's concept of matter waves. Illustration of wave nature of electrons in SEM, list of other applications.

Numerical problems on Miller indices, Interplanar space, Bragg's law.

MODULE– 3	10 hrs

Photonics

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser –construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation

MODULE– 4	10 hrs

Thermoelectric materials and devices

Thermoelectric phenomena. Thermo emf and thermo current, Seebeck effect. Variation of thermo emf with temperature, Peltier effect, Seebeck, Peltier and Thomson coefficients (Mention Expression), laws of thermoelectricity. Experimental demonstration of Peltier effect. Explanation of thermo emf based on Peltier effect. Thermo-electric power. Construction and Working of Thermoelectric generators (General). Construction and working of Thermoelectric coolers (Refrigerators), Construction and working of Exhaust (Automobiles).

Numerical Problems

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.

4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011
2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.
3. Brijlal N Subramanyam : Heat and Thermodynamics ISBN: 81-219-2813-3 S. Chand and Co. Ltd. New Delhi, Edition, 2007.

Reference Books:

1. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998
2. E-resources; NPTEL courses on Engineering physics.
3. Singal, Agarwal and Prakash : Heat, Thermodynamics and Statistical Physics, ISBN-13-9789350065235,Pragati Prakashan, India, 2017.
4. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.

Massive Open Online Courses (MOOC) :

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_cy37/preview

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3											
CO4	3									1		

Plan for tutorial classes (PHY4M12/22)

Every fourth hour of physics in a week is scheduled for tutorial class in the timetable.

Week	Topic
1	Numerical problems on amplitude and phase of forced vibrations and summarization of the topics taught during preceding three classes.
2	Numerical problems on time-period of oscillation and summarization of the topics taught during preceding three classes.
3	Numerical problems on bending moment and Young's Modulus/depression of a cantilever and summarization of the topics taught during preceding three classes.
4	Summarization of the topics of MODULE 1.
5	Numerical problems on Miller indices and summarization of the topics taught during preceding three classes.
6	Numerical problems on Interplanar space and summarization of the topics taught during preceding three classes.
7	Numerical problems on Bragg's law and summarization of the topics taught during preceding three classes.
8	Summarization of the topics of MODULE 2.
9	Numerical problems on Numerical problems on Boltzmann factor and summarization of the topics taught during preceding three classes.
10	Numerical problems on V-number, Numerical aperture and summarization of the topics taught during preceding three classes.
11	Numerical problems on attenuation and summarization of the topics taught during preceding three classes.
12	Summarization of the topics of MODULE 3.
13	Numerical problems on thermoelectric materials and summarization of the topics taught during preceding three classes.
14	Numerical problems on thermoelectric devices and summarization of the topics taught during preceding three classes.
15	Numerical problems on thermoelectric materials and summarization of the topics taught during preceding three classes.
16	Summarization of the topics of MODULE 4.

Course Title	PHYSICS FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM		
Course Code	PHY4E12/22	**(L-T-P)C**	(3-1-2)4
SEE duration	3hour	**Hours/Week**	06 (4T+2L)
CIE (Theory) marks	30	**CIE (Practicals) marks**	20
SEE marks	50	**Type of Course**	IPCC

Course Objective:

Objective of the course is to make students learn principles and theories of physics in electronics and electrical engineering fields and to develop effective solutions for engineering problems

Course Outcomes(COs): Upon completion of the course, students shall be able to:

#	Course outcomes	PO	PSO
1	Discuss the concepts of materials science, photonics and quantum mechanics	1	-
2	Interpret the laws of materials science, applications of photonics and quantum mechanics.	1	-
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1	-
4	Verify experimentally the laws and concepts of materials science, lasers, optical fibers and quantum mechanics.	1,10	-

Course Contents:

MODULE– 1	10Hrs

Photonics

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE– 2	10Hrs

Electrical Properties of Solids

Free electrons in metals. Classical free electron theory-assumptions. Drift velocity, Mean free path, Mean collision time, Relaxation time. Expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory–assumptions. Fermi energy. Fermi-Dirac distribution function (Fermi factor). Merits of quantum free electron theory.

Dielectric materials. Polarization and its types. Frequency dependence of polarizability and

permittivity. Expression for internal field. Claussius-Mossotti equation. Applications of dielectrics in capacitors, transformers, LEDs; OLED and QLED and microwave tunable devices.

Numerical problems on electrical conductivity, Fermi energy, and Claussius-Mossotti equation.

MODULE– 3	**10 hrs**

Semiconductors and Superconductors

Effects of impurity and temperature on electrical resistivity of metals. Effects of impurity and temperature on their electrical resistivity semiconductors. Electrical conductivity of a semiconductor (derivation). Applications in development of electronic devices (mention diodes, transistors, LEDs, etc.,)

Superconductors. Temperature dependence of electrical resistivity in superconductors. Meissner effect (qualitative). Critical magnetic field. Type I and Type II superconductors. BCS Theory. High temperature superconductors. Applications of superconductors; superconducting magnets, MRI, SQUID (to mention) and Maglev Vehicle (qualitative discussion).

Numerical problems on electrical conductivity and critical magnetic field

MODULE– 4	**10 hrs**

Quantum mechanics

Origin of quantum mechanics - Black body radiation spectrum, Wien's law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck's law. Evidence/explanation of dual nature of matter. Louis de Broglie hypothesis of matter waves. **Relationship between group velocity, phase velocity, particle velocity and velocity of light.** Characteristic properties of matter waves. Expression for de Broglie wavelength of electron, its application in SEM and TEM, and advent of nanotechnology (Qualitative). Schrodinger wave equation, wave function, Probability density & normalization of wave function (Max Born's interpretation). Eigen values and Eigen functions, **Application of Schrodinger wave equation for trapped particle and free particle; computation of eigen values and eigen functions.**

Numerical problems on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.

8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. Engineering physics: R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai Publishing Company (P) Ltd. Edition, 2011
2. Solid state physics: S O Pillai, ISBN-10: 9386070928, New Age International Pvt. Ltd, Eighth edition, 9 January 2018.

Reference Books:

1. Modern Physics, Kenneth S. Krane, ISBN-13: 9781118061145, John Wiley & Sons, Inc., 3rd Edition, 2012.
2. B.B. Laud - Lasers and non-linear optics, New Age International, ISBN: 9788122430561, 3rdEdition, 2015.
3. Fiber Optics: A K Ghatak and K Thyagarajan, ISBN-13: 978-0521577854, Cambridge University Press India Pvt. Limited, 1998.
4. E-resources; NPTEL courses on Engineering physics.
5. Physics laboratory manual, Dept. of Physics, Malnad College of Engineering, Hassan.

Massive Open Online Courses (MOOC) :

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_ph36/preview

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3											
CO4	3									1		

Plan for tutorial classes (PHY4E12/22)

Every fourth hour of physics in a week is scheduled for tutorial class in the timetable.

Week	Topic
1	Numerical problems on Boltzmann factor and summarization of the topics taught during preceding three classes.
2	Numerical problems on V-number, Numerical aperture and summarization of the topics taught during preceding three classes.
3	Numerical problems on attenuation and summarization of the topics taught during preceding three classes.
4	Summarization of the topics of MODULE 1.
5	Numerical problems electrical conductivity and summarization of the topics taught during preceding three classes.
6	Numerical problems on Fermi energy and summarization of the topics taught during preceding three classes.
7	Numerical problems on Claussius-Mossotti equationand summarization of the topics taught during preceding three classes.
8	Summarization of the topics of MODULE 2.
5	Numerical problems on electrical conductivity and summarization of the topics taught during preceding three classes.
10	Numerical problems on critical magnetic field and summarization of the topics taught during preceding three classes.
11	Numerical problems on critical magnetic field and summarization of the topics taught during preceding three classes.
12	Summarization of the topics of MODULE 3.
13	Numerical problems on Louis de Broglie equations, and summarization of the topics taught during preceding three classes.
14	Numerical problems on group velocity, phase velocity and summarization of the topics taught during preceding three classes.
15	Numerical problems on Eigenvalue equationand summarization of the topics taught during preceding three classes.
16	Summarization of the topics of MODULE 4.

Course Title	PHYSICS FOR COMPUTER ENGINEERING STREAM		
Course Code	PHY4S12/22	(L-T-P)C	(3-1-2)4
SEE duration	3hour	Hours/Week	06 (4T+2L)
CIE (Theory) marks	30	CIE (Practicals) marks	20
SEE marks	50	Type of Course	IPCC

Course Objective:

Objective of the course is to make students learn principles and theories of physics in computer science and allied engineering fields and to develop effective solutions for engineering problems

Course Outcomes(COs): Upon completion of the course, students shall be able to:

#	Course outcomes	PO	PSO
1	Discuss the concepts of materials science, photonics and quantum mechanics in computation.	1	-
2	Interpret the laws of materials science, applications of photonics and quantum mechanics.	1	-
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1	-
4	Verify experimentally the laws and concepts of materials science, lasers, optical fibers and quantum mechanics.	1,10	-

Course Contents:

MODULE 1	10 hrs

Free Electron Theory and Superconductivity

Free electron concept in metals. Classical free electron theory-assumptions. Drift velocity, mean free path, Mean collision time, Relaxation time. Mention of expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory–assumptions. Fermi-Dirac distribution function. Merits of quantum free electron theory**.** Effects of impurity and temperature on electrical resistivity of metals.

Superconductors. Temperature dependence of electrical resistivity in superconductors. Meissner effect (qualitative). Critical magnetic field. Type I and Type II superconductors. BCS Theory. High temperature superconductors. Applications of superconductors; MRI and SQUID.

Role of semiconducting and dielectric properties in computation; Elements of memory and processing of tasks in computation using transistors, resistors, capacitors.

Numerical problems on electrical conductivity, Fermi energy, and critical magnetic field

MODULE 2	10 hrs

Photonics

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser – construction and working, Measurement of pollutants (LIDAR), List of other applications: laser fencing, laser cutting, laser drilling, laser welding, laser-guided missiles, LASER Range Finder,

Road Profiling, Bridge Deflection, Speed Checker.

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. List of applications of optical fibers. Merits and demerits of optical fibers.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE 3	**10 hrs**

Quantum mechanics for computation

Origin of quantum mechanics - Black body radiation spectrum, Wien's law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck's law. Evidence/explanation of dual nature of matter. Louis de Broglie hypothesis of matter waves. **Relationship between group velocity, phase velocity, particle velocity and velocity of light.** Characteristic properties of matter waves. Expression for de Broglie wavelength of electron, its application in SEM and TEM, and advent of nanotechnology (Qualitative). Schrodinger wave equation, wave function, Probability density & normalization of wave function (Max Born's interpretation). Eigen values and Eigen functions, **Application of Schrodinger wave equation for trapped particle and free particle; computation of eigen values and eigen functions.**

Numerical problems on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.

MODULE 4	**10 hrs**

Elements of Quantum Computing

Introduction to quantum computers, difference between classical and quantum computers, exponential growth of quantum computers for artificial intelligence and deep learning. Qubits and working principle of their different types; SQUID, Photonic, NMR, Ion trap. Dirac bracket notation, Bloch sphere, quantum logic gates; single qubit logic gates and multi qubit logic gates. Heisenberg's uncertainty principle, Quantum tunneling, Quantum entanglement, quantum superposition. Quantum Superposition and Quantum Entanglement; circuit building. Operation of logic gates on single and multi-Qubits. Game on quantum superposition and quantum entanglement

Numerical problems: Logic gates operation on Qubits

List of experiments

1. Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.
6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.

Text Books:

1. **Engineering physics: R K Gaur and S L Gupta** ;*ISBN*: 9788189928223; *Dhanpat Rai Publishing* Company (P) Ltd. Edition: 2011
2. **Solid state physics: S O Pillai**; *ISBN*-10: 9386070928; New Age International Pvt. Ltd, Eighth edition: 9 January 2018.

Reference Books:

1. Modern Physics: Kenneth S. Krane;*ISBN*-13: *9781118061145* ; John Wiley & Sons, Inc., ; 3rd Edition, 2012.

2. Fiber Optics: A K Ghatak and K Thyagarajan; *ISBN*-13: 978-0521577854; Cambridge University Press India Pvt. Limited, 1998.

3. **Quantum computation and quantum information** - Michael A. Nielsen, Isaac L. Chuang - Cambridge University Press, 2004.\

Massive Open Online Courses (MOOC) :

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_ph29/preview

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3											
CO4	3									1		

Plan for tutorial classes (PHY4S12/22)

Every fourth hour of physics in a week is scheduled for tutorial class in the timetable.

Week	**Topic**
1	Numerical problems electrical conductivity and summarization of the topics taught during preceding three classes.
2	Numerical problems on Fermi energy and summarization of the topics taught during preceding three classes.
3	Numerical problems on Claussius-Mossotti equation and summarization of the topics taught during preceding three classes.
4	Summarization of the topics of MODULE 1.
5	Numerical problems on Boltzmann factor and summarization of the topics taught during preceding three classes.
6	Numerical problems on V-number, Numerical aperture and summarization of the topics taught during preceding three classes.
7	Numerical problems on attenuation and summarization of the topics taught during preceding three classes.
8	Summarization of the topics of MODULE 2.
5	Numerical problems on electrical conductivity and summarization of the topics taught during preceding three classes.
10	Numerical problems on critical magnetic field and summarization of the topics taught during preceding three classes.
11	Numerical problems on critical magnetic field and summarization of the topics taught during preceding three classes.
12	Summarization of the topics of MODULE 3.
13	Summarization of the topics taught during preceding three classes.
14	Summarization of the topics taught during preceding three classes.
15	Numerical problems Logic gates operation on Qubitsand summarization of the topics taught during preceding three classes.
16	Summarization of the topics of MODULE 4.

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

Hassan – 573202, Karnataka, India

BACHELOR OF ENGINEERING

DEPARTMENT OF CHEMISTRY

SYLLABUS

I AND II SEMESTERS

FIRST YEAR

Academic year 2024-25

VISION

To establish institutions of excellence and produce the best citizens who can contribute to global peace and prosperity.

MISSION

- To contribute to the qualified manpower of the nation.
- To provide excellent infrastructure and environment for quality education.
- To recruit and retain the finest faculty.
- To ensure enriching rewards to all stake holders.
- To fulfill social obligations in all possible ways.

Course Title	**CHEMISTRY FOR CIVIL ENGINEERING STREAM**		
Course Code	CHE4C12/22	**(L-T-P)C**	(3-1-2)4
SEE duration	3 hour	**Hours / Week**	06
CIE (Theory) marks	30	**CIE(Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	60

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	**Course outcomes**	**Mapping to POs**
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2& PO7

Course Contents:

MODULE –1	10 Hrs.

Water and its Treatment

Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.

Boiler feed water and boiler problems, Boiler scales and sludge's- meaning, formation, disadvantages and prevention, priming and foaming.

