K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (EVEN SEMESTER)

CO-PO MAPPING

Course: ENGINEERING CHEMISTRY			
Type: Core		Course Code: 18CHE22	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	4	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. To discuss the working and applications of electrodes, batteries and fuel cells.
2. To understand the concepts of corrosion and its control.
3. To discuss the concepts on renewable and non-renewable energy sources
4. Understand the reasons for pollution and its control.
5. To discuss the role of modern instruments in the quantitative analysis along with synthesis and properties of nano-materials.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Apply** Nernst equation to determine emf of the cell and also able to explain the construction, working and applications of electrodes and batteries.	**Applying (K3)**
CO2	**Utilize** the knowledge of electrochemical theory of corrosion in metals for corrosion control by various methods.	**Applying (K3)**
CO3	**Determine** the calorific value of a fuel using bomb calorimeter and also able to explain the production and consumption of energy.	**Applying (K3)**
CO4	**Build** the knowledge of sewage water treatment, desalination of sea water and Control of Environmental Pollution.	**Applying (K3)**
CO5	**Use** the knowledge of Instrumental method of analysis and able to explain the synthesis, properties & applications of Nanomaterials.	**Applying (K3)**

Syllabus Content

MODULEI: Electrochemistry and Energy storage systems. Use of free energy in chemical equilibria: Thermodynamic functions: Introduction, I law of thermodynamics, Definition of energy & free energy. II law of thermodynamics, definition of entropy. Cell potential: Meaning of EMF. Derivation of Nernst equation for single electrode potential. Numerical problems on E, E^0, and E_{cell}. Electrochemical energy systems: Introduction, types of electrodes, Meaning of reference electrodes, construction, working, advantages and applications of Calomel electrode. Ion-selective electrode – Definition, examples, membrane electrodes, construction and principle of Glass electrode. Determination of pH using glass electrode, Concentration cells: Definition, examples, derivation of an equation to find the EMF of concentration cells, Numerical problems on concentration cells.	**CO1** 10 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO7-1 PO12-1 PSO1-2 PSO2-1

Energy storage systems: Introduction, classification - primary, secondary and reserve batteries with examples. Construction, working and applications of Ni-MH and Li-ion batteries. **LO:** At the end of this session the student will be able to 1. Define laws of thermodynamics, cell potential, reference electrode, concentration cell and battery. 2. Derive an expression for the EMF of a concentration cell & Nernst equation for single electrode potential. 3. Explain the construction, working and applications of reference electrode, glass electrode and batteries.	
MODULE-II: Corrosion and Metal Finishing **Corrosion:** Definition, Wet & Dry corrosion, Electrochemical theory taking corrosion of iron as an example.Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH (greater than 10, between 3 and 10, lower than 3), conductivity and temperature. Types of corrosion- Differential metal corrosion and differential aeration corrosion: Pitting and water line corrosion with diagrams, Corrosion control: Anodizing – Anodizing of aluminium Cathodic protection : Definition, sacrificial anode and impressed current methods, Metal coatings – Galvanization. **Metal Finishing:** Definition and technological importance of metal finishing. Principles governing metal finishing-Polarization, decomposition potential and overvoltage. Electroplating: Introduction, Electroplating of chromium (hard and decorative). its applications. Electroless plating: Introduction, electroless plating of nickel. Electroless plating of copper and its applications, distinction between electroplating and electroless plating processes. **LO:** At the end of this session the student will be able to 1. Define corrosion, Anodizing, metal finishing, electroplating, electroless plating. Polarization, decomposition potential and overvoltage. 2. Explain electrochemical theory of corrosion, types of corrosion, factors influencing rate of corrosion and its control. 3. Explain electro plating of chromium and electro less plating of Nickel and copper.	**CO2** 10 hrs. PO1-3 PO2-3 PO3-1 PO5-1 PO7-1 PO12-1 PSO1-2 PSO2-1
MODULE-III: Energy System **Chemical Fuels:** Introduction, classification based on occurrence and state of aggregation. definitions of CV, LCV and HCV. Determination of calorific value of solid/liquid fuel using bomb calorimeter: Principle, diagram, construction, working and calculation. Numerical problems on calorific values. Knocking of petrol engine – Definition, mechanism, ill effects and prevention, Power alcohol, unleaded petrol and biodiesel. **Fuel Cells:** Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte, and solid oxide fuel cell (SOFCs). **Solar Energy:** Photovoltaic cells- introduction, construction and working of a typical PV cell. Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells. **LO:** At the end of this session the student will be able to 1. Determine the calorific value of a fuel using bomb calorimeter. 2. Explain construction working and applications of PV cell and fuel cells. 3. Explain the synthesis of solar grade silicon and Biodiesel.	**CO3** 10 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO7-1 PO12-1 PSO1-2 PSO2-1