External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.

Internal treatment of water- phosphate conditioning & calgon treatment.

Desalination- Meaning, purification of water by reverse osmosis.

Potable water- Meaning, Standards of potable water, treatment of water for town supply**.** BOD and COD- definition, experimental determination of COD of the industrial waste water sample.

MODULE –2	10 Hrs.

Chemical Energy Sources and Engineering Materials

Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV.

Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerization, cyclisation, aromatization and dehydrogenation). Octane number &Cetane number. Knocking in IC engine. **Prevention of knocking** - Anti knocking agents (TEL & MTBE).

Green fuels:Power alcohol- introduction, advantages and disadvantages.B**iodiesel**- introduction, synthesis, advantages, and disadvantages.

Cement: Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.

MODULE –3	10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – Calomel electrode-construction, working and applications.

Ion selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells. Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Battery technology

Batteries- Definition, classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell& Methanol-O_2 fuel cell.

MODULE – 4	**10 hrs.**

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrialapplications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration(water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of p^{Ka} of vinegar using p^{H} sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using p^{H} sensors and simulation

D2. Estimation of copper in e-waste.

D3.Volumetric estimation of gypsum in Portland cement

D4. Searching suitable PDB file and target for molecular docking

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MOOC COURSES

https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy02/

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**2**	**3**					
CO2	**2**	**3**					
CO3	**3**	**2**					
CO4	**2**	**3**					**3**

Tutorial class topics

1.	Revision of water and its treatment
2.	Question paper of CIE and SEE on water and its treatment will be discussed
3.	Test will be given on water and its treatment
4.	Numerical problems on GCV and NCV will be discussed
5.	Question papers of CIE and SEE on chemical energy sources and engineering materials will be discussed
6.	Test will be given on chemical energy sources and engineering materials
7.	Revision of electrochemistry and battery technology
8.	Question papers of CIE and SEE on electrochemistry and battery technology will be discussed
9.	Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells will be discussed
10.	Revision of macromolecules for engineering applications
11.	Question papers of CIE and SEE on macromolecules for engineering applications will be discussed
12.	Test will be given on macromolecules for engineering applications

Course Title	CHEMISTRY FOR COMPUTER SCIENCE AND ENGINEERING STREAM		
Course Code	CHE4S12/22	**(L-T-P)C**	(3-1-2)4
SEE duration	3 hour	**Hours / Week**	06
CIE (Theory) marks	30	**CIE(Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	60

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2&PO7

Course Contents:

MODULE –1	10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics - Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites - introduction. **Fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber**.**

MODULE –2	10 Hrs.

Electrochemistry and Sensors

Electrochemistry

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of E.M.F of concentration cells.

Electrodes -Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas electrode and ion selective electrode.

Secondary reference electrodes – Calomel electrode- construction, working and applications.

Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells. Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Sensors: Introduction, working principle and applications of electrochemical sensors - Potentiometric sensors, Amperometric sensors, and Conductometric sensors. Optical sensors.

MODULE –3	10 Hrs.

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries- primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cell.

Green fuels:Power alcohol-introduction, advantages and disadvantages.

Biodiesel- Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE – 4	10 hrs.

Surface Finishing (PCB preparation)

Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of gold.

Electroless plating - Definition, distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Nickel and electroless plating of Copper in the manufacture of double-sided PCB.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method.

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of pKa of vinegar using p^H sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using pH sensors and simulation

D2. Estimation of copper in e-waste.

D3.Volumetric estimation of gypsum in Portland cement

D4. Searching suitable PDB file and target for molecular docking

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MOOC COURSES

https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy02/

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3					
CO2	2	3					
CO3	3	2					
CO4	2	3					3

Tutorial class topics

1.	Revision of macromolecules for engineering applications
2.	Question papers of CIE and SEE on macromolecules for engineering applications will be discussed
3.	Test will be given on macromolecules for engineering applications
4.	Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells are discussed
5.	Question papers of CIE and SEE on electrochemistry and sensorswill be discussed.
6.	Test will be given on electrochemistry and sensors
7.	Revision of energy, storage and conversion
8.	Question paper of CIE and SEE on energy, storage and conversion will be discussed
9.	Test will be given on energy, storage and conversion
10.	Revision of surface finishing
11.	Question papers of CIE and SEE on surface finishing are discussed
12.	Test will be given on surface finishing

Course Title	CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	CHE4E12/22	**(L-T-P)C**	(3-1-2)4
SEE duration	3 hour	**Hours / Week**	06
CIE (Theory) marks	30	**CIE(Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	60

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2&PO7

Course Contents:

MODULE –1	10 Hrs.

Electrochemistry and Analytical Techniques

Electrochemistry- Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst'sequation.

Concentration cell- Definition with example, derivation of emf of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal-metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrode – Calomel electrode - construction, working and applications.

Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells.

Analytical techniques: Introduction, principle and instrumentation: Colorimetric sensors – estimation of copper, Potentiometric sensors – estimation of iron and Conductometric sensors – estimation of weak acid.

MODULE –2	10 Hrs.

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries – primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cells.

Green fuels:Power alcohol-Introduction, advantages and disadvantages. **Biodiesel**- Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE –3	10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites- introduction**, Fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol,and Silicon rubber**.**

MODULE – 4	10 hrs.

Surface Finishing: Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of Gold.

Electroless plating - Definition, distinction between electroplating and electroless plating. Advantages of electroless plating. Electroless plating of Nickel.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

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A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

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B5. Estimation of total hardness of water by EDTA method

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C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

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C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using p^H sensors and simulation

D2. Estimation of copper in e-waste.

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COURSE ARTICULATION MATRIX

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CO2	2	3					
CO3	3	2					
CO4	2	3					3

Tutorial class topics

1.	Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells are discussed
2.	Question papers of CIE and SEE on electrochemistry and analytical techniques Will be discussed.
3.	Test will be given on electrochemistry and analytical techniques
4.	Revision of energy, storage and conversion
5.	Question paper of CIE and SEE on energy, storage and conversion will be discussed
6.	Test will be given on energy, storage and conversion
7.	Revision of macromolecules for engineering applications
8.	Question papers of CIE and SEE on macromolecules for engineering applications will be discussed
9.	Test will be given on macromolecules for engineering applications
10.	Revision of surface finishing
11.	Question papers of CIE and SEE on surface finishing are discussed
12.	Test will be given on surface finishing

Course Title	CHEMISTRY FOR MECHANICAL ENGINEERING STREAM		
Course Code	CHE4M12/22	(L-T-P)C	(3-1-2)4
SEE duration	3 hour	Hours / Week	06
CIE (Theory) marks	30	CIE(Practicals)/Activity marks	20
SEE marks	50	Total contact hours	60

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2 PO7

Course Contents:

MODULE –1	10 Hrs.

Chemical Energy Sources and Engineering materials

Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV.

Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerisation, cyclisation, aromatisation and dehydrogenation). Octane number & Cetane number. Knocking in IC engine. **Prevention of knocking** - anti knocking agents (TEL & MTBE).

Green fuels: Power alcohol- introduction, advantages and disadvantages.**Biodiesel**- introduction, synthesis, advantages and disadvantages.

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.

MODULE –2	10 Hrs.

Water and its Treatment

Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.

Boiler feed water and boiler problems, Boiler scales and sludges- meaning, formation, disadvantages and prevention, priming and foaming.

External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.

Internal treatment of water- phosphate conditioning & Calgon treatment.

Desalination- Meaning, purification of water by reverse osmosis. **Potable water**- Meaning, Standards of potable water, treatment of water for town supply**.** BOD and COD- definition, experimental determination of COD of the industrial waste water sample.

MODULE –3	10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation ofNernst equation.

Concentration cell- Definition with example, derivation of emf of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – calomel electrode-construction, working and applications.

Ion-selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Battery technology: Batteries- Definition, Classification of batteries- primary & secondary batteries. **Secondary batteries** - construction, working and industrial applications of Lead-acidbattery and Nickel -metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & Methanol-O_2 fuel cell.

MODULE –4	10 Hrs

Macromolecules for Engineering applications : Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrial applications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration(water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

List of experiments/Activities

A – Demonstration (any two) offline/virtual:

A1. Synthesis of polymer

A2. Synthesis of iron oxide nanoparticles

A3: Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch

A4. Determination of chloride content in the given water sample by Argentometric method

B – Exercise (compulsorily any 4 to be conducted):

B1. Conductometric estimation of acid mixture

B2. Potentiometric estimation of FAS using $K_2Cr_2O_7$

B3. Determination of pKa of vinegar using pH sensor

B4. Determination of rate of corrosion of mild steel by weight loss method

B5. Estimation of total hardness of water by EDTA method

C – Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor

C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method

C4. Estimation of Sodium present in soil/effluent sample using flame photometry

C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

D – Open Ended Experiments (any two):

D1: Evaluation of acid content in beverages by using pH sensors and simulation

D2. Estimation of copper in e-waste.

D3.Volumetric estimation of gypsum in Portland cement

D4. Searching suitable PDB file and target for molecular docking

TEXT BOOKS

1. Engineering Chemistry by M.M. Uppal, Khanna Publishers.
2. A text Book of Engineering Chemistry- by P C Jain and Monica Jain, Dhanapatrai Publications, New Delhi.(2015 edition)
3. A Text Book of Engineering Chemistry, R.V. Gadag and Nitthyananda Shetty, I.K. International Publishing house. 2nd Edition, 2016.
4. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, Bangalore.5th Edition,2014.

REFERENCE BOOKS

1. Principles of Physical Chemistry B.R.Puri, L.R.Sharma & M.S.Pathania, S.Nagin Chand &Co., (2008 edition).
2. Industrial Chemistry by B.K.Sharma, GOEL Publishing House (2014 edition).
3. Industrial Electrochemistry, Second Edition by Derek Pletcher & Frank C. Walsh publisher: Chapman & Hall, USA (1993 edition)X
4. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
5. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan.
6. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
7. Vogels text book of quantitative inorganic analysis, revised by J. Bassett, R.C. Denny, G.H. Jeffery, 4th Ed.

MOOC COURSES

https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy02/

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3					
CO2	2	3					
CO3	3	2					
CO4	2	3					3

Tutorial Class Topics

1.	Numerical problems on GCV and NCV will be discussed
2.	Question papers of CIE and SEE on chemical energy sources and engineering materials will be discussed
3.	Test will be given on chemical energy sources and engineering materials
4.	Revision of water and its treatment
5.	Question paper of CIE and SEE on water and its treatment will be discussed
6.	Test will be given on water and its treatment
7.	Revision of electrochemistry and battery technology
8.	Question papers of CIE and SEE on electrochemistry and battery technology will be discussed
9.	Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells will be discussed
10.	Revision of macromolecules for engineering applications
11.	Question papers of CIE and SEE on macromolecules for engineering applications will be discussed
12.	Test will be given on macromolecules for engineering applications

Scheme of Examination 2024-25

COURSE TYPE- INTIGRATED

Total marks	CIE Marks	SEE Marks
100	50	50

	Max Marks	**Min. Passing Marks**	**NOTE**
CIE:Theory	30	12	3 Tests
CIE:Practical	20	8	Experiments, records (15 Marks) & 1 Test (5 Marks)
CIE:Total	50	20	40% of 50 Marks(Minimum Eligible Marks for Writing SEE)
SEE (Only Theory)	100	35	Questions from practical component may be asked
SEE: Total	Reduced to 50Marks	18	35% of 50 Marks
Overall	100	40	CIE+SEE: (40%)

MALNAD COLLEGE OF ENGINEERING, HASSAN

An Autonomous Institution Affiliated to VTU, Belagavi

BACHELOR of ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS (2024 Admitted Batch)

I AND II SEMESTERS

(1st YEAR)

Academic Year 2024-25

Course Title	ELEMENTS OF MECHANICAL ENGINEERING		
Course Code	EME413	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40

Course Objective:

To introduce fresh entrants of mechanical engineering co.urse to the principles and fundamentals of Mechanical Engineering

Course Outcomes (COs) {with mapping shown against the **Program**

Outcomes (POs)}Upon completion of the course, students shall be able to:

Sl. No.	Course outcomes	Mapping to POs
1.	Explain the purpose of mechanical engineering in industry and society, basics of steam, IC engines and electric vehicles	1, 2, 10
2.	Describe different power transmission systems, and concepts of engineering materials	1, 2, 10
3.	Describe traditional manufacturing techniques and illustrate manufacturing components using Lathe, CNC, additive manufacturing, and joining processes	1, 10
4.	Understand the basic principles of refrigeration and air-conditioning and mechatronics systems	1, 10

Course Contents:

MODULE –1	10 Hrs.

Introduction to Mechanical Engineering (Overview)

Role of Mechanical Engineers in Industries and Society - Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, Automation, Industry 4.0 and applications in Artificial Intelligence (AI) and Machine Learning (ML)

Steam Formation and its properties: Steam formation, Types of steam, Steam properties and applications of steam, Simple numerical problems.

IC Engines: Components and working principles, 4-stroke petrol and diesel engines, Applications of IC Engines, Performance of IC engines, Numerical problems on IP, BP, FP, Mechanical Efficiency.

Activity:

1. Visit to any manufacturing/ aero/ auto industry or any power plant
2. Demonstration of working of IC engine
3. Various pollutants from the IC engine emission and effect on the environment.

MODULE –2	10 Hrs.

Engineering Materials: Classification of Engineering Materials, Composite materials - classification, need, properties, advantages, limitations, and applications.

Power Transmission: Gears-spurgears, bevelgears, helicalgears, worm gear sets, and rack and pinion, simple and compound gear trains, Belt drives (Flat and V-belt drive), Slip and creep in belt drives, V-belt drive, Velocity ratio, Simple numerical problems.

Electric Vehicles: Working, Advantages and disadvantages, Components - Batteries, Chargers, Power devices, Drives and Transmission, Current status of EV vehicle technology in India.

Activity:

1. Demonstration on tensile testing using UTM
2. Demonstration of power transmission devices
3. Comparison of electric and hybrid vehicles

MODULE –3	10 Hrs.

Conventional Machining Processes: Introduction, Differences between conventional and non-conventional machining processes. **Machine Tool Operations:** Lathe: Principle of working of a center lathe, lathe operations - Turning, facing, thread cutting, taper turning by swiveling the compound rest. Drilling Machine: Working principle of simple drilling machine, drilling operations: drilling, boring, reaming, tapping. Milling machine: Working principle of simple milling machine, milling operations: up milling and down milling.

(No sketches of machine tools, sketches to be used only for explaining operations)

Joining Processes: Basic principle of welding, working principle of Electric Arc-welding and Gas welding and flames, Brazing, and soldering with applications.

Activity:

1. Demonstration of lathe/ milling/ drilling operations
2. Demonstration of welding operation

MODULE – 4	10 hrs.

Refrigeration and Air Conditioning: Principle of refrigeration, Refrigerants and their desirable properties, Working principle of VCR refrigeration system, Working principle of room/ window type air conditioner and Applications of air conditioners.

Introduction to Advanced Manufacturing Systems: Introduction, Components of CNC, advantages and applications of CNC, Additive Manufacturing.

Introduction to Mechatronics: Measurement system, Elements of measurement system, Open-loop and closed loop control systems, Advantages, disadvantages and applications of Mechatronics.

Activity:

1. Demonstration of working of refrigerator
2. Visit to air conditioning unit
3. Demonstration of CNC operations and 3D printing

TEXTBOOK:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.

REFERENCES:

1. An Introduction to Mechanical Engineering, Jonathan Wickert, 2nd edition, Cengage Learning 2006, ISBN-10: 1-111-57682
2. Elements of Mechanical Engineering - K P Roy, S K H Choudhry, A K H Choudhry, Roy Media promoters and publishers, Mumbai, 7th edition, ISBN: 4567145216, 1234567145210.
3. Electric and Hybrid vehicles by A. K. Babu Khanna Publications
4. Introduction to Mechatronics, AppuuKuttan K K, Oxford University Press, 2007.

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO3	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

Scheme of Evaluation (Theory Courses)

	Portions for CIE	Mode of Evaluation	Weightage in Marks
CIE - 1	Syllabus to be decided by the course coordinators such that all the COs shall be covered.	Descriptive Test	**10**
CIE - 2		Descriptive Test	**10**
CIE - 3		Descriptive Test	**10**
Activity	Minimum of two activities to be conducted	Assignment / Case study/Practical/ Working model /Quiz	**20**
SEE			**50**
Total			**100**

Course Title	Computer Aided Engineering Drawing (CAED)		
Code	CED413/423	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	52

Course Objective: To introduce the students to "universal language of Engineers" for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	visualize geometrical solids in 3D space through exercises in orthographic projections	1, 2, 5, 10
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components and perspective projections	
4	visualize engineering components	

Course contents:

MODULE 1 **14 Hours**

Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).

Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).

MODULE 2 **18 Hours**

Orthographic Projection of Solids:Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).

Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.

MODULE 3 **12 Hours**

Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.

MODULE 4 **08 Hours**

Multidisciplinary Applications & Practice

Basic building drawing (Plan and Elevation), 2D Electrical wiring and lighting drawing, 2D Electronic PCB drawings.

Graphs & Charts: ***(Only for CIE)***

Column chart, Pie chart, Line charts, Gantt charts, etc.using Microsoft Excel or any suitable software.

TEXT BOOK:

1. Engineering Drawing: N. D. Bhatt & M.Panchal. 37th Edition 1996, Charotar Publishing House. Gujarat.

REFERENCES:

1. Engineering Drawing & Design: Cencil Jensen, Jay D. Helsel, Dennis R. Short, Seventh Edition, Tata McGraw-Hill 2012.
2. Engineering Drawing: K. R. Gopal Krishna, 24th Edition 1999 Subhash Publications, Bangalore.
3. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
4. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newness, 1997.
5. Nainan P Kurian Design of foundation systems, Alpha Science International Ltd; 3rd edition, 2005.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	3	-	-	-	-	2	-	-
CO2	1	1	-	-	3	-	-	-	-	2	-	-
CO3	1	1	-	-	3	-	-	-	-	2	-	-
CO4	1	1	-	-	3	-	-	-	-	2	-	-

Scheme of Evaluation

	Portions for CIE	Mode of Evaluation	Weightage in Marks
CIE - 1	Syllabus to be decided by the course coordinators such that all the COs shall be covered.	Descriptive Test	**10**
CIE - 2		Descriptive Test	**10**
Activity	All 5 Modules	Assignment Submission	**30**
SEE			**50**

Total	100

Question Paper Pattern for Semester End Examination (SEE)

Q. No.	Module	Questions on	Sketching	CAD Printouts	Total
Part A (Answer Any Two)					
1	1	Projection of Planes	08	17	25
2	2	Projections of Solids (Polyhedra)	08	17	25
3	2	Projections of Solids (Solids of Revolution)	08	17	25
Part B (Answer Any Two)					
4	2	Development of lateral surfaces (Polyhedra)	08	17	25
5	3	Development of lateral surfaces (Solids of Revolution)	08	17	25
6	4	Isometric projections of geometric solids	08	17	25
Total Marks			**32**	**68**	**100**

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)

Bachelor of Engineering

DEPARTMENT OF CIVIL ENGINEERING

VISION

The Department of Civil Engineering will be a centre of excellence in industry-oriented teaching, training, research, professional ethics, social responsibility, and continuing education for practicing engineers through sponsored research and consultancy services.

MISSION

- To improvise the curriculum to include contents pertaining to situational experience of variety of sites and develop a sense of social responsibility and to enhance research orientation of students through internship programs.
- To enhance sponsored research and consultancy works to achieve effective industry-institute-interaction and conduct Continuing Education Programme for practicing engineers.
- To inculcate professional ethics through quality and modern construction practices.
- To switch over to modern methods of material testing, Engineering analysis and design

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives:

PEO1: The graduate will be successful professionally and contribute to core civil engineering construction projects, infrastructure projects, alternative construction technology projects, green buildings towards environmental sustainability for academic domain as well as for research and pursue higher studies.

PEO2: The graduate will be professionally sound in broad area of knowledge of various dimensions of civil engineering and allied fields.

PEO3: The graduate will be a team leader/effective team member with ethical values, versatile, quick learner will adapt to given professional context with lifelong learning capability.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

1. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
2. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
3. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

(Source - Lead Society: American Society of Civil Engineers (ASCE) - Program Specific Criteria)

PSO 1: The Gradates will demonstrate the ability to design a civil engineering system, component or the process to meet desired project needs.

PSO 2: Graduates will be familiar with modern civil engineering professional software tools and demonstrate their ability in applying them for the solution of design situations.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	**10**
CIE 2	**10**
CIE 3	**10**
Activities (Assignment/Mini Project) Minimum 2	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**20 (12+8)**
SEE	**50**	**20**

Course Title	ENGINEERING MECHANICS		
Course Code	CIV413	(L-T-P) C	(2-1-0) 3
SEE duration	3 Hours	Hours / Week	04
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total Contact Hours	50

Course Objective:

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the Centre of gravity and moment of inertia and their applications.

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Compute the resultant of coplanar concurrent and non-concurrent force system	1,2
2.	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces	1,2
3.	Analyze the frictional resistance offered by different planes and locate the centroid.	1,2
4.	Compute the moment of inertia of sections and analyze the bodies in motion	1,2

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3												
CO2	2	3												
CO3	2	3												
CO4	2	3												

Course Contents:

MODULE –1 **12Hrs.**

Resultant of coplanar force system:

Basic dimensions and units, Idealizations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples.

MODULE –2	12 Hrs.

Equilibrium of coplanar force system:

Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.

MODULE –3	12 Hrs.

Friction:

Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.

Centroid of Plane areas:

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built-up sections, Numerical examples.

MODULE – 4	14 hrs.

Moment of inertia of plane areas:

Introduction, moment of inertia of plane lamina, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration,

moment of inertia of composite areas and simple built-up sections, Numerical examples.

Kinematics and Kinetics

Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion. Projectiles: Introduction, numerical examples on projectiles.

D 'Alembert's principle of dynamic equilibrium and its application in-plane motion and connected bodies including pulleys, Numerical examples.

Text Books:

1. I B Prasad, "A Textbook of Applied Mechanics Dynamics and Statics", Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1, 19th Edition, Eleventh Reprint 2016.
2. Bansal R. K., Rakesh RanjanBeohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.
3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB
4. Engineering Mechanics Statics And Dynamics,S RajasekaranVikas Publishing House, 1 Nov 2009 - Technology & Engineering

Reference:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.

2. IrvingH.Shames,EngineeringMechanics, 2019,Prentice-Hall.

3. HibblerR.C., EngineeringMechanics: PrinciplesofStaticsand Dynamics,2017,Pearson Press.

4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

5. BhavikattiSS, EngineeringMechanics,2019, NewAgeInternational

6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication.

7. Ramamrutham S: "Text book of Applied Mechanics", Dhanpat Rai and Sons, New India. 1997.

CIE Evaluation Scheme

Assessment		Weightage in Marks
CIE-I		10
CIE-II		10
CIE-III		10
Activity - I	1. Pragmatic application	10
Activity - II	1. Kinesthetics learning	10
Total		**50**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**20 (12+8)**
SEE	**50**	**20**

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous institution Affiliated to VTU, Belgaum)

Bachelor of Engineering

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS

I & II Semester

(2024-25 Admitted Batch)

Academic Year 2024-25

Scheme & Syllabus for BE (E&C) I and II semesters

2024-25 Academic year

VISION OF THE DEPARTMENT

To produce industry ready, research oriented and socially responsible Electronics & Communication Engineers.

MISSION OF THE DEPARTMENT

- To create an ambience for learning.
- To conduct research, beneficial to the society.
- To promote industry-academic interaction at all-levels.
- To be continuously agile to the needs of the stake holders.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:
PEO1: Design and test Electronics & Communication systems and be successful professional in the field of ECE and allied areas.
PEO2: Be a good leader, team worker with strong communication skills.

PEO3: Possess capability to pursue higher education and be involved in research in the core and allied areas of E&C engineering and be a lifelong learner.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: An ability to understand the basic concepts in Electronics and Communication Engineering and to apply them to various areas, like Signal and image processing, VLSI, Embedded systems, photonics, networks, MEMS, antennas etc., in the design and implementation of complex systems.

PSO2: Possess the skills to analyze and solve problems, using the latest software tools and hardware available in E & C Engineering along with analytical skills for real-time applications.

PROGRAMOUTCOMES

The program is targeted at developing the following competencies, skills and abilities amongst students of E & C Engineering:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis: Identify, formulate**, reviewer search literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
THREE CIE's conducted for a total of 30 marks	**30**
Activities as decided by course faculty	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**12+8=20**

		(CIE + Activity)
SEE	**50**	**20**

Course Title	BASIC ELECTRONICS		
Course Code	BEE413/423	**(L-T-P)C**	(3-0-0)3
SEE duration	3hours	**Hours/Week**	03
CIE(Theory)marks	30	**Activity marks**	20
SEE marks	50	**Total contact hours**	40

Sl. No.	Course outcomes	Mapping To POs	PSO's
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	1,2
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	1,2
3.	Develop competence knowledge to construct basic digital circuit by making use of basic gate and its function.	1, 2, 5, 9	1,2
4.	Analyze the basic concepts of communication System and various Modulation Techniques	1, 2, 5, 9	1,2

Course Objective:
The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Course Contents:

MODULE –1	10 Hrs.
Semiconductor Diodes : Introduction, PN Junction diode, Characteristics, Diode Approximations, (Text1:2.1,2.2,2.3,2.4) **Diode Applications:** Introduction, Half Wave Rectification, Full Wave Center tapped and bridge Rectifier, Full wave Capacitor Filter Circuit, (Text1:3.1,3.2,3.4,3.5) **Zener Diodes:** Junction Breakdown, Characteristics, Zener Diode as Voltage Regulator (Numerical). (Text1:2.9, 3.7)	
MODULE–2	**10 Hrs.**
Bipolar Junction Transistors: Introduction, PNP and NPN Transistor, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Loadline and Biaspoint: Self bias, fixed bias and voltage divider bias (Text1:4.2, 4.3, 4.5,4.6,4.7, 5.1, 5.2, 5.3, 5.4) **Field Effect Transistor:** Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs(Text1: 9.1,9.2,9.5)	
MODULE –3	**10 Hrs.**

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting &Non-Inverting Amplifier.
Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text 2: 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).

MODULE– 4	**10hrs.**
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions. **Digital Logic Gates** (Text3: 1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7) **Combinational logic**: Introduction, Design procedure, Adders-Half adder, Full adder (Text3:4.1,4.2,4.3) **Communications:** Introduction to Communication System, Modulation- AM and FM(Derivation and numerical)(Textbook5:1.1,1.2, 1.3, 3.1, 5.1)	

List of Activities

Activity Number	Activity Name	Description	Marks
1	**Analog Circuit design and implementation using open Source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10***
2	**Digital Circuit design and implementation using open-source Simulator**	• Use Multisim Live Circuit Simulator (Online Simulation) • A group of 3 students should solve assigned experiment • Demonstration of the circuit with results	**10***

Activity-1 Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio

signal frequency of 2kHz.

4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be2.5 V.
5. A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 Vun regulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity-2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of SR and D flip flops.
6. Realization of JK and T flip flop.
7. Conversion of JK flip flop into D flips flop.
8. Realization of 4x 2 encoder and 2 x4 decoder.

Activity-3Details:

Assignment / Quiz

Suggested Learning Resources:

Books (Title of the Book / Name of the author/ Name of the publisher/Edition and Year)

1. Electronic Devices and Circuits, David A Bell, 5th Edition,Oxford,2016
2. Op-amp s and Linear Integrated Circuits, Ramakanth A Gayakwad, PearsonEducation,4th Edition
3. Digital Logic and ComputerDesign,M.MorrisMano,PHILearning,2008ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University
5. Press,2013 ElectronicCommunicationSystems,GeorgeKennedy,4thEdition,TMH

Web links and Video Lectures(e-Resources):

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132

- https://nptel.ac.in/courses/117104072

Course Articulation Matrix

Course Outcomes	Program Outcomes												Program Specific Outcomes	
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	2											2	1
CO2	3	2			2				1				2	1
CO3	3	2			2				1				2	1
CO4	3	2			2				1				2	1

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)

Bachelor of Engineering

DEPARTMENT OF

ELECTRICAL & ELECTRONICS ENGINEERING

VISION

To become a department of excellence in the domain of Electrical and Electronics Engineering producing competent engineers with research acumen having moral and social values.

MISSION

- Enhance industry and alumni interaction.
- Promote continuous quality up gradation of faculty and technical staff.
- Time to time modernization of departmental infrastructure to provide state of the art laboratories.
- Create research-oriented culture to invoke the desire and ability of lifelong learning among the students for pursuing successful career.
- Create and sustain environment of learning in which students acquire knowledge and learn to apply it professionally with due consideration of social and ethical values.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the program will be able to

1. Design, analyse, operate and maintain equipment related to electrical and electronic industries with continuous integration with core and allied industries.
2. Use state of art laboratories and modern computer-based tools to pursue a diverse range of career as engineers and researchers.
3. Bring out innovations to provide best solutions to electrical engineering problems.
4. Fulfil the needs of society in solving technical problems using engineering principles, tools and practices, in an ethical and responsible manner.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Electrical & Electronics Engineering will be able to:

1. Develop models, design, analyse and assess the performance of different types of electrical machines, control systems and generation, transmission, distribution, protection mechanisms in power systems.
2. Demonstrate knowledge and hands-on competence in the application of circuit analysis and design, associated software and applications, analog and digital electronics and microcontrollers to build, test, operate and maintain electrical and electronics systems.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the

Scheme of Evaluation (Theory Courses)

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	10

CIE 2	**10**
CIE 3	**10**
Activities (Assignment/Mini Project) Minimum 2	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**20 (12+8)**
SEE	**50**	**20**

CIE Evaluation Scheme

Assessment		Weightage in Marks
CIE-I		10
CIE-II		10
CIE-III		10
Activity - I	1. Study of different types of wires, switches, sockets, lights and protective devices used for house wiring. 2. Selection of wires, switches, sockets, lights and protective devices with proper specification for given house plan	10
Activity - II	1. Calculation and analysis of energy consumption ofindividual residence and verification of electricity bill. 2. Working model of 1-way and 2-way control of a lamp.	10
Total		**50**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	50	20 (12+8)
SEE	50	20

Course Title	Elements of Electrical Engineering		
Course Code	EEE413	L-T-P	(2-2-0) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50Marks	Total Hours	40

Course Objective: The Students will acquire basic knowledge of electrical circuits, electromagnetism, protective devices and electric tariffs.