MODULE -IV: Environmental Pollution and Water Chemistry **Environmental Pollution:** Introduction, Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and hydrocarbons. Oxides of sulphur, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion. **Waste Management:** Solid waste, e-waste, Biomedical waste: Sources, Characteristics & disposal methods (Scientific land filling, composting, recycling and reuse). **Water Chemistry:** Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages-scale and sludge formation. Boiler corrosion (due to dissolved O_2, CO_2 and $MgCl_2$), Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Determination of COD. Numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis. **LO:** At the end of this session the student will be able to 1. Explain Sources, effects and control of air and water pollutants. 2. Explain Sources, Characteristics,recycling and disposal methods ofsolid waste. 3. Determine COD of waste water sample.	**CO4** 10hrs PO1-3 PO2-3 PO3-1 PO5-1 PO7-3 PO12-1 PSO1-2 PSO2-1
MODULE-V: Instrumental methods of analysis and Nanomaterials **Instrumental methods of analysis:** Introduction, principle, advantages and limitations. Instrumentation and applications of Colorimetry (Estimation of copper in brass), Flame Photometry (estimation of sodium and potassium). Instrumentation and applications of Atomic Absorption Spectroscopy, Potentiometry (estimation of FAS). Instrumentation and applications of Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base). **Nanomaterials:** Introduction, size dependent properties: Surface area, Electrical, Optical, Catalytic and Thermal properties. Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by bottom up approach: Sol-gel. Synthesis of nanomaterials: precipitation and chemical vapour deposition method.Nanoscale materials: Fullerenes. Carbon nanotubes and Graphenes – properties and applications (synthesis not required). **LO:** At the end of this session the student will be able to 1. Explaininstrumentation and applications of Colorimeter, Potentiometer, and Atomic Absorbtion spectroscopy and flame photometer. 2. Synthesis and properties of nano-materials. 3. Explain properties and applications of Fullerenes, Carbon nanotubes and Graphenes	**CO5** 10hrs PO1-3 PO2-3 PO3-1 PO5-1 PO7-1 PO12-1 PSO1-2 PSO2-1

Text Books

1. B. S. Jai Prakash, R.Venugopal, Sivakumaraiah&Pushpalyengar,"*Chemistry for Engineering Students*", Subhash Publications, Bangalore, Fifth edition,2014.
2. R.V.Gadag&A.NityanandaShetty, "*Engineering Chemistry*", I K International Publishing House Private Ltd., New Delhi, Third Edition 2014.
3. P.C.Jain& Monica Jain.,"*Engineering Chemistry*", DhanpatRai Publications, New Delhi, Fifteenth Edition, 2009.

Reference Books (specify minimum two foreign authors text books)

1. O.G.Palanna,"*Engineering Chemistry*",Tata McGraw Hill Education Pvt.Ltd. New Delhi, Fourth Edition, 2014.
2. G.A.Ozin, A.C. Arsenault &LudovicoCademartiri "*Nanochemistry A Chemical Approach to Nanomaterials*", Royal Society of Chemistry, First Edition, 2005.
3. Wiley,"*Engineering Chemistry*", India Pvt. Ltd. New Delhi. Second Edition. 2013.
4. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., "*Polymer Science*", Wiley-Eastern Ltd. New Delhi, First Edition, 1986.
5. M.G.Fontana., "*Corrosion Engineering*", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi. Third Edition, 1986.

Useful Websites

- http://www.chemtutor.com/
- http://www.rsc.org/
- http://www.mdpi.com/
- http://webbook.nist.gov/chemistry/

Useful Journals

1. Journal of Power Sources.(*www.**journals**.elsevier.com/**journal-of-power-sources**)*
2. Journal of Alloys and Compounds.(*www.journals.elsevier.com/journal-of-alloys-and-compounds)*
3. Fuel Cells Bulletin.(*www.journals.elsevier.com/**fuel-cells-bulletin***)
4. Electrochemical Acta. (*www.journals.elsevier.com/**electrochimica-acta**)*
5. European Polymer Journal. (*www.**journals**.elsevier.com/**european-polymer-journal***)

Teaching and Learning Methods

1. **Lecture class:** 50 hrs
2. **Practical classes:** 0

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 30 marks (Average of three tests will be considered)

Assignment: 10 marks(Average of three assignments).

Semester End Exam (SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hrs

Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt& Finance **PO12:**Life long Learning

PSO1: Ability to apply concept of Chemistry to design a system, to address a real world challenges.

PSO2: Ability to develop effective communication, team work and computational skills.

CO	PO	PO1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS O1	PS O 2
18CH E22	K-level														
CO1	K3	3	3	1	-	1	-	1	-	-	-	-	1	2	1
CO2	K3	3	3	1	-	1	-	1	-	-	-	-	1	2	1
CO3	K3	3	3	1	-	1	-	1	-	-	-	-	1	2	1
CO4	K3	3	3	1	-	1	-	3	-	-	-	-	1	2	1
CO5	K3	3	3	1	-	1	-	1	-	-	-	-	1	2	1

Course In charge

Head of the Department
Dr. C. VASUDEV
Professor & Head
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Principal
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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (EVEN SEMESTER)

CO-PO MAPPING

Course: Advanced Calculus and Numerical Methods

Type: Core		Course Code: 18MAT21	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	4	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. To familiarize the important tools of vector calculus, ordinary/partial differential equations and power series required to analyze the engineering problems.
2. To apply the knowledge of interpolation/extrapolation and numerical integration technique whenever analytical methods fail or very complicated, to offer solutions.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Illustrate** the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and line integrals.	**Applying (K3)**
CO2	**Demonstrate** various physical models through higher order differential equations and solve such linear ordinary differential equations.	**Applying (K3)**
CO3	**Find** the variety of partial differential equations and solutions by exact methods/method of separation of variables.	**Applying (K3)**
CO4	**Apply** the knowledge of numerical methods in the models of various physical and engineering phenomena.	**Applying (K3)**
CO5	**Describe** the applications of infinite series and obtain series solution of ordinary differential equations.	**Applying (K3)**