Course Outcomes: At the end of course, students will be able to:

#	Course outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the basic laws used in the electromagnetism and DC circuits.	1,2	1
2	Apply the fundamentals of single phase and three phase AC circuits and perform related calculations.	1,2	1
3	Explain the concept of domestic wiring and Electrical safety measures.	1,2	1
4	Analyze the power rating of household appliances and electricity billing	1,2	1

MODULE-1	10 Hrs.

Electrical Energy: Significance of electrical energy, sources of energy, Conventional and renewable energy sources.

Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical problems.

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, Power and energy. Maxwells loop and node equations.

Self-learning topics: Simple applications electromagnetic induction, self and mutual inductances.

MODULE-2	10 Hrs.

Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phas or representation of alternating quantities. Analysis of R,L,C,R-L,R-C and R-L-C circuits with phas ordiagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. Simple Numerical problems.

Self-learning topics: Measurement of Voltage, current, power and power factor in single phase AC system

MODULE-3	10 Hrs.

Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phasepower. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3-phase power by 2-wattmeter method. Simple Numerical.

Self-learning topics: Measurement of Voltage, current, power and power factor in three phase AC systems

MODULE-4	**10 Hrs.**

Domestic Wiring: Requirements, Types of wiring, Two way and three-way control. General types of wires and cables. Specifications of wires used for domestic wiring and their selection.

Electrical Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Electric Shock, General concept of Earthing, Types of earthing, Safety Precautions to avoid shock, Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). General types of wires and cables and selection.

Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

DC Motor: Types of DC machines, emf equation, construction of DC machines, working principle of DC motor, applications.

Transformer: Types of transformer, emf equation, working principle of transformer on No load and load.

Text Books:

1. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice-Hall of India Pvt. Ltd., ISBN: 81-203-2729-2, 2005.

Reference Books:

1. D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2nd edition, 2019
2. E. Hughes, Electrical and Electronics Technology, Pearson 2010
3. D.P. Kothari, I.J. Nagrath, Basic Electrical Engineering, McGraw Hill Education, 4th Ed., 2019

Course Articulation Matrix

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											3	

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)

Bachelor of Engineering

DEPARTMENT OF

Computer Science and Engineering

SYLLABUS

I & II Semester (2024 Admitted Batch)

(1st Year)

Academic Year 2024-25

PRINCIPLES OF PROGRAMMING USING C				
Course Code	PPC413/423		**L-T-P-C**	(2-0-2)3
Exam. Hours	03		**Hours / Week**	04
SEE	50 Marks		**Total hours**	40

Course Objective :	To provide fundamental programming concepts essential to develop program for a given problem.
Course Outcomes (COs) :	Upon Completion of the course, students shall be able to:

COs	Statement	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of C programming language	1	-
2.	Analyze the given program to determine the output and its correctness	1, 2	-
3.	Develop and document programs to find a solution for the given problem	3, 10	-

Course Contents:

MODULE – 1	10 Hrs
Introduction: Importance of C, Basic structure of C program, executing a C program, Characters set, C tokens, Variables, Data types, Operators, Expressions**,** Evaluation of expressions, Operator precedence and associativity, Type conversion, Managing Input and Output Operations.	
MODULE – 2	**10 Hrs**
Decision making and Branching: Simple if, if..else, nested if and else if…ladder statements.Switch statement, The ?: operator. **Decision making and Looping:** Jumps in Loops, programming examples, Nested loops.	
MODULE – 3	**10 Hrs**
Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays**,** Arithmetic operation on characters, String handling functions.	
MODULE – 4	**10 Hrs**
User-defined Functions: Elements of User defined function, Category of functions, Parameters passing in functions: call by value and call by reference. **Structures**: Defining a structure, Declaring a structure variable, Accessing structure members, Structure initialization, Operations on individual members, Arrays of structure **Pointers:** Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables, Accessing a variable through its pointers, Pointer expressions, Pointers increments and scale factor, Pointers and arrays.	

Text Book:	
1.	Balagurusamy E, Programming in ANSI C, 8th Edition, Tata Mc Graw Hill, 2013.
Reference Books:	
1.	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language", 2nd Edition, PHI, 2012.
2.	Programming Techniques through C, M. G. Venkateshmurthy, Pearson Education, 2014

Practice Programs	
1.	a. Write a C program to read length of the sides of a triangle and find its area. b. Write a C program to read radius of a circle and find its area and circumference
2.	An employee gets DA 90% of basic salary; HRA 15% of basic salary, CA 5% of basic salary. And also employee has to pay income tax of 10% of gross salary (Grass salary=Basic Salary+ DA+HRA+CA). Write a C program to read the basic salary of an employee and find the take homesalary of the employee. (Take home salary =gross salary – income tax)
3.	Heights of three students in a class are h1, h2 and h3. Write a C program to find the tallest amongthree students using nested if else statement.
4.	Read first name, middle name and last name of a person. Write a C program to concatenate first name with middle name without using built in function. And concatenate the resultant string with last name using built in function.
Guided Laboratory Experiments	
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients provided where $a\neq0$.The formula to find roots of quadratic equation is $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$. Write a C program to find all the roots and test it for all three cases(based on discernment value)
2.	A shop keeper requires performing simple calculations like addition, subtraction, multiplication, division and modulo division for his daily business. Write a C program to designa simple calculator for shop keeper.
3.	An electric power distribution company charges its domestic consumers as follows:Consumption Units — Rate of Charge 0-200 — Rs. 0.50 per unit 201-400 — Rs.100 plus Rs.0.65 per unit excess of 200 401-600 — Rs.230 plus Rs.0.80 per unit excess of 400 601 and above — Rs.390 plus Rs.1.00 per unit excess of 600 Write a C program to read the customer number, power consumed and display the amount to be paid by the customer.
4.	Sine series is given by $x-\frac{x}{3!}+\frac{x}{5!}-\frac{x}{7!}$+----------upto n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sine value using built in function.
5.	A person wants to register his newly purchased car. He is passionate to have a palindrome number for car registration. Write a C program to check whether thenumber allotted is palindrome or not.
6.	Given a list of n student's weight, write a C program to find a student with given weight. If found, display the position of the student in the list else display suitable message.
7.	Given two matrices, write a C program to check whether the matrices aremultipliable, if so find the product matrix, otherwise display suitable message.
8.	Given a matrix, write a C program to find its transpose. Also find sum of uppertriangle elements and sum of lower triangle elements of the transposed matrix.
9.	Write a C program to read a string, find number of vowels and consonants in it.
10.	Develop a function to find the factorial of a given number. Using the above function write a C program to find nCr and nPr where $nCr = \frac{n!}{r!(n-r)!}$ and $nPr = \frac{n!}{(n-r)!}$
11.	Develop a C function to swap two numbers using pointers. Write a C program usingthe above function to swap two numbers.

12.	Define a structure data type called student containing members: name, usn, marks of CIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign values to individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, acitvity1 and activity2.
Open ended problems	
1.	Solve a puzzle/game like tic-tac-toe
2.	Read two strings and check whether they are anagram or not
3.	Generate bill in a grocery store
4.	Generate magic square.
5.	Design a car/hut/rainbow using graphics in C.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	2	-	-	-	-

COMMUNICATIVE ENGLISH

Course Title:	**Communicative English**		
Course Code:	**ENG416**	CIE Marks	50
		SEE marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: C)	1:0:0:1	Exam Hours	3 hours
Total Hours of Pedagogy	15 hours	Credits	01

CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills.
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present requirement.
CO4	Understand and use all types of English vocabulary and language proficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.

Course objectives: The course Communicative English (22ENG16) will enable the students,

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
3. To impart basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better communication skills.
5. To learn about Techniques of Information Transfer through presentation.

Teaching-Learning Process :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:

Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,

(v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be

adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

Module-1 (04 hours)
Introduction to Communicative English : Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.
Module-2 (04 hours)
Introduction to Phonetics : Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.
Module-3 (04hours)
Basic English Communicative Grammar and Vocabulary PART - I : Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.
Module-4 (04 hours)
Basic English Communicative Grammar and Vocabulary PART - II: Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it. **Communication Skills for Employment:** Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (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 subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

OneImprovementtestbeforetheclosingoftheacademictermmaybeconductedifnecessary.However besttwo tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others.. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for thecourse.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour.** The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1) **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd -2019.
2) **A Textbook of English Language Communication Skills,** (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru -2022.

Reference Books:

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] -2019.
2. **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. **English Language Communication Skills–Lab Manual cum Workbook,**Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5),2019.
4. **A Course in Technical English – D Praveen Sam, KN Shoba,** Cambridge University Press –2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press –2016.

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

1. Contents related activities (Activity-based discussions)
2. For active participation of students instruct the students to prepare Flowcharts and Handouts
3. Organizing Group wise discussions Connecting to placement activities
4. Quizzes and Discussions, Seminars and assignments

INDIAN CONSTITUTION

Course Title:	**Indian Constitution**		
Course Code:	ICO417 / 427	CIE Marks	50
		SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	3 hours
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course **INDIAN CONSTITUTION (22ICO17 / 27)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Course outcome (Course Skill Set)

At the end of the course 22ICO17/27 the student will be able to:

CO1	Analyze the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching – Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

(ii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills.

Module-1	(04 hours)
Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.	
Module-2	**(04 hours)**
Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.	
Module-3	**(04 hours)**
Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet.	
Module-4	**(04 hours)**
Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (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 subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus.
- Second test after completion of 80-90% of the syllabus.

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the

closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour.** The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1. **"Constitution of India" (for Competitive Exams)** - Published by Naidhruva Edutech Learning Solutions, Bengaluru. –2022.
2. "**Introduction to the Constitution of India**", (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall, 2008.

Reference Books:

1. **"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E.Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. **"The Constitution of India"** by Merunandan K B: published by Merugu Publication, SecondEdition, Bengaluru.
3. **"SamvidhanaOdu" - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.**
4. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "**Engineering Ethics**", Prentice – Hall,2004.

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

1. Contents related activities (Activity-based discussions)
2. For active participation of students instruct the students to prepare Flowcharts and Handouts
3. Organizing Group wise discussions Connecting to placement activities
4. Quizzes and Discussions, Seminars and assignments.

Course Title	SAMSKRUTHIKA KANNADA		
Course Code	KSK417/427	(L-T-P)C	(1-0-0)1
CIE (Theory) marks	50	Class Hours/Week	01
SEE marks	50	Total class hours	30

Course Outcomes (COs):

At the end of course, student will be able to

#	Course outcomes	Mapping to PO's	Mapping to PSO's
CO1	Kannada bashe , Sahithya mathu kannadadha samskruthiya kurithu arivu mudiruthadhe.	P10	-
CO2	Kannada sahithyadha pradhana bhaghavadha adhunika poorva mathu Adunika kavyagalannu sankethikavagi Kalithu hechina odhige mathu jnanakke spoorthi moodiruthadhe.	P10	-
CO3	Vidhyarthigalalli sahithya mathu samskruthiya bhagge arivu agu asakthiyannu hechaguthade.		
CO4	Thantrika vyaktigala parichaya agu avarugala sadhisidha vishayagalannu thilidhukondu nadina ennithara vyakthigala bhagge thilidhukollalu Kauthukathe hechaguthadhe.		
CO5	Samskruthika,janapadha agu oravasa kathanagala parichaya madikoduvudu.		

Course Contents:

Ghataka -1: Kannada Samkruthi mathu bhashe Kurithadha Lekhanagalu

1. Karnataka Samkruthi – Hampa Nagarajayya

2. Karnatakada yekikarana : Ondhu Apoorva Charithre – G.Venkatasubbayya

3. Adalitha Bhasheyaagi kannada – Dr. L.Thimmesha mathu, Prof.V.Keshavamurthy

Ghataka -2: Adhunika poorvadha kavya bhaga

4 .Vachanagalu : Basavanna , Akkamahadevi , Allamaprabhu , Aydhakki Maaraiyya , Jedaradasimaiyya , Aydhakki Lakkamma.