Syllabus Content

Module 1: **Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector	**CO1** 10 hrs

fields-Illustrative problems. **Vector Integration:** Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux. **LO:** At the end of this session the student will be able to 1. Find the gradient, directional derivative; curl and divergence. 2. Show that the vector function is solenoidal and irrotational. 3. Evaluate the integrals using Green's, stoke's and divergence theorem.	PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2

Module 2: Differential Equations of higher order:-Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters: Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and L-C-R circuits. **(RBT Levels : Ll, L2 & L3)** **LO:** At the end of this session the student will be able to 1. Solve the differential equations by inverse differential operation method. 2. Solve the differential equations by method of variation of parameters. 3. Solve linear ordinary differential equations.	**CO2** 10 hrs. PO1-3 PO2 -2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 3: **Partial Differential Equations(PDE's)**:-Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables. **(RBT Levels: Ll, L2 & L3)** **LO:** At the end of this session the student will be able to 1. Obtain the PDE by elimination of arbitrary constants and functions. 2 Derive one dimensional heat and wave equations. 3 Find the solution of heat and wave equations by the method of separation of variables. 4 Solve the homogeneous and non-homogeneous PDE .	**CO3** 10 hrs PO1-3 PO2 -2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2

Module 4: **Numerical Methods:** Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations-Newton-Raphson and Regula-Falsi methods(only formulae)-illustrative examples. **LO:** At the end of this session the student will be able to 1. Evaluate the definite integrals by using Beta and Gamma functions. 2. Find the real root of the equations by Newton-Raphson and Regula-Falsi methods 3.	**CO4** 10hrs PO1-3 PO2 -2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 5: **Infinite Series**:-Series of positive terms-convergence and divergence. Cauchy's root test and D'Alembert's ratio test(without proof)-illustrative examples. **Power Series solutions:**-Series solution of Bessel's differential equation leading to Jn(x)-Bessel's function of first kind-orthogonality. Series solution of Legendre's differential equation leading to .Pn(x)-Legendre polynomials. Rodrigues formula (without proof), problems. **(RBT Levels : Ll & L2)** **LO:** At the end of this session the student will be able to 1. Test for the convergence. 2. Obtain the Series solution of Bessel's differential equation leading to Jn(x)-Bessel's function of first kind. 3. Obtain Series solution of Legendre's differential equation leading to .Pn(x)-Legendre polynomials. 4. Solve the given polynomials by using Rodrigues formula.	**CO5** 10hrs PO1-3 PO2 -2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2

Text Books

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43 Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10 Rd Ed.(Reprint), 2016.

Reference Books

1. **C.Ray Wylie, Louis C.Barrett** : "Advanced Engineering Mathematics", 6 Edition, 2. McGraw-Hill Book Co., New York, 1995.

2. **James Stewart** : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.

3. **B.V.Ramana**: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

4. **Srimanta Pal & Subobh C Bhunia:** "Engineering Mathematics", Oxford University Press.3 Th Reprint, 2016.

5. **Gupta C.B., Singh S.R. and Mukesh Kumar**: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Useful Websites

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

Useful Journals

- Annals of Mathematics
- Acta Mathematica
- International Journal of Mathematics
- Communications on pure and applied Mathematics.

Teaching and Learning Methods

1. Lecture class: 50 hrs
2. Practical classes: 0

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)
Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.
Test duration: 1 :30 hours
Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt & Finance **PO12:**Life long Learning

PSO1: Ability to apply concept of Mathematics in engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

CO	PO	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
18MAT21	K-level														
CO1	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	2
2	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	2
CO3	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	2
CO4	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	2
CO5	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	2

Course In charge

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DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (EVEN SEMESTER)

CO-PO MAPPING

Course: COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS			
Type: Core		Course Code: 18MAT41	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3	0	3	40
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

- To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

Course Learning Outcomes

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

CO1	**Solve** the problems arising in electromagnetic field theory by using the concept of analytic function and complex potentials.	**Applying (K3)**
CO2	**Utilize** conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing	**Applying (K3)**
CO3	**Analysing** the probability models arising in engineering field by applying discrete and continuous probability distributions	**Applying (K3)**
CO4	**Fit** a suitable mathematical model for the statistical data by using correlation and regression analysis.	**Applying (K3)**
CO5	**Construct** joint probability distributions and demonstrate the validity of testing the hypothesis.	**Applying (K3)**

Syllabus Content

Module 1: : Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. **Construction of analytic functions:** Milne-Thomson method-Problems **LO:** At the end of this session the student will be able to 1. Derive Cauchy-Riemann equations in Cartesian and polar forms.	**CO1** 8 hrs PO1-3 PO2-2 PO3-1 PO4-1

2. Construct the analytic function when v is given. 3. Find the analytic function when u is given.	PO10-1 PO12-1 PSO1-3 PSO2-2