5. Kirthanegalu : Adharindenu pala edharindhenu pala? Purandharadhasaru Thalanisadhiru kandya thalu manave – Kanakadasaru

6. Thatvapadagalu : Saavira kodagala suttu – Shishunaala sharipha

Ghataka -3: Adhunika kavyabhaga

7. DVG ravara Mankuthimmana kaggadhindha aydhu bandha kelavu bhagagalu

8. Kurudu kachana : Da.Ra.Bhendre

9.Hosabalina geethe : Kuvempu

Ghataka -4: Thantrika Vyakthigala Parichaya

10. Dr.Sir.M.Visveshwaraih : Vyakthi mathu Aithihasika – A.N.Murthyrao

11. Karakushala kalegalu mathu parampareya vignana – Karigowda Bichanahalli

Ghataka -5: Samkruthika , janapadha kathe mathu pravasa kathegalu

12. Ugadi – Vasudhendra

13. Meghane yembha girijana parvatha – Hi.Chi.Bhoralingaiyya

Course Title	BALAKE KANNADA (KANNADA FOR CONVERSATION)		
Course Code	KBK417/427	(L-T-P)C	(1-0-0)1
CIE (Theory) marks	100	Class Hours/Week	02
SEE marks	50	Total class hours	30

Course Learning Objectives:
At the end of course, student will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Non kannadiga students to undrestan, speak, read and write kannada language	P10	-
2	Communicate (converse) in Kannada language in their daily life with kannada speakers	P10	-

Course Contents:

Part-I: Lessons to teach and learn Kannada Language

Lesson-1: Vayaktika swaamyasuuchaka/ sambandhitha saarwanaamagalu mattu prashnarthaka padagalu- personal pronouns, possessive forms, interrogative words

Lesson-2: Namapadagala sambandharthaka roopagalu, sandehaspada prashnegalu mattu sambhanda vachaka namapadagalu – Possessive forms of nouns, dubitive question and relative nouns

Lesson-3: Guna parimaana mattu varnabanna visheshanagalu sankhyavachakagalu- Qualitative, Quantitative and Color Adjectives, Numerals

Lesson-4: Kaaraka roopagalu mattu vibhakti prathyayagalu- sapthami vibhakti prathyaya- (aa, adu, avu, alli) Predictive forms, locative case

Lesson-5: Chathurthi vibhakthi prathyayada balake mattu sankhyavachakagalu- Dative cases and Numerals

Lesson-6: Sankhyaagunavaachakagalu mattu bahuvachana naamaroopagalu- Ordinal numerals and Plural markers

Lesson-7: Nyuuna / nishedhaarthaka kriyapadagalu mattu Varna gunavachakagalu- Defective / negative verbs and Color Adjectives

Lesson-8: Appane/oppige, nirdeshana, proothsaaha mattu otthaaya artharoopa padagalu mattu vaakyagalu- Permission, Commands, encouraging and Urging words (Imperative words and sentences)

Lesson-9 : Saamanya sambhaashanegalalli dvithiya vibhakthi prathyayagalu mattu sambhavaniya prakaaragalu- Accusative Cases and Potential Forms used in General Communication

Lessson-10 : "Iru mattu Iralla" sahayaka kriyaapadagalu, sambhavyasuchaka mattu nishedhaarthaka kriyaa padagalu – Helping Verbs "Iru and Iralla" , Corresponding future and Negation Verbs

Lesson-11:Hoolike (tharathama), sambhanda suchaka mattu vastu suchaka prathyayagalu mattu nishedhaarthaka padagala balake- Comparative, Relationship, Identification and Negation Words

Lesson-12: Kaala mattu samayada haagu kriyapadagala vividha prakaragalu- Different types of

forms of Tense Sentences with Verb forms

Lesson-13: Dh, -Th, -Thu, -ithu, -aagi, -alla,-gh, -kh, -ide, kriyaa prathyayagalondige bhootha, bhavishyath mattu varthamana kaala vaakya rachane- Formation of Past, Future and Present Tense Sentences with Verb forms

Lesson-14: Karnataka raajya mattu raajyada bagge kurithaada ithare maahithigalu- Karnataka State and General information about the State

Lesson-15: Kannada bhaashe mattu saahithya- Kannada Language and Literature

Lesson-16: Bhaashe kaliyalu eenannu maadabeeku mattu maadabaaradu- Do's and Don'ts in Learning a Language

Lesson-17: Part-II

Kannada Language Script Part-1

Lesson-18 : Part-III

Kannada Vocabulary List: Sambhashaneyalli dinoopayoogi Kannada padagalu- Kannada words in Conversation.

University Guidelines for CIE Procedure:

i) CIE Marks in Vyavaharika Kannada and Aadalita Kannada shall be the sum of marks prescribed for tests and assignments. Marks prescribed for tests shall be 75 and that for the assessments be 25.

ii) The CIE marks awarded for the tests shall be based on three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 25 marks and the final CIE marks shall be the sum of the marks of all the three tests.

iii) The remaining 25 marks shall be awarded based on the evaluation of assignments/unit tests/written quizzes that supports to communication skills as per Bloom's Revised Taxonomy and Course/programme outcomes.

iv) Final marks awarded shall be the sum of (ii) and (iii) for a maximum of 100 marks.

The candidates shall write the test in Blue Books and also assignments/unit-tests/written quizzes in Blue Books/Notes which shall be preserved by the Principal/Head of the Department for at least six months after the announcement of University results and shall be made available for verification at the direction of the Registrar (Evaluation).

Course Title	INNOVATION & DESIGN THINKING		
Course Code	IDT418/428	(L-T-P) C	(1-0-0)1
SEE duration	2 hours	Hours / Week	01
CIE marks	50	Total Marks	100
SEE marks	50	Total contact hours	15

Course Objective:

The objective of this course is to make students choose real life problems and generate innovative ideas to solve them through design thinking approach.

Course Outcomes (COs) {with mapping shown against the **Program** Outcomes (POs)} Upon completion of the course, students shall be able to:

Sl. No.	Course outcomes	Mapping to POs
1.	explain the different stages in design thinking	1, 6, 7
2.	generate solutions to real life problems by applying the design thinking approach	1, 2, 10, 12

Course Contents:

MODULE –1	5 Hrs.

Introduction: Innovation, Design, Early man as a designer, Design thinking levels: Component or product level, System or community level. **Morphology of Design:** Divergence or Explorative phase, Transformation or Creative phase, Convergence phase. Sustainable Development Goals.

MODULE –2	5 Hrs.

Fundamentals of Design Thinking: Design Thinking Process: Different Phases. Empathize: Observation, Interview, Literature Survey. Define/Analyze:5 Why's technique, Conflict Analysis.

MODULE –3	5 Hrs.

Ideate: Eskimo nine dot problem,Theory of Inventive Problem Solving (TRIZ method), Brain storming.**Prototype:** Methods of Prototyping. **Testing:** Self-reflection, Interviewing real customer.

Activities:

1. Identifying real life problems through observation & interaction with real world
2. Literature Review
3. Brain Storming Session to generate ideas for the chosen problem
4. Skill building to prepare a prototype

TEXTBOOK:

1. Dr. BalaRamadurai***,"Karmin Design Thinking",*** Mudranik Technology Private Ltd. ISBN978-93-5419-0I0-0.
2. V. Gupta and P. Murthy, An Introduction to engineering design method, Tata McGraw Hill, 2000. ISBN-0070964416.

REFERENCES:

1. John.R.Karsnitz, Stephen O' Brienand JohnP. Hutchinson, ***"Engineering Design"*** ,Cengage learning (International edition) Second Edition, 2013.
2. RogerMartin,***"The Design of Business: Why Design Thinking is the Next Competitive Advantage"***, Harvard Business Press ,2009.
3. HassoPlattner, Christoph Meine land LarryLeifer (eds),***"Design Thinking: Understand–Improve–Apply"***, Springer, 2011
4. IdrisMootee,***"Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School"***, John Wiley & Sons 2013.

Scheme of Evaluation (Laboratory Courses)

Level	Evaluation Type	Evaluation modules	Marks
1	Continuous internal Evaluation	Work diary	10
		Record	20
		Presentation based on chosen project	20
2	Semester End Examination	Design thinking project report	20
		Presentation based on chosen project	20
		Viva voce	10
		Total	**100**

Note: The marks distribution to be made based on the rubrics.

Examination	Maximum marks	Minimum marks to qualify
CIE	**50**	**20**
SEE	**50**	**20**

SCIENTIFIC FOUNDATIONS OF HEALTH & PHYSICAL EDUCATION

Course Title:	**SCIENTIFIC FOUNDATIONS OF HEALTH & PHYSICAL EDUCATION**		
Course Code:	**SFH418/428**	CIE Marks	50
Course Type(Practical)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	0:0:1:0	Exam Hours	02 hours Practical
Total Hours of Pedagogy/physical activity	30 hours	Credits	01

Course objectives:

To improve the student's physical and mental health

Course Outcome:

At the end of the course students will be able to

#	Course Outcomes	Mapping to PO's
1	Describe Health, wellness & its balance for positive mindset.	PO1
2	Adopt healthy lifestyles or good health and better future.	PO1
3	Demonstrate physical activity	PO1, PO9

Course Contents:

Module-1

(3hours of Pedagogy) :

Good Health & It's balance or positive mind set: Health-Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Method to improve good psychological health, Changing health habits for good health.

Module-2

(3hours of Pedagogy)

Building of healthy life styles for better future: Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.

Physical Education Practical classes(24hours of Practical)		
Sl. No	Name of the Game	Name of the Skills
1.	Shuttle badminton	Service
		Smash
		Receive
		Drop Shot
		Foot work
2.	Basket ball	Dribbling
		Shooting
		Ten ley shoot
		Defensive slide
		Passing
3.	Foot Ball	Dribbling
		Chest drop
		Ball control
		Thigh drop
		Shooting
4.	Table tennis	Service
		Fore hand receive
		Back hand receive
		Smash
		Rally
5.	Volley ball	Attack
		Block
		Service
		Upper hand pass
		Under hand pass
6.	Ball badminton	Service
		Fore hand receive
		Back hand receive
		Spin Smash
		Striate Smash
7.	Throw ball	Spin Pass
		Jump Throw
		Service
		Receive
		Simple pass
8.	Kho- Kho	Giving Kho
		Single chain
		Pole dive
		Pole turning
		3 – 6 Up

9.	Kabaddi	Hand Touch
		Chain Hold
		Ankle Hold
		Thigh Hold
		Bonus
10.	Hand ball	Step with ball
		Shoot
		Pass
		Block
		Dribbling

Assessment Details (both CIE and SEE):

CIE Theory -20 Marks (Multiply Choice Questions - 20 marks)

CIE Practical -30 Marks (Physical activity, Performance and Attendance)

SEE Practical -50 Marks (Skill test-20 marks, Game performance-20 marks, and Event viva -10 marks)

Evaluation method	Assessment Tool	Maximum Marks	Minimum marks to be obtained
CIE	Multiple Choice Questions	20	**8**
	Performance and Attendance Criteria	30	**12**
SEE	Skill Examination	20	**20**
	Game Performance Examination	20	
	Viva -Voce	10	
	Total Marks	**100**	**40**

ENGINEERING SCIENCE COURSES (ESC)

1. INTRODUCTION TO CIVIL ENGINEERING
2. INTRODUCTION TO ELECTRICAL ENGINEERING
3. INTRODUCTION TO ELECTRONICS ENGINEERING
4. INTRODUCTION TO MECHANICAL ENGINEERING
5. INTRODUCTION TO C PROGRAMMING

Course Title	**INTRODUCTION TO CIVIL ENGINEERING**		
Course Code	**ESC4141/4241**	(L-T-P) C	(3-0-0) 3
SEE duration	3 Hours	Hours / Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total Contact Hours	40

Course Objective:

- To make students learn the scope of various specializations of civil engineering.
- To make students learn the concepts of sustainable infrastructure
- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To develop the student's ability to find out the center of gravity and their applications.
- To make the students learn about kinematics.
- To make students learn the scope of Transportation Engineering in Civil Engineering

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Comprehend the Fundamentals of Civil Engineering and Building Science	1,2
2.	Illustrate the Societal and Global Impact of Infrastructure	1,2
3.	Apply the Principles of Force Systems	1,2
4.	Determine Centroid and comprehend the basic concepts of Transportation Engineering	1,2

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	2	3												
CO3	2	3												
CO4	2	3												

Course Contents:

MODULE –1	**10Hrs.**

Civil Engineering Disciplines and Building Science

Introduction to Civil Engineering:

Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Environmental Engineering, Construction planning & Project management.

Basic Materials of Construction:

Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. Precast construction, Glass Fiber Reinforced Polymer.

Structural elements of a building: foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase.

MODULE –2	**10 Hrs.**

Societal and Global Impact of Infrastructure

Infrastructure: Introduction to sustainable development goals, Smart city concept, clean city concept, Safe city concept.

Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Land fill sites, urban flood control.

Built-environment: Energy efficient buildings, recycling, Temperature and Sound control in buildings, Security systems; Smart buildings.

MODULE –3	**10 Hrs.**

Analysis of force systems:

Concept of idealization, system of forces, principles of super position and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems.

MODULE – 4	**10 hrs.**

Centroid: Importance of centroid and center of gravity, methods of determining the centroid, locating the centroid of plane laminar from first principles, centroid of built-up sections. Numerical examples.

Transportation Engineering: Importance of Transportation:

Modes of transportation, Comparison with other modes, Different Road Patterns-Planning surveys.

Importance-Controlling factors- Surface Characteristics-Cross Sectional elements, Camber, Sight distances, Horizontal and vertical alignment.

Pavement Materials: Introduction, Soil, Road Aggregates and Bitumen.

Text Books:

1. I B Prasad, "A Textbook of Applied Mechanics Dynamics and Statics", Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1, 19th Edition, Eleventh Reprint 2016.
2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
2. Irving H.Shames, Engineering Mechanics, 2019,Prentice-Hall.
3. HibblerR.C., Engineering Mechanics: Principles of Statics and Dynamics,2017, Pearson Press.
4. Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
5. Bhavikatti SS, EngineeringMechanics,2019, New Age International.
6. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication.

CIE Evaluation Scheme

Assessment		Weightage in Marks
CIE-I		10
CIE-II		10
CIE-III		10
Activity - I	Field Activity	10
Activity - II	Quiz	10
Total		**50**

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	10
CIE 2	10
CIE 3	10
Activities (Assignment/Mini Project) Minimum 2	20
SEE	50
Total	**100**

Examination	Maximum Marks	Minimum Marks to Qualify
CIE	**50**	**20 (12+8)**
SEE	**50**	**20**

Course Title	**Introduction to Electrical Engineering**		
Course Code	ESC4142/4242	**(L-T-P)C**	(3-0-0)3
Exam	3Hours	**Hours/Week**	03
SEE	50	**Total Contact Hours**	40

Course Objective: The student will acquire basic knowledge of electrical power systems, protective devices, electric circuits, measuring systems and machines.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl.No.	Course outcomes	Mapping to POs
1.	Explain the basic concepts of electrical generation, transmission, distribution and basic electrical protection devices.	1, 2
2.	Describe the basic principle and construction of analog and digital measuring instruments.	1, 2
3.	Apply the basic concepts of electrical machines.	1, 2
4.	Analyze the fundamentals of single phase and three phase AC circuits and perform related calculations.	1, 2

MODULE –1	**8 Hrs.**

Electric Energy systems: Significance of electrical energy, sources of energy (Conventional/renewable), Single line/ block diagram representation of a typical power system. Brief introduction to the electrical generation, transmission and distribution subsystems indicating typical voltage levels.

General concept of earthing, types of earthing, introduction to protective devices- Fuses, MCB, ELCB, MCCB, General types of wires and cables and selection, Electrical Tariff, Elementary calculation of energy consumption.

SLC: General safety precautions in handling electrical appliances.

MODULE –2	**12 Hrs.**

AC systems: Generation of single / three phase voltages, Instantaneous/average/rms values. Definition of impedance, admittance, real power, reactive power, apparent power and power factor. Analysis of series R-L,R-C,R-L-Ccircuits, phasordiagrams. Illustrative examples involving series and parallel circuits.

Three phase systems: Star-Delta connection – calculation of voltage, current and power in a balanced three phase Star-Delta system.

SLC: Measurement of Voltage, current, power and power factor in single phase and three phase AC system.

MODULE –3	**10 Hrs.**

Electromechanical / Digital Instruments: Construction, working and principle of operation of Dynamometer type wattmeter. Digital meters, Merits and demerits of digital meters over analogmeters, digital multimeter and digital voltmeter.

Electrical Machines: Specifications of machines, classification of machines, DCmachines-Constructional features, working principle of generator, EMF equation, Working principle of motor, Torque equation, Types of motors and their Voltage & Current relations, applications, Illustrative examples.

SLC: Digital/smart energy meter, Brushless DC Motors and their application

MODULE – 4	**10hrs.**

Transformers: Classification of transformers, applications of each type, construction of core and shell type transformers, principle of operation, EMF Equation, Transformation ratio, Power losses and efficiency, Illustrative examples on EMF equation and efficiency.

Induction machines: Induction Motors-Concept of rotating magnetic field, classification (Squirrel cage an Slipring motors) Principle of operation and Constructional features, Slip and its significance, Single-phase induction motors, working principle, classification and applications.

SLC: Applications of transformers and induction motors, types of electric motors used in Electric Vehicles.

Text Books:

1.Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice-Hall of India Pvt. Ltd., ISBN:81-203-2729-2,2005.

Reference Books:

1. D.C.Kulshreshtha, *Basic Electrica lEngineering*, McGrawHill,2nd edition,2019
2. E.Hughes, Electrical and ElectronicsTechnology, Pearson2010
3. D.P.Kothari, I.J.Nagrath, *Basic Electrical Engineering*, McGrawHillEducation,4th Ed.,2019

Course Articulation Matrix

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											2	

Course Title	INTRODUCTION TO ELECTRONICS ENGINEERING		
Course Code	ESC4143/4243	(L-T-P) C	(3-0-0)3
SEE duration	3 hours	Hours / Week	03
CIE (Theory) marks	30	Activity marks	20
SEE marks	50	Total contact hours	40

Course Objective:

The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course outcomes	Mapping to POs
1.	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2
2.	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9
3.	Develop competence knowledge to construct basic digital circuit by make use of logic gate and its function.	1, 5, 9
4.	Apply the knowledge of Embedded system and basic communication system.	1,2

Course Contents:

MODULE –1	10 Hrs.

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, voltage Multiplier.

Amplifiers – CE amplifier input and output characteristics, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, self bias and fixed bias. (Text 1)

MODULE –2	10 Hrs.

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1)

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, **RC Phase Shift Oscillator**, Colpitt's and Hartley oscillator, Crystal oscillator, Multivibrators, Single-stage astable multivibrator (using transistor only). (Only Concepts, working, and waveforms. No mathematical derivations).]

MODULE –3	10 Hrs.
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)**.** **Combinational logic:** Introduction, Design procedure, Adders -Half adder, Full adder. (Text 2).	
MODULE – 4	**10 hrs.**
Embedded Systems–Definition, Embedded systems vs general computing systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller**.** (Text 4). **Analog Communication Schemes** – Modern communication system scheme, Information source,and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM. (Problems on AM only). **Digital Modulation Schemes**: Advantages of digital communication over analog communication, ASK, FSK, PSK.(Only concepts, no mathematical derivations) (Text 3).	

List of Activities

Activity Number	Activity Name	Description	Marks
1	Analog Circuit design and implementation on using open Source Simulator	• Use Multisim Live Circuit Simulator (OnlineSimulation) • A group of 3 students should solve assignedexperiment • Demonstration of the circuit with results	**10**
2	Digital Circuit design and implementation using open- source Simulator	• Use Multisim Live Circuit Simulator (OnlineSimulation) • A group of 3 students should solve assignedexperiment • Demonstration of the circuit with results	**10**

Activity 1 Details:

Following are the experiments list of analog circuit design and implementation using open-source simulator.

1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage producedby bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2 kHz.
4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be 2.5 V.
5. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output.Design the circuit with suitable resistance values.
6. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
7. The difference of two input signals is to be amplified by a factor of 20. Design the circuitwith suitable resistance values.
8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.

Activity -2 Details:

Following are the experiments list of circuit design and implementation using open source simulator.

1. Realization of Boolean expressions using basic gates.
2. Realization of half adder circuit.
3. Realization of full adder circuit.
4. Realization of 4-bit parallel adder.
5. Realization of Integrator.
6. Realization of Differentiator.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4 thEdition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980.
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978- 81-203-0417-84.
3. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India),Private Limited, 2018.
4. Shibu K V, "Introduction to Embedded systems", 4th print, McGraw Hill Education (India),Private Limited,2011.

Course Articulation Matrix

Course Outcomes	Program Outcomes												Program Specific Outcomes	
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	2											2	1
CO2	3	2			2				1				2	1
CO3	3				2				1				2	1
CO4	3	2											2	1

Course Title	INTRODUCTION TO MECHANICAL ENGINEERING		
Course Code	ESC4144/4244	(L-T-P)C	(3-0-0)3
SEE duration	3 hour	Hours / Week	03
CIE (Theory) marks	30	CIE (Practicals)/Activity marks	20
SEE marks	50	Total contact hours	39

Course Objective:

To introduce fresh entrants of engineering courses to the principles and fundamentals of Mechanical Engineering

Course Outcomes (COs) {with mapping shown against the **Program Outcomes (POs)}Upon completion of the course, students shall be able to:**

Sl. No.	Course outcomes	Mapping to POs
1.	explain the concepts of mechanical engineering, energy sources, and engineering materials	1, 10
2.	explain the working principle of IC engines, electric and hybrid vehicles	1, 10
3.	describe non-traditional and modern manufacturing techniques and illustrate manufacturing components using CNC, additive manufacturing, and joining processes	1, 10
4.	understand the basic principles of automation, mechatronics and robotics	1, 10

Course Contents:

MODULE –1	10 Hrs.

Introduction to Mechanical Engineering

Role of Mechanical Engineers in Industries and Society - Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, Automation, Industry 4.0 and applications in Artificial Intelligence (AI) and Machine Learning (ML).

Energy Sources: Introduction and applications of Energy sources like Fossil fuels, nuclear fuels, Hydel, Solar, wind, and biofuels.

Engineering Materials: Classification of Engineering Materials, Types and applications of Ferrous &Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer, composite materials.

Activity:

1. Visit to any manufacturing/ aero/ auto industry or any power plant
2. Demonstration on Tensile testing using UTM

MODULE –2	10 Hrs.
Introduction to IC Engines: Introduction, classification, Components and working principles, 4-stroke petrol and diesel engines, Applications of IC engines, Heat sinks in electronic devices. **Electric and Hybrid Vehicles:** Introduction, Working principle, Components of hybrid and electric vehicles, Advantages, and disadvantages of EVs and Hybrid vehicles.	
Activity: 1. Demonstration of working of IC engine 2. Various pollutants from the IC Engine Emission and Effect on the environment **3.** Demonstration of power transmission devices	
MODULE -3	**10 Hrs.**
Non-conventional machining processes: Introduction, Difference between conventional and non-conventional machining processes. Working principle, advantages, disadvantages and applications of AJM, ECM, EDM and LBM. **Joining Processes:** Soldering and Brazing - principles and applications, Welding - Definition, applications, working principle of electric arc welding, gas welding and flames.	
Activity: Demonstration of welding, soldering and brazing	
MODULE – 4	**10 hrs.**
Introduction to Advanced Manufacturing Processes: Introduction, Components of CNC, advantages and applications of CNC, Additive Manufacturing. **Introduction to Mechatronics and Robotics:** Open loop and closed loop mechatronic systems,Programmable logic controllers, Sensors, Actuators, Nomenclature of an Industrial Robot: Polar Cylindrical, Cartesian coordinate and Spherical robot, Advantages, disadvantages, and applications. Automation, Types - Fixed, programmable, and flexible automation, merits and demerits of automation, Applications.	
Activity: 1. Demonstration of CNC operations and 3D Printing 2. Demonstration of pneumatic system and robot configuration in robotics lab.	

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	2	-	-	-	-

Scheme of Evaluation (Theory Courses)

	Portions for CIE	Mode of Evaluation	Weightage in Marks
CIE - 1	Syllabus to be decided by the course coordinators such that all the COs shall be covered.	Descriptive Test	**10**
CIE - 2		Descriptive Test	**10**
CIE - 3		Descriptive Test	**10**
Activity	Minimum of two activities to be conducted	Assignment / Case study/Practical/ Working model /Quiz	**20**
SEE			**50**
Total			**100**

Course Title	INTRODUCTION TO C PROGRAMMING		
Course Code	ESC4145/4245	**L-T-P-C**	**(2-0-2)3**
SEE Hours	03	**Hours / Week**	**04**
SEE	50 Marks	**Total Hours**	**40**

Course Objective :

To provide fundamental programming concepts essential to develop program for a given problem.

Course Outcomes (COs) :

Upon Completion of the course, students shall be able to:

COs	Statement	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of C programming language	1	-
2.	Analyze the given program to determine the output and its correctness	1, 2	-
3.	Develop and document programs to find a solution for the given problem	3, 10	-

Course Contents:

MODULE – 1	10 Hrs

Introduction: Importance of C, Basic structure of C program, executing a C program, Characters set, C tokens, Variables, Data types, Operators, Expressions**,** Evaluation of expressions, Operator precedence and associativity, Type conversion, Managing Input and Output Operations.

MODULE – 2	10 Hrs

Decision making and Branching: Simple if, if..else, nested if and else if…ladder statements. Switch statement, The ?: operator.

Decision making and Looping: Jumps in Loops, programming examples, Nested loops.

MODULE – 3	10 Hrs

Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays**,** Arithmetic operation on characters, String handling functions.

MODULE – 4	10 Hrs

User-defined Functions: Elements of User defined function, Category of functions, Parameters passingin functions: call by value and call by reference.

Structures: Defining a structure, Declaring a structure variable, Accessing structure members, Structure initialization, Operations on individual members, Arrays of structure

Pointers: Understanding pointers, Accessing the address of a variable, Declaring pointer variables,Initialization of pointer variables, Accessing a variable through its pointers.

Text Book:	
1.	Balagurusamy E, Programming in ANSI C, 8th Edition, Tata Mc Graw Hill, 2013.
Reference Books:	
1.	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language", 2nd Edition,PHI, 2012.
2.	Programming Techniques through C, M. G. Venkateshmurthy, Pearson Education, 2014

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	2	-	-	-	-

Laboratory Experiments	
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients provided where $a\neq0$.The formula to find roots of quadratic equation is $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ Write a C program to find all the roots and test it for all three cases(based on discernment value)
2.	A shop keeper requires performing simple calculations like addition, subtraction, Multiplication and modulo division for his daily business. Write a C program to design a simple calculator for shop keeper.
3.	An electric power distribution company charges its domestic consumers as follows: Consumption Units — Rate of Charge 0-200 — Rs. 0.50 per unit 201-400 — Rs.100 plus Rs.0.65 per unit excess of 200 401-600 — Rs.230 plus Rs.0.80 per unit excess of 400 601 and above — Rs.390 plus Rs.1.00 per unit excess of 600 Write a C program to read the customer number, power consumed and display the amount to bepaid by the customer.
4.	Sine series is given by $x-\frac{x}{3!}+\frac{x}{5!}-\frac{x}{7!}+\cdots$ upto n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sine value using built in function.
5.	A person wants to register his newly purchased car. He is passionate to have a Palindrome number for car registration. Write a C program to check whether the number allotted is palindrome or not.
6.	Given a list of n student's weight, write a C program to find a student with given Weight. If found, display the position of the student in the list else display suitable message.
7.	Given two matrices, write a C program to check whether the matrices are multipliable, if so find the product matrix, otherwise display suitable message.
8.	Given a matrix, write a C program to find its transpose. Also find sum of upper triangle elements and sum of lower triangle elements of the transposed matrix.
9.	Write a C program to read a string, find number of vowels and consonants in it.
10.	Develop a function to find the factorial of a given number. Using the above function write a C program to find nCr and nPr where $nCr = \frac{n!}{r!(n-r)!}$ and $nPr = \frac{n!}{(n-r)!}$
11.	Develop a C function to swap two numbers using pointers. Write a C program using the above function to swap two numbers.
12.	Define a structure data type called student containing members: Name, USN, Marks ofCIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign values to individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, acitvity1 and activity2.

EMERGING TECHNOLOGY COURSES (ETC)

1. RENEWABLE ENERGY SOURCES
2. INTRODUCTION TO ELECTRIC VEHICLE TECHNOLOGY
3. WASTE MANAGEMENT
4. INTRODUCTION TO INTERNET OF THINGS (IOT)
5. INTRODUCTION TO CYBER SECURITY

Course Title	Renewable Energy Sources		
Course Code	ETC415E/425E	(L-T-P)C	(3-0-0)3
Exam	3Hours	Hours/Week	03
SEE	50	Total Contact Hours	40

Course Objective: The student will acquire basic knowledge of renewable energy systems.

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl.No.	Course outcomes	Mapping to POs
1.	Explain basic concept of renewable energy sources	1
2.	Describe the operation of solar thermal systems	1,6,7
3.	Explain the concept of wind energy systems	1,6,7
4.	Explain hydrogen energy, biomass, tidal and ocean energy systems	1,6,7

Course articulation matrix

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											2	

Course Contents:

MODULE –1	**10 Hrs.**

Energy sources: Introduction to energy systems, introduction to renewable energy sources, Definition of renewable and non-renewable energy system with examples, Classification of renewable energy sources, worldwide renewable energy availability, Renewable energy in India

Energy from sun: Solar energy geometry -latitude and longitude, Declination angle, day length and hour angle. Measurement of solar radiation- solar constant, Types of solar radiation, measurements and working principle of pyrheliometer.

MODULE –2	10 Hrs.

Solar thermal energy systems and applications: Introduction to solar thermal energy storage and collection devices systems. Concentrating and non-concentrating type solar collectors, comparison between concentration and non-concentrating type solar collectors.

Non-concentrating solar collectors: working principle of Flat-plate collectors. Concentrating Collectors: Types of concentrating collectors and descriptions. Applications: solar water heater and solar air heater

Solar Photovoltaic: Solar cells- Types of solar cell, materials used for solar cell, Working principle of solar cell, I-V & P-V characteristics of solar cell. Series and parallel connection of solar cells. Panels, Modules. applications of solar cell systems, block diagram of solar PV system.

MODULE –3	10 Hrs.
Hydrogen energy: Introduction to hydrogen energy, Properties of hydrogen with respect its utilization, Sources of hydrogen, production of hydrogen, Storage and transportation methods, Introduction to green hydrogen technology. Wind energy system: Availability of wind energy in India, motion of wind, wind seed characteristics. Basic components of a wind energy conversion system (WECS). Power in wind, Classification of WEC systems, Advantages, and disadvantages of WECS, Site Selection consideration.	
MODULE – 4	10hrs.
Biomass Energy: Introduction to biomass energy, types of biomasses and their applications, Energy content of biomass. Biomass as a source of energy-types of conversion process. Biogas-biogas production, Description biogas plant (batch type floating and fixed type). Ocean Energy: Tidal energy-Fundamental characteristics of Tidal power, classification of tidal power plants, advantages, and disadvantages of tidal power. Ocean thermal energy-fundamental characteristics of ocean thermal power, open cycle and closed cycle OTEC power plant. Advantages and limitations of OTEC. Introduction to sea wave energy.	