Module 2: **Conformal transformations:** Introduction. Discussion of transformations: $w = z^2, w = e^z, w = z + \frac{1}{z}$ $. z \neq 0$. Bilinear transformations- Problems. **Complex integration:** Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems. **LO:** At the end of this session the student will be able to 1. Find the Bilinear transformation. 2. Discuss the transformation $w = z^2, w = e^z, w = z + \frac{1}{z}$ $. z \neq 0$ 3. Evaluate the integral using Cauchy's integral formula. 4. Derive cauchy's theorem and Cauchy's integral formula.	**CO2** 8 hrs. PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 3: **Probability Distributions:** Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)- Illustrative examples. **LO:** At the end of this session the student will be able to 1. Describe the random variables and probability distributions using statistical methods	**CO3** 8 hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 4: **Statistical Methods:** Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares- fitting the curves of the form $y = ax + b, y = ax^2 + bx + c, y = ax^b$ **LO:** At the end of this session the student will be able to 1. Obtain the coefficients of correlation and the lines of regression for the given data. 2. Compute the coefficient of rank correlation for the given data. 3. Fit a curve for the given data.	**CO4** 8 hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 5: **Joint probability distribution:** Joint Probability distribution for two discrete	**CO5**

random variables, expectation and covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **LO:** At the end of this session the student will be able to 1. Explain Type-I and Type-II errors, ,null hypothesis, level of significance. 2. Find the joint probability distribution for two variables. 3. Find the expectation, co-variance for the joint probability distributions.	8 hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-2

Text Books

1 Advanced Engineering Mathematics E. Kreyszig John Wiley & Sons 10th Edition, 2016

2 Higher Engineering Mathematics B. S. Grewal Khanna Publishers 44th Edition, 2017

3 Engineering Mathematics Srimanta Pal et al Oxford University Press 3 rd Edition, 2016

Reference Books

1. Advanced Engineering Mathematics C. Ray Wylie, Louis C. Barrett McGraw-Hill Book Co 6 th Edition, 1995

2 Introductory Methods of Numerical Analysis S.S.. Sastry Prentice Hall of India 4 th Edition 2010

3 Higher Engineering Mathematics B.V. Ramana McGraw-Hill 11th Edition,2010

4 A Textbook of Engineering Mathematics N.P. Bali and Manish Goyal Laxmi Publications 6 th Edition, 2014

5 Advanced Engineering Mathematics Chandrika Prasad and Reena Garg Khanna Publishing, 2018

Useful Websites

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME - 20

Useful Journals

- Annals of Mathematics
- Acta Mathematica
- International Journal of Mathematics
- Communications on pure and applied Mathematics.

Teaching and Learning Methods

1. Lecture class: 40 hrs
2. Practical classes: 0

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)
Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.
Test duration: 1 :30 hours
Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Management & Finance **PO12:**Life long Learning

PSO1: Ability to apply concept of Mathematics in engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18 MAT41	K-level														
CO1	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	1
CO2	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	1
CO3	K3	3	1	2	1	-	-	-	-	-	2	-	1	3	1
CO4	K3	3	2	2	1	-	-	-	-	-	1	-	1	3	1
CO5	K3	3	1	2	1	-	-		-	-	2	-	1	3	1

Course In charge

Head of the Department

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KSSEM

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DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (EVEN SEMESTER)

CO-PO MAPPING

Course Title: Engineering Physics

Type: Fundamental | **Course Code: 18PHY22**

No of Hours

Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
5	0	5	50

Marks

Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. Engineering Physics is one of a basic subject for all engineering course. In this course, principles of Physics are taught to build strong foundation of knowledge required for engineering courses.
2. Learning the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.
3. Gaining the knowledge of newer concepts in modern physics for the better appreciation of modern technology.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Utilizing** the knowledge of simple harmonic motion, derive the expressions for various types of oscillations and to understand the role of shock waves in various fields.	**Applying (K3)**
CO2	**Apply** the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation and to study the construction and working of different types of laser and its application in different fields.	**Applying (K3)**
CO3	**Determine** the various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.	**Applying (K3)**
CO4	**Identify** the elastic properties of materials for engineering applications.	**Applying (K3)**
CO5	**Understand** the interrelation between time varying electric field and magnetic field, the transverse nature of EM waves and **applying** the concepts of EM waves in optical fibers.	**Applying (K3)**

Syllabus Content

Module 1: Oscillations and Waves **Free Oscillations:** Definition of SHM, derivation of equation for SHM, Mechanical and electrical simple harmonic oscillators (mass suspended to spring oscillator), complex notation and phasor representation of simple harmonic motion. Equation of motion for free oscillations, Natural frequency of oscillations. **Damped and forced oscillations:** Theory of damped oscillations: over damping, critical & under damping, quality factor. Theory of forced oscillations and resonance, Sharpness of resonance. One example for mechanical resonance. **Shock waves:** Mach number, Properties of Shock waves, control volume. Laws of	**CO1** 10 hrs PO1-3 PO2-3 PO4-1 PO6-2 PO7-2 PO12 -1 PSO1-3