Text Books:

1. G.D.Rai, Non-conventional energy sources, Khana Publishers, 4th edition,2009, ISBN:8174090738, 9788174090737
2. S.P.Sukhatme, Solar Energy Principle of Thermal Collection and Storage, TataMcGraw Hill,1990,ISBN10: 0074624539

Reference Books:

1. P.K.Nag,Solar power Engineering, TMH, 2003, ISBN: 0-07-043599-5.
2. Domkundwar, Power Plant Engineering, Dhanpath Rai & Sons, 3rd Edition, 2003, ISBN:6700000000330
3. B.H.Khan, Nonconventional energy resources by, TMH, 3rd edition, 2015, ISBN:13:978-0070142763

Course Title	Introduction to Electric Vehicle Technology		
Course Code	24ETC415J/425J	**(L-T-P)C**	(3-0-0) 3
Exam	3Hrs.	**Hours/Week**	**3**
SEE	50	**Total Hours**	40

Course objective:

To enlighten students with various aspects of Electric Vehicles and Hybrid Electric Vehicles

Course outcomes: The student will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSO's
1	Recognize and recall the history, necessity, and evolution of different type of electric vehicles	1,7	-
2	Explain EV and EHV configurations and the electric propulsion systems used in them.	1	-
3	Identify various type of sources that can be used in EV and EHV	1	-
4	Compare the electric power supply and infrastructure used with EV and EHV, distinguish different types of fuel cells used in this in dustry and verify their suitability.	1,7	-

Course articulation matrix

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	2												
CO3	3	3												
CO4	3	2												

MODULE-1 **10Hrs**

Introduction to Electric Vehicles: History of Electric Vehicles (EV), Hybrid Electric Vehicles (EHV)and Fuel Cell Vehicles. Social and environmental importance of electric and hybrid electric vehicles – air pollution, global warming, impact of modern drive-trainson energy supplies.

TypesofElectricVehicles: BatteryElectricVehicles,ICEngine/ElectricHybridVehicle,FuelledEVs, EVsusingSupplyLines,EVswhichuseFlywheelsorSupercapacitors,Solar-PoweredVehicles,VehiclesusingLinear Motors, EVs for the Future

MODULE-2 **10Hrs**

Configuration of EV's and EHV's: Configurations of EVs, Concept of Hybrid Electric Drive Trains, Architectures of Hybrid Electric Drive Trains - Series Hybrid Electric Drive Trains, Parallel Hybrid Electric Drive Trains and series-parallel Hybrid Electric Drive Trains

Electric Propulsion Systems: DC Motor Drives, Induction Motor Drives, Permanent Magnetic BLDC Motor Drives, PMSM Drives, SRM Drives

MODULE-3	10Hrs
Sources: Batteries, Battery Parameters, Lead Acid Batteries, Nickel-Based Batteries, Sodium-Based Batteries, Lithium Batteries, Battery Charging, Battery Management System.	
MODULE-4	**10Hrs**
Electric Supply: Normal Existing Domestic and Industrial Electricity Supply, Infrastructure needed for charging Electric Vehicles, Electricity supply Rails, Battery swapping **Fuel Cells:** Operating principles of fuel cells, Fuel cell technologies, fuel supply, non-Hydrogen fuel cells	

ReferenceBooks:

1. JamesLarminie,JohnLowry, Electric Vehicle Technology Explained, John Wiley & Sons Ltd, 2nd ed.,2012.
2. JohnG.Hayes,G.AbasGoodarzi, Electric Powertrain: EnergySystems, Power Electronics and Drives for Hybrid,
3. Electric and Fuel Cell Vehicles, John Wiley & Sons Ltd,2018
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press Taylor & Francis Group,2004.

Course Title	WASTE MANAGEMENT		
Course Code	ETC415F/425F	(L-T-P-S)	3-0-0-0
CIE marks	50	Hours/Week	03
SEE marks	50	Total contact hours	40
Total marks	100	SEE duration	3 hours

Course Objective:

To learn broader understandings on various aspects of solid waste management practice

Course Outcomes(COs): Upon completion of the course, students shall be able to

Sl.No.	Courseoutcomes	Mapping toPOs
1.	Comprehend the sources, classification, characteristics and system of collection of solid waste	PO1,PO2,PO7
2.	Learn different methods of transportation and treatment of solid waste	PO1,PO2,PO7
3.	Comprehend the various methods of air pollution control techniques and types of composting	PO1,PO6, PO7
4.	Learn different disposal methods of solid waste and hazardous waste	PO1,PO6,PO7

Course Articulation Matrix

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	2					1							
CO2	3	2					2							
CO3	2					1	3							
CO4	3					1	2							

Course Contents:

MODULE –1	10Hrs.

Introduction: Land Pollution-Definition, causes, health and environmental effects of waste. Scope and importance of solid waste management – Classification, source and characteristics. Estimation of energy content. Material flow and Functional elements of solid waste management.

Collection: segregation at source, Types of collection service. Systems of collection– hauled container and stationary container system. Estimation of solid waste quantities. Collection equipment– Garbage chutes. Bailing and compacting

MODULE –2	10Hrs.
Transportation and Processing Techniques: Transport methods, Transfer station and route optimization techniques. Mechanical volume reduction, Chemical volume reduction, Mechanical size reduction, Component separation, Drying and dewatering. **Waste Disposal**: key issues in waste disposal, disposal options and selection criteria. **Incineration** - Process, Design and Performance Considerations, 3T'so fincineration process and problems associated within cineration operation	
MODULE –3	**10Hrs.**
Air Pollution Control Technologies: Gravitational settling chambers, Cyclone separator, Fabric filters, Electrostatic precipitators and Scrubbers **Composting**: Objectives, Aerobic and anaerobic composting-process and design consideration. Bangalore process of composting and Indore process of composting. Factors affecting composting. Vermi composting	
MODULE –4	**10hrs.**
Sanitary Land Filling: Different types Trench, area and Ramp Method. Advantages and disadvantages, land fill gas emission, leachate formation **Hazardous waste**: classification, exposure path ways and effects **Biomedical waste**: classification, potential implication and steps in biomedical waste management	

TextBooks:

1. Integrated Solid Waste Management: Tchobanoglous: Mc.GrawHill,1970, IEdition
2. SasiKumar. K,Sanoop GopiKrishna "Solid Waste Management" PHIL earning Pvt. ltd, 2009

ReferenceBooks:

1.Pavoni J.L "Hand book on Solid Waste Disposal" - 19732. Peavy and Tchobanoglous "EnvironmentalEngineering"1985

Course Title	INTRODUCTION TO INTERNET OF THINGS
Course Code: ETC415H	**LTPC: 3-0-0-3**
Exam Hours : 3	Hours / Week : 3
SEE : **50 Marks**	Lecture hours : 40 hours

Course Objective:

Understand about the fundamentals of networking, things in IOT and connecting things with theinternet and IOT usage domains in everyday life.

Course Outcomes (COs){with mapping shown against the Program Outcomes (POs)} Upon completion of the course, students shall be able to:

COs	Statement	POs
1.	Describe the evolution of IOT, IOT networking components, and addressingstrategies in IOT.	PO1
2.	Classify various sensing devices and actuator types.	PO1
3.	Explain the processing in IOT and associated IOT technology-cloud computing	PO1
4.	Illustrate architecture of IOT Applications	PO1,PO5

Course Contents:

Module-1	Teaching Hours
Basics of Networking: Introduction, Network Types, Layered network models **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components Textbook 1: Chapter 1- 1.1 to 1.3 Chapter 4 – 4.1 to 4.4	**10 Hours**
Module-2	
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensor examples,Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. Case study- Sensors and actuators in a smart phone Textbook 1: Chapter 5 – 5.1 to 5.9 Textbook-2 Chapter3- Tables 3.1 and 3.2	**10 Hours**

Module-3	
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading. **ASSOCIATED IOT TECHNOLOGIES** Cloud Computing: Introduction, Virtualization, Cloud Models Textbook 1: Chapter 6 – 6.1 to 6.5 Chapter 10– 10.1 to 10.3	**10 Hours**
Module-4	
IOT CASE STUDIES Agricultural IoT – Introduction and Case Studies Vehicular IoT – Introduction Healthcare IoT – Introduction, Case Studies IoT Analytics – Introduction Textbook 1 Chapter 12- 12.1-12.2; Chapter 13– 13.1; Chapter 14- 14.1-14.2; Chapter 17- 17.1	**10 Hours**

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (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 subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. Continuous Internal Evaluation(CIE):

Three Unit Tests each of 20 Marks then reduced to 10 Marks (duration 01 hour)

- First test after the completion of 30 % of the syllabus
- Second test after completion of 60% of the syllabus
- Third test after completion of 90% of the syllabus

ACTIVITIES

Activity Number	Activity Name	Description	Marks
1	Demonstratio n g the usage ofgeneral IoT sensors and actuators	• Demonstration using online simulation platform wokwi in group of 5-6 students. • Student can select any sensor or actuator for the simulation. For example sensors like DHT11, Ultrasonic sensor, IR sensor,Soil Moisture sensor,gas sensor, Current sensor, barometer etc and actuators like servo motor, LED, buzzer, DC motors etc. • Presentation with two pages report about the characteristics of sensors and actuators used.	**15**
2	Group Discussion	• Groups discussion about IoT case studies like Greenhouse automation, Vechicular IoT, IoT in smart cities, IoT in health and lifestyle etc.	**05**

Text Book:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry- IoT Fundamentals- Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press-2017

Reference:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Course Title	INTRODUCTION TO CYBER SECURITY		
Course Code	ETC415I/425I	**(L-T-P)C**	(3-0-0)3
SEE duration	3 hour	**Hours / Week**	03
SEE marks	50	**Total contact hours**	40

Course Objective: Students will be able to gain knowledge on Cyber security and laws.

Course Outcomes (COs): Upon completion of the course, students shall be able to

Sl. No.	Course Outcomes	Mapping to POs
1.	Comprehend knowledge on cybercrime terminologies	PO1
2.	Explain Cyber offenses and Botnets	PO1, PO8
3.	Gain insight on Modern Tools and Methods used on Cybercrime	PO1, PO5
4.	Identify Phishing, Identity Theft and need of computer forensics	PO1, PO6

Course Contents:

MODULE –1	10 Hrs.

Introduction to Cybercrime:

Cybercrime: Definition and Origins of the Word, Cybercrime, and Information Security, who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives

Cyber Offenses:

How Criminals Plan Them: Introduction, how criminals plan the attacks.

MODULE –2	10 Hrs.

Social Engineering, Cyber Stalking, Cybercafé & cybercrimes.

Botnets: The fuel for cybercrime, Attack Vector.

Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers,

MODULE –3	10 Hrs.

Phishing, Password Cracking, Key Loggers and Spyware, Virus, and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks.

Phishing and Identity Theft: Introduction, methods of phishing, phishing, phishing techniques, spear phishing

MODULE – 4	10 Hrs.
Types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft **Understanding Computer Forensics:** Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.	
Text Books : 1. Nina Godboleand SunitBelapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)	
MOOCs 1. https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu 2. https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4 _ 3. https://www.youtube.com/watch?v=6wi5DI6du4&list=PL_uaeekrhGzJlB8XQBxU3z__hDwT95xlk 4. https://www.youtube.com/watch?v=KqSqyKwVuA8	

Course Articulation Matrix:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-	-	-	-

PROGRAMMING LANGUAGE COURSES (PLC)

1. Introduction to Python Programming

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)

Bachelor of Engineering

DEPARTMENT OF

Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

SYLLABUS

I&II Semester (2024 Admitted Batch)

(1st Year)

Academic Year 2024-25

Course Title	Introduction to Python Programming		
Course Code	PLC415B/425B	L-T-P-C	(2-0-2) 4
SEE duration	3 hours	Hours / Week	4
CIE(Theory)marks	30	CIE(Practicals)/Activity marks	20
SEE marks	50	Total contact hours	40

Course Objective: Student's will be able to write a python program to solve the given problem.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

SL. No.	Course Outcomes	Mapping to Pos	Mapping to PSOs
1.	Describe and apply python language construct for writing a program	1,3,5	-
2.	Analyze the codes snippet for its correctness	2,5	-
3.	Design a GUI/python program for the given problem	3,5	-

Course Contents:

Module 1	10 Hours

Python Basics: The way of Programming. Variables, Expression and Entering Expressions into the Interactive Shell. The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program,

Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow ControlStatements, Importing Modules, Ending a Program Early with sys.exit(). Loops for iteration.

Manipulating Strings: Working with Strings, Useful String Methods.

Module 2	10 Hours

Lists: The List DataType, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List. List-like Types: Strings and Tuples.

Dictionaries: The Dictionary DataType, Pretty Printing.

Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Argument sandprint(). Local and Global Scope, The global Statement. Exception Handling, A Short Program: Guess the Number.

Module 3	10 Hours

Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the print.format() Function.

GUI Programming: Tkinter Introduction, Tkinter and Python programming, Widgets Label, Button, Entry, Scaling, Menu, Check Box, Radio button. Tkinter examples

Module 4	10 Hours

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instancesas returnvalues, Objects are mutable, Copying. **Classes and functions:** Time, Pure functions, Modifiers, Prototyping versus planning. **Classes and methods:** Object oriented features, Printing objects, Another example, A more complicated example, Theinit method. Thestr method. Operator overloading. Type-baseddispatch, Polymorphism.

Programming Exercises:

1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
2. Develop a program to generate Fibonacci sequence of length(N).Read N from the console.
3. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R),
4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
5. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
6. Write a python program to Guess the number using randint() Functions (ask player to guess 6times).
7. Write a magic 8-ball game program in python using list.
8. Write a program to search an element using linear search.
9. Write a program to search an element using binary search.
10. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
11. Write an Object-oriented Python program to create two Time objects: current Time, which contains the current time; and bread Time, which contains the amount of time it takes for a bread maker to make bread. Then we'll use add Time to figure out when the bread will be done. Write the print Time function to display the time when the bread will be done by the bread maker.
12. Define a function that takes two objects representing complex numbers and returns new complex number with an addition of two complex numbers. Define a suitable class 'Complex to represent the complex number. Develop a program to read N (N>2) complex numbers and to compute the addition of N complex numbers.
13. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details [Hint: Use list

to store the marks in three subjects and total marks. Use init() method to initialize name, USN and the lists to store marks and total, Use the get Marks() method to read marks into the list, and display() method to display the scorecard details.]

14. Design GUI a python program to store the information about the student like first name, last name, department (text box), gender (radio button) with login and cancel button.
15. Design a simple GUI image viewer.

Text Books :

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition. No Starch Press, 2015.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition,Green Tea Press, 2015.
3. Wesley J Chun, "Core Python Application Programming", 3rd Edition, Pearson Publication, 2016.

Reference Books:

1. R. Nageswara Rao, "Core Python Programming", 3rd Edition, Dreamtech Press

Teaching-Learning Process

These are sample strategies, which teacher can use to accelerate the attainment of the various Course outcomes and make Teaching-Learning more effective

1. Chalk and talk, use modern tools and projector.
2. Demonstrate and visualize basic data types(list, tuple, and dictionary).
3. Use https://pythontutor.com/visualize.html/mode edit in order to visualize the python code
4. Online Videos

Web links and Video Lectures(e-Resources):

- https://www.learnbyexample.org/python/
- https://www.learnpython.org/
- https://pathontutor.com/visualize.html#mode=edi

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

- Quizzes for list, tuple, string dictionary slicing operations using below link: https://github.com/sushantkhara/Data-Structures-And-Algorithms-with-python/raw/main/Python%203%20%20400%20exercises%20and%20solutions%20for%20beginners.pdf

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc21_cs32/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3		2		3									
CO2		2			3									
CO3			2		3									

Scheme of Evaluation (Lab Integrated Courses)

Assessment	Marks
Three CIE's conducted for 20 marks each and reduced to 10 - Total of 30 Marks	30
Activities – 20 Marks 1. Continuous Evaluation in every lab session by the course coordinator -5 Marks 2. Record writing -5 Marks 3. Lab CIE – Conducted for 50 Marks and reduced to 10 Marks	20
SEE – Conducted for 100 Marks and reduced to 50 Marks.	50
Total	**100**

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	(Theory 12 Marks, Activity 8 Marks) - 20
SEE	50	20

MATHEMATICS FOR SECOND SEMESTER B. E.

Course Title	Mathematics for Computer Science Engineering stream-2		
Course Code	MAT4S21	**(L-T-P)**	(3-1-2)4
Exam	3hours	**Hours / Week**	06
SEE	50 Marks	**Total Hours**	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the simple problems connected with ordinary differential equations/partial differential equations and vector calculus, number theory.	PO1	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl.	PO1, PO2	-
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1	**10 Hrs.**

Ordinary Differential Equations: First order first degree-Linear differential equations, Exact differential equation. Power series solutions --second order only.

Applicatons - Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to

escape from earth. Modelling of infected diseases, carbon dating half-life period, mixing problem involving one tank, two tank. Application of first order differential equation- Autonomous equation and population dynamics- Logistic model- Natural growth of halibut population in certain areas of Pacific Ocean.

Self-Study- Bernoulli's differential equations, Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories in Cartesian form, illustrative examples, Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body, Equi-potential lines in an electric field between two concentric cylinders**.**

MODULE - 2	**10 Hrs.**

Ordinary Differential Equations: Higher order - Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms: exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications - Oscillatory Electrical circuit: LC Circuit, LCR Circuit, LC Circuit with E.M.F, LCR Circuit with E.M.F, Electro-Mechanical Analogy.

Self-Study- Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations).

MODULE - 3	**10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector method.

Partial Differential Equations: Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications - To find all possible solutions of one-dimensional heat equation and two-dimensional wave equation. Application connected with Computer Science Engineering.

Self-Study - Adam-Bashforth method, Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find all possible solutions of two-dimensional Laplace equation.

MODULE - 4	**10 hrs.**

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Number theory -Properties of integers- division algorithm, GCD and LCM, Congruence relations, residue classes, congruence equations, applications of congruences on cryptography.

Applications -Modelling projectile motion(vector approach), RSA Algorithm.

Self-Study - Curvilinear coordinates: Scale factors, base vectors, and transformation between Cartesian and curvilinear systems, orthogonality- Problems.

Tutorial component:

1. Need of studying the differential equations connected with L3.
2. Examples on first order first degree differential equations connected with L3.
3. Examples on first order first degree differential equations connected with L4.
4. Mathematical modeling using first order first degree differential equations.
5. Need of studying mathematical modeling –L4
6. Examples on linear differential equations with constant co-efficient (second order and first degree).L3 and L4
7. Mathematical modeling such as LCR circuit, transmission lines highway engineering, connected with LDE- L3 and L4
8. Need to study numerical solution of differential equations and examples L3 and L4
9. Report on role of partial differential equations in engineering-L3
10. Examples on numerical solution of simple partial differential equations-L3
11. Report on need of studying vector calculus-L4
12. Physical interpretation of the terms like gradient, divergence, curl, rotational and irrotational vectors - L3 and L4

13. Examples on application on Vector Calculus connected with L3

14. Examples on application on Vector Calculus connected with L4

Practical component:

List of Programmes:

1. Solution of First order first degree-Linear differential equations
2. Solution of First order first degree-Exact differential equations
3. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
4. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
5. Solution of first order ordinary differential equation using Taylor series method
6. Solution of first order ordinary differential equation using Runge-kutta method.
7. Solution of first order ordinary differential equation using Milne's Predictor-Corrector method.
8. Finding gradient, divergence and curl.
9. Solution of 2^{nd} order differential equations(by variation of parameter method).
10. Solution of partial differential equation (Laplace & Poisson equations).

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

3. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

Reference Books:

1. R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MOOC Course:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics for Civil Engineering-2		
Course Code	MAT4C21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the simple problems connected with ordinary differential equations/partial differential equations and vector calculus.	PO1	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl.	PO1, PO2	-
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Ordinary Differential Equations: First order first degree-Linear differential equations, Exact differential equations.

Power series solutions -second order only.

Applicatons - Mathematical modelling through differential equations of first order first degree and

solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. Modelling of infected diseases, carbon dating half-life period, mixing problem involving one tank, two tank.Application of first order differential equation- Autonomous equation and population dynamics - Logistic model - Natural growth of halibut population in certain areas of Pacific Ocean.

Self-Study - Bernoulli's differential equations, Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right) and \frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form, illustrative examples. Applications to find the orthogonal trajectories - streamlines of flow in the channel, curves of constant temperature in a body. Equi-potential lines in an electric field between two concentric cylinders**.**

MODULE - 2	**10 Hrs.**

Ordinary Differential Equations: Higher order - Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications - Mechanical Vibrations-A Spring mass system $mu^{II}(t)+ku^{I}(t)+gu(t)=f(t)$ Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping.

Self-Study - Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations). Mechanical system and transmission lines.

MODULE - 3	**10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations: Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications - To find all possible solutions of one-dimensional heat equation and two-dimensional wave equation. Application connected with Civil Engineering.

Self-Study - Adam-Bash forth method. Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find all possible solutions of two-dimensional Laplace equation.

MODULE - 4	**10 hrs.**

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations.

Applications -Modeling projectile motion(vector approach). Analysis of stream lines and electic potentials.

Self-Study- Curvilinear coordinates: Scale factors, base vectors, and transformation between Cartesian and curvilinear systems, orthogonality- Problems.

Tutorial component:

1. Need of studying the differential equations connected with L3.
2. Examples on first order first degree differential equations connected with L3.
3. Examples on first order first degree differential equations connected with L4.
4. Mathematical modeling using first order first degree differential equations.
5. Need of studying mathematical modeling –L4
6. Examples on linear differential equations with constant co-efficient (second order and first degree).L3 and L4
7. Mathematical modeling such as LCR circuit, transmission lines highway engineering, connected with LDE- L3 and L4
8. Need to study numerical solution of differential equations and examples L3 and L4
9. Report on role of partial differential equations in engineering-L3
10. Examples on numerical solution of simple partial differential equations-L3

11. Report on need of studying vector calculus-L4

12. Physical interpretation of the terms like gradient, divergence, curl, rotational and irrotational vectors - L3 and L4

13. Examples on application on Vector Calculus connected with L3

14. Examples on application on Vector Calculus connected with L4

Practical component:

List of Programmes:

1. Solution of First order first degree-Linear differential equations
2. Solution of First order first degree-Exact differential equations
3. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
4. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
5. Solution of first order ordinary differential equation using Taylor series method
6. Solution of first order ordinary differential equation using Runge-kutta method.
7. Solution of first order ordinary differential equation using Milne's Predictor-Corrector method.
8. Finding gradient, divergence and curl.
9. Solution of 2^{nd} order differential equations(by variation of parameter method).
10. Solution of partial differential equation (Laplace & Poisson equations).

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Text Books :

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

3. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

Reference Books:

1. R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MOOC Course:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics for Electrical and Electronics Engineering stream-2		
Course Code	MAT4E21	**(L-T-P)**	(3-1-2)4
Exam	3hours	**Hours / Week**	06
SEE	50 Marks	**Total Hours**	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the simple problems connected with ordinary differential equations/partial differential equations and vector calculus, graph theory.	PO1	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl.	PO1, PO2	-
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1	**10 Hrs.**

Differential Equations (DE): first order first degree-Linear differential equations, Exact differential equations.

Power series solutions-second order only.

Applicatons : Mathematical modelling through differential equations of first order first degree and

solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. Modelling of infected diseases, carbon dating half-life period, mixing problem involving one tank, two tank.Application of first order differential equation- Autonomous equation and population dynamics - Logistic model- Natural growth of halibut population in certain areas of Pacific Ocean.

Self-study - Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ $and\ \frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories in Cartesian form-illustrative examples. Applications to find the orthogonal trajectories - streamlines of flow in the channel, curves of constant temperature in a body. Equi-potential lines in an electric field between two concentric cylinders**.** Bernoulli's differential equations.

MODULE - 2	**13 Hrs.**

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications of second order, first degree Differential equations - Oscillatory Electrical circuit, LC Circuit, LCR Circuit, LC Circuit with E.M.F, LCR Circuit with E.M.F, Electro-Mechanical Analogy. Applications of second order, first degree Differential equations - Transmission lines, Highway engineering.

Self-study-Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations).

MODULE - 3	**10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications: To find all possible solutions of one-dimensional heat equation and two-dimensional wave equation. Estimating the approximate solutions of ODE for electric circuits.

Self-Study - Adam-Bash forth method, Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find all possible solutions of two-dimensional Laplace equation. Application connected with Electrical Engineering.

MODULE - 4	**10 hrs.**

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Physical& Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Graph theory: Introduction to graph theory, types of graphs, subgraphs, spanning subgraphs, shortest path algorithms (Prims and Kruskal).

Applications: Modelling projectile motion (vector approach), Analysis of streamlines and electric potentials.

Self - study: .Curvilinear coordinates: Scale factors, base vectors and transformation between Cartesian and curvilinear systems, orthogonality-Problems.

Tutorial component:

1. Need of studying the differential equations connected with L3.
2. Examples on first order first degree differential equations connected with L3.
3. Examples on first order first degree differential equations connected with L4.
4. Mathematical modeling using first order first degree differential equations.
5. Need of studying mathematical modeling –L4
6. Examples on linear differential equations with constant co-efficient (second order and first degree).L3 and L4
7. Mathematical modeling such as LCR circuit, transmission lines highway engineering, connected with LDE- L3 and L4
8. Need to study numerical solution of differential equations and examples L3 and L4
9. Report on role of partial differential equations in engineering-L3

10. Examples on numerical solution of simple partial differential equations-L3

11. Report on need of studying vector calculus-L4

12. Physical interpretation of the terms like gradient, divergence, curl, rotational and irrotational vectors - L3 and L4

13. Examples on application on Vector Calculus connected with L3

14. Examples on application on Vector Calculus connected with L4

Practical component:

List of Programmes:

1. Solution of First order first degree-Linear differential equations
2. Solution of First order first degree-Exact differential equations
3. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
4. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
5. Solution of first order ordinary differential equation using Taylor series method
6. Solution of first order ordinary differential equation using Runge-kutta method.
7. Solution of first order ordinary differential equation using Milne's Predictor-Corrector method.
8. Finding gradient, divergence and curl.
9. Solution of 2^{nd} order differential equations(by variation of parameter method).
10. Solution of partial differential equation (Laplace & Poisson equations).

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

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MOOC Course:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**													
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**3**	**2**												
CO5	**3**	**2**			**1**									

Course Title	Mathematics for Mechanical Engineering -2		
Course Code	MAT4M21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	65(40L+13T+12P)

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the simple problems connected with ordinary differential equations/partial differential equations and vector calculus.	PO1	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl.	PO1, PO2	-
CO4	Model the real-life problems/Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods, differential equations, vector calculus, execute the same and provides correct output.	PO1, PO2,PO5	-

MODULE - 1 — 10 Hrs.

Ordinary Differential Equations - first order first degree-Linear differential equations,Exact differential equations.

Power series solutions- second order only.

Applications: Mathematical modelling through differential equations of first order first degree and

solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. Modelling of infected diseases, carbon dating half-life period, mixing problem involving one tank, two tank. Application of first order differential equation- Autonomous equation and population dynamics- Logistic model- Natural growth of halibut population in certain areas of Pacific Ocean.

Self-study--Bernoulli's differential equations, Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right) and \frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, Applications to find the orthogonal trajectories - streamlines of flow in the channel, curves of constant temperature in a body. Equi-potential lines in an electric field between two concentric cylinders.

MODULE - 2	**10 Hrs.**

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications of second order, first degree Differential equations: - Mechanical Vibrations-A Spring mass system $mu^{II}(t)+ku^{I}(t)+gu(t)=f(t)$ Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping.

Self-study- method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.

MODULE - 3	**10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications: To find all possible solutions of one-dimensional heat equation and two-dimensional

wave equation. Finding approximate solutions to solve mechanical engineering problems.

Self-Study- Adam-Bash forth method, Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find all possible solutions of two-dimensional Laplace equation. Application connected with Mechanical Engineering..

MODULE - 4	**10 hrs.**

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, reducible to Clairaut's equations.

Applications: Modelling projectile motion(vector approach), Formulation and solution of Cantilever beam. Analysis of stream lines and electic potentials.

Self-study: Curvilinear coordinates: Scale factors, base vectors, and transformation between Cartesian and curvilinear systems, orthogonality-Problems.

Tutorial component:

1. Need of studying the differential equations connected with L3.
2. Examples on first order first degree differential equations connected with L3.
3. Examples on first order first degree differential equations connected with L4.
4. Mathematical modeling using first order first degree differential equations.
5. Need of studying mathematical modeling –L4
6. Examples on linear differential equations with constant co-efficient (second order and first degree).L3 and L4
7. Mathematical modeling such as LCR circuit, transmission lines highway engineering, connected with LDE- L3 and L4
8. Need to study numerical solution of differential equations and examples L3 and L4
9. Report on role of partial differential equations in engineering-L3
10. Examples on numerical solution of simple partial differential equations-L3

11. Report on need of studying vector calculus-L4

12. Physical interpretation of the terms like gradient, divergence, curl, rotational and irrotational vectors - L3 and L4

13. Examples on application on Vector Calculus connected with L3

14. Examples on application on Vector Calculus connected with L4

Practical component:

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CO5	**3**	**2**			**1**									