conservation of mass, energy and momentum. Construction and working of Reddy shock tube, applications of shock waves. Numerical problems **LO:** At the end of this module, the students will be able to 1. Explain SHM and different types of oscillations. 2. Derive the expressions for amplitude of damped and forced vibrations. 3. Explain Mach number, classification based on Mach number and Reddy shock tube.	PSO2-1
Module 2: Quantum Mechanics and Lasers **Quantum mechanics:** Introduction to Quantum mechanics, Wave nature of particles, Heisenberg's uncertainty principle and applications (non-confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy Eigen values of a particle in a box and probability densities **Lasers:** Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO2 and semiconductor Lasers. Application of Lasers in Defense (Laser range finder) and Engineering (Data storage) Numerical problems **LO:** At the end of this module, the students will be able to 1. Explain the uncertainty principle and its applications. 2. Obtain the expression for time independent Schrodinger wave equation and energy Eigen values. 3. Derive the expression for energy density in terms of Einstein's Coefficients. 4. Explain the construction and working of different types of lasers and its applications.	**CO2** 10 hrs. PO1-3 PO2-3 PO4-3 PO6-3 PO7-1 PO12-1 PSO1-3 PSO2-2
Module 3: Material science **Quantum Free electron theory of metals**: Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory, Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level. Derivation of the expression for Fermi energy, Success of QFET. **Physics of Semiconductor:** Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient(derivation) **Dielectric materials:** Polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation (Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems **LO:** At the end of this module, the students will be able to 1. Explain CFET, QFET, Fermi energy and FD statistics. 2. Derive an expression for electrical conductivity of semiconductors and Hall coefficients. 3. Explain dielectrics, types of polarisation and hence arrive Clausius-Mossotti equations.	**CO3** 10 hrs PO1-3 PO2-3 PO4-2 PO6-2 PO7-1 PO12-1 PSO1-3 PSO2-1

Module 4: Elastic properties of materials **Elasticity:** Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure (fracture/fatigue). Hooke's law, different elastic moduli: Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of α and β. Relation between Y, n and K, Limits of Poisson's ratio. **Bending of beams:** Neutral surface and neutral plane, Derivation of expression for bending moment. Bending moment of a beam with circular and rectangular cross section. Single cantilever, derivation of expression for young's modulus **Torsion of cylinder:** Expression for couple per unit twist of a solid cylinder (Derivation). Torsional pendulum-Expression for period of oscillation. Numerical problems **LO:** At the end of this module, the students will be able to 1. Explain the terminologies related to elasticity. 2. Define bending of beams, single cantilever and torsion of a cylinder. 3. Derive the expressions for bending moment, Young's modulus of single cantilever and couple for unit twist for a solid cylinder.	**CO4** 10hrs PO1-3 PO2-3 PO4-3 PO6-3 PO7-1 PO12-1 PSO1-3 PSO2-2
Module 5: Maxwell's equations, EM waves and Optical fibers **Maxwell's equations:** Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum **EM Waves:** The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations). Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves(Qualitative) **Optical fibers:** Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion of block diagram of point to point communication. Merits and demerits Numerical problems **LO:** At the end of this module, the students will be able to 1. State Gauss' divergence theorem, Stokes' theorem and Faraday's laws of electromagnetic induction and transverse nature of EM waves. 2. Derive the wave equation in terms of E using Maxwell's equations. 3. Explain the mechanism of optical fiber and attenuation.	**CO5** 10hrs PO1-3 PO2-3 PO4-2 PO6-2 PO7-2 PO10-1 PO12-1 PSO1-3 PSO2-2

Text Books

1. M N Avadhanulu and P G Kshirsagar, "**A textbook of Engineering Physics**", 10th revised Ed. S Chand & Company Ltd, New Delhi
2. Gaur and Gupta, "**Engineering Physics**", 2017, Dhanpat Rai Publications
3. Arthur Beiser, "**Concepts of Modern Physics**", 6th Ed, 2006, Tata McGraw Hill Edu Pvt Ltd, New Delhi

Reference Books (specify minimum two foreign authors text books)

1. MK Verma, "**Introduction to Mechanics**", 2nd Ed, 2009, University Press(India) Pvt. Ltd.,

Hyderabad

2. David Griffiths, **"Introduction to Electrodynamics"**, 4th Ed, 2017, Cambridge University Press
3. Halliday and Resnick **"Fundamentals of Physics Extended"** 10th edition Wiley publications.
4. BB laud, **"Lasers and Non Linear Optics"**, 3rd Ed, 2011, New Age International Publishers
5. S O Pillai, **"Solid State Physics"**, 8th Edition, 2018, New Age International Publishers
6. Chintoo S Kumar ,K Takayama and K P J Reddy, **"Shock waves made simple"**, 2014, Wiley India Pvt. Ltd., New Delhi

Useful Websites

- W1 Nptel.ac.in
- W2 www.physics.org
- W3 www.physicsclassroom.com
- W4 www.coursera.org
- https://drive.google.com/file/d/1aHovqmsd4HRu7dlEfjTKtwxfTbFcKrqs/view?usp=sharing
- https://drive.google.com/file/d/1UV68Yw9lbSNe0dUEAAbdWTEbJ-FKMZ02/view?usp=sharing

Useful Journals

- Journal of Nature Physics
- Journal of Foundation of Physics
- Journal of Physical Review
- Journal of Applied Physics
- Journal of Classical and Quantum Gravity

Teaching and Learning Methods

1. Lecture class: 50 hours
2. Practical classes: 2 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks i.e., Average of three tests + 10 marks Assignments)

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:** Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Mngmt & Finance **PO12:** Life long Learning

PSO1: Ability to understand the basic principles, laws, theories and problem solving skills of Engineering Physics and their application in engineering and technology.

PSO2: Ability to apply the concepts of physics to design a process to address the real world challenges.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18PHY22	K-level														
CO1	K3	3	3	-	1	-	2	2	-	-	-	-	1	3	1
CO2	K3	3	3	-	3	-	3	1	-	-	-	-	1	3	2
CO3	K3	3	3	-	2	-	2	1	-	-	-	-	1	3	1
CO4	K3	3	3	-	3	-	3	1	-	-	-	-	1	3	2
CO5	K3	3	3	-	2	-	2	2	-	-	-	-	1	3	2

Course In charge

Head of the Department

Dr. C. VASUDEV
Professor & Head
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K S School of Engineering and Management
Bangalore - 560 109.

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

CO-PO Mapping

Course: SYSTEM SOFTWARE AND COMPILERS			
Type: Core		**Course Code: 18CS61**	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total Teaching Hours
3	0	3	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. Outline the architecture of SIC and SIC/XE machine. Illustrate the concept of Application software and system software such as assemblers, Loaders.
2. Infer the various phases of compiler and apply these phases to build an application.
3. Identify the methods and strategies for parsing techniques.
4. Identify the tool to produce a parser for given grammar.
5. Devise and perform syntax directed translation schemes for compiler and analyze the optimized code generated after the synthesis phase.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Outline** the architecture of Simplified Instructional Computer, functions of assembler, Loader Functions and **Obtain** the object program for assembly programs.	Applying (K3)
CO2	**Make use of** tokens, patterns **Design** the lexical analyzer for real world problems.	Understanding(K3)
CO3	**Identify** and **apply** the different Parsing level techniques to solve grammar.	Applying(K3)
CO4	**Identify** different Regular expression and **apply** Lex and Yacc tool to build scanner and parser respectively.	Applying(K3)
CO5	**Inspect** and **construct** the syntax tree by associating synthesis phase with analysis phase for better optimization and performance.	Applying (K3)

Syllabus Content

Module1: Introduction to System Software, Machine Architecture of SIC and SIC/XE. **Assemblers:** Basic assembler functions, machine dependent assembler features, machine independent assembler features, assembler design options. Basic Loader Functions. LO: At the end of this session the student will be able to, 1. Identify the importance of SIC and SIC/XE.	**CO1** **10hrs** PO1-3 PO2-3 PO3-2

2. Outline the function of assembler with algorithm. 3. Apply feature of SIC and XE to obtain the object Programme and Explain the basic function of Loader.	PO4 -1 PO9 - 2 PO11 -1 PO12 -1 PSO1-2 PSO2-2

Module 2: **Introduction:** Language Processors, The structure of a compiler, The evaluation of programming languages, The science of building compiler, Applications of compiler technology. **Lexical Analysis:** The role of lexical analyzer, Input buffering, Specifications of token, recognition of tokens. LO: At the end of this session the student will be able to, 1. Outline the structure of compiler and application of it. 2. Making use of compiler stages generate machine code for input strings. 3. Design lexical phase for input problems.	**CO2** **10hrs.** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 3: Syntax Analysis: Introduction, Context Free Grammars, Writing a grammar, Top-Down Parsers, Bottom-Up Parsers. LO: At the end of this session the student will be able to, 1. Infer the role of Parser for syntax analysis and CFG. 2. Contrast the importance Top-down parser and bottom-up parser 3. Apply different methods to check grammar is ambiguous or not and generate parse tree.	**CO3** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 4: Lex and Yacc –The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.	**CO4** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -3 PO11 -2

LO: At the end of this session the student will be able to, 1. Infer the role of Lexer and parser. 2. Contrast the structure of Lex and Yacc. 3. Apply shift/ reduce parsing with different approaches.	PSO1-2 PSO2-3
Module 5: Syntax Directed Translation, Intermediate code generation, Code generation LO: At the end of this session the student will be able to, 1. Making use of Syntax directed definition construct annotated parse tree. 2. Construct directed acyclic graphs for expressions. 3. Generate intermediate code generator by making use of different addressing modes.	**CO5** 10hrs PO1-3 PO2-3 PO3-2 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2

Text Books: - (specify minimum two foreign authors text books)

1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012
2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007
3. Doug Brown, John Levine, Tony Mason, lex & yacc, O'Reilly Media, October 2012.

Reference Books:

1. Systems programming – Srimanta Pal, Oxford university press, 2016
2. System programming and Compiler Design, K C Louden, Cengage Learning
3. System software and operating system by D. M. Dhamdhere TMG
4. Compiler Design, K Muneeswaran, Oxford University Press 2013.

Useful Websites:

https://nptel.ac.in/courses/106/104/106104123/
https://www.tutorialspoint.com/compiler_design/index.html
https://www.javatpoint.com/compiler-tutorial

Useful Journals

- Advances in Compiler Technology.
- Special Issue on Languages, Compilers and Tools for Embedded Systems (SI:LCTES18)
- Compiler Design - Syntactic and Semantic Analysis

Ph.D. Thesis:

Language Support for Programming High-Performance Code: Leißa, R.
Ph.D. Thesis, Saarland University, Saarbrücken, Germany, 2017. [url] [bib]

Teaching and Learning Methods:

1. Lecture class: 50 hrs.
2. Self-study: ---
3. Field visits/Group Discussions/Seminars: 3hrs.
4. Practical classes: --

Assessment:

Type of test/examination: Written examination
Continuous Internal Evaluation (CIE): 40 marks (Average of total three tests will be considered)

Semester End Exam (SEE): 60 marks (students have to answer all main questions)
Test duration: 1 :30 hr
Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:**Environment and Society
PO2: Problem Analysis	**PO8:**Ethics
PO3: Design & Development	**PO9:**Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:**Project Mngmt & Finance
PO6: Engineer & Society	**PO12:**Lifelong Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Engineering to analyze, design and implement the solutions for the real-world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of society and solve engineering problems.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PS O2
18CS61	K-Level														
CO1	K3	3	3	2	1					2		1	1	2	2
CO2	K3	3	3	3	2	2						2		2	2
CO3	K3	3	3	3	2	2						2		2	2
C	K3	3	3	3	2	3						2		2	3
CO5	K3	3	3	2	2	2						2		2	2

Course In charge

Head of the Department

HOD
Dept. of Computer Science & Engineering
K.S. School of Engineering & Management
Bangalore-560 062

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF CIVIL ENGINEERING

CO-PO Mapping

Course: Alternative Building Materials

Type: Professional Elective		**Course Code: 18CV643**	
No. of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	---	03	40
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

1. To understand environmental issues due to building materials and the energy consumption in manufacturing building materials
2. To study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
3. Study the alternative building materials in the present context.
4. To understand the alternative building technologies which are followed in present construction field.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Discuss** the environmental issues concerned to building materials and cost-effective building technologies.	**Understanding (K2)**
CO2	**Evaluate** the structural behavior of masonry elements under axial compression.	**Applying (K3)**
CO3	**Discuss** various alternative building materials.	**Understanding (K2)**
CO4	**Explain** the various alternative building technologies and roofing systems with neat **sketches.**	**Understanding (K2)**
CO5	**Explain** the various equipments used for the production of alternative building materials and cost saving techniques in planning, design and construction.	**Understanding (K2)**

Syllabus Content

Module 1: Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions **LO:** At the end of this session the student will be able to 1. Explain the need for alternate building materials. 2. Discuss about green building concepts.	**CO1** 8 hrs PO1-3 PO6-3 PO7-3 PO12-3 PSO1-2

3. Explain about Rainwater harvesting and list the methods, merits and demerits. 4. What are the commonly used environmentally friendly and cost-effective building technologies? Explain any two. 5. Explain the concept of energy embodied in building materials. 6. Explain the role of construction industry in global warming. 7. What are the advantages of LEED? List out the five main credit categories in LEED rating system. 8. Discuss environmental issues related to building materials. 9. Explain different categories of energy consumption in a building.	PSO2-3
Module 2: Elements of Structural Masonry: Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks. **Structural Masonry Mortars:** Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load. **LO:** At the end of this session the student will be able to 1. What are the alternatives for conventional stone and bricks in masonry? 2. List out the characteristics of concrete blocks. 3. Explain the process of manufacturing stabilized mud blocks. 4. List out the requirements of mortar. 5. List and explain the properties of good mortar. 6. Write a note on: (i) Fal-G blocks (ii) Laterite blocks. 7. What are the factors affecting the compressive strength of masonry? 8. A brick masonry prism is made up of 5 bricks joined by mortar of thickness 20mm. The brick is 75mm in thickness. The prism is subjected to a uniform vertical stress of 4.0 N/mm^2. The brick has a modulus of 500 N/mm^2 and mortar ha a modulus of 8000 N/mm^2. Determine the horizontal lateral stress in brick and mortar. Take μ_b=0.1 and μ_m=0.15.	**CO2** 8 hrs PO1-3 PO2-3 PO6-3 PO7-3 PO12-3 PSO1-2 PSO2-3

Module 3: Alternative Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes. **LO:** At the end of this session the student will be able to 1. Discuss about different sources of limestones. 2. Name the different types of pozzolana materials. Explain any two in detail. 3. What is meant by GFRP? List the fiber reinforcing materials. 4. List the agro wastes ad mention its applications in building construction. 5. List the different industrial wastes. Explain their use as a building material. 6. What are the sources of industrial wastes? 7. Write short note on construction and demolition wastes. Mention its merits and demerits. 8. Write the properties and uses of lime pozzolana cement. 9. List out the different methods employed in manufacturing of FRP and explain any one in brief. 10. Explain the applications of FRP composites.	**CO3** 8 hrs PO1-3 PO6-3 PO7-3 PO12-3 PSO1-2 PSO2-3
Module 4: Alternative Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. **Alternative Roofing Systems:** Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes **LO:** At the end of this session the student will be able to 1. Explain any two alternatives for wall construction with neat sketches. 2. What is meant by ferrocement? List the materials used for ferrocement and mention its applications. Explain its construction methods in brief. 3. List out the advantages and disadvantages of Mivan Construction Techniques. 4. What are the primary functions of a roof? Explain briefly the various roofing alternatives. 5. Write the concepts of filler slab method and explain any two methods in detail. 6. Write short notes on: (i) Composite beam and panel roofs (ii) Construction of masonry domes and vaults. 7. Explain the process of constructing masonry domes and vaults.	**CO4** 8 hrs PO1-3 PO6-3 PO7-3 PO12-3 PSO1-2 PSO2-3
Module 5: Equipment for Production of Alternative Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using	**CO5** 8 hrs

alternatives. **LO:** At the end of this session the student will be able to 1. Briefly explain about: (a) Types of machines used for manufacture of concrete (b) Methods of production of precast elements 2. Explain the cost saving techniques in planning, design and construction. 3. Write the difference between conventional and alternative building materials. 4. Write a note on: (i) Types of concrete mixer (ii) Cost concept in building. 5. What are the equipments used for producing stabilized blocks? Explain them in brief.	PO1-3 PO6-3 PO7-3 PO12-3 PSO1-2 PSO2-3

Text Books

1. KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publishers.
2. Arnold W Hendry,"Structural Masonry", Macmillan Publishers.

Reference Books

1. RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley Publishers.
2. LEED India, Green Building Rating System, IGBC Publishers.
3. IGBC Green Homes Rating System, CII Publishers.
4. Relevant IS Codes.

Useful Websites

- https://theconstructor.org/building/alternate-building-materials/420/
- https://www.sciencedirect.com/science/article/abs/pii/S0378778801001414
- https://igbc.in/igbc/redirectHtml.htm?redVal=showLeednosign

Useful Journals

- Building Research and Information
- Energy and Buildings

Teaching and Learning Methods

1. Lecture class: 40 hours
2. Tutorials: 04 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 60 marks.

Test duration: 1.5 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:**Environment and Sustainability
PO2: Problem Analysis	**PO8:**Ethics
PO3: Design & Development	**PO9:**Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:**Project Mngmt & Finance
PO6: Engineer & Society	**PO12:**Life long Learning

PSO1: The proficiency in mathematics, fluid dynamics and management sciences helps to excel in the areas of planning and analysis related to Civil Engineering systems.

PSO2: Identify sustainable materials and technologies, codes of practice in construction industry and Transportation Systems.

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
17CV 653	K-level														
CO1	K2	3	-	-	-	-	3	3	-	-	-	-	3	2	3
CO2	K3	3	3	-	-	-	3	3	-	-	-	-	3	2	3
CO3	K2	3	-	-	-	-	3	3	-	-	-	-	3	2	3
CO4	K2	3	-	-	-	-	3	3	-	-	-	-	3	2	3
CO5	K2	3	-	-	-	-	3	3	-	-	-	-	3	2	3

Course In charge

Head - Dept.

Professor & Head
Dept. of Civil Engineering
K.S. Group of Institutions
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Principal

Dr. K. Rama Narasimha
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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SESSION: 2020 – 2021 (EVEN SEMESTER)
CO-PO Mapping

Course: Transmission and Distribution			
Type: Core		**Course Code: 18EE43**	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
4	-	4	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. To understand the concepts of various methods of generation of power.
2. To understand the importance of HVAC, EHVAC, UHVAC and HVDC transmission.
3. To design insulators for a given voltage level.
4. To calculate the parameters of the transmission line for different configurations and assess the performance of the line.
5. To study underground cables for power transmission and evaluate different types of distribution systems.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Explain** basic Structure of electric power system and **Calculate** sag, potential distribution over a string and string efficiency.	**Applying (K3)**
CO2	**Calculate** parameters of transmission line for different configurations.	**Applying (K3)**
CO3	**Determine** the performance of different types of overhead transmission lines.	**Applying (K3)**
CO4	**Interpret** corona and **find** different parameters of underground cables.	**Applying (K3)**
CO5	**Discuss** different types of distribution systems, its reliability and **obtain** different parameters in AC distributors.	**Applying (K3)**

Syllabus Content

Module 1: Introduction to Power System: Structure of electric power system: generation, transmission and distribution. Advantages of higher voltage transmission: HVAC, EHVAC, UHVAC and HVDC. Interconnection. Feeders, distributors and service mains. **Overhead Transmission Lines**: A brief introduction to types of supporting structures and line conductors-Conventional conductors; Aluminium Conductor steel reinforced (ACSR), All – aluminium alloy conductor (AAAC) and All –aluminium conductor (AAC). High temperature conductors; Thermal resistant aluminium alloy (ATI), Super thermal resistant aluminium alloy (ZTAI), Gap type thermal resistant aluminium alloy conductor steel reinforced (GTACSR), Gap type super thermal resistant aluminium alloy conductor steel reinforced (GZTACSR). Bundle conductor and its advantages. Importance of sag, Sag calculation – supports at same and different levels, effect of wind and ice. Line vibration and vibration dampers. Overhead line protection against lightening; ground wires.	**CO1** 10 hrs PO1-3 PO2-2 PO6-2 PO12 -1 PSO1-3 PSO2-1

Overhead Line Insulators: A brief introduction to types of insulators, material used- porcelain, toughened glass and polymer (composite). Potential distribution over a string of suspension insulators. String efficiency, Methods of increasing string efficiency. Arcing horns. At the end of this session the student will be able to 1. Explain the power system scheme with the help of single line diagram and indicate standard voltages. 2. Discuss the desirable properties of insulators and list the types of insulators. 3. Derive an expression for Sag in freely suspended conductor when the supports at same and different levels. 4. Define string and explain different methods of improving string efficiency. 5. Find the voltage distribution across each unit and string efficiency.	
Module-2: Line Parameters: Introduction to line parameters- resistance, inductance and capacitance. Calculation of inductance of single phase and three phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Inductance of composite – conductors, geometric mean radius (GMR) and geometric mean distance (GMD). Advantages of single circuit and double circuit lines. Calculation of capacitance of single phase and three phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Capacitance of composite – conductor, geometric mean radius (GMR) and geometric mean distance (GMD). Advantages of single circuit and double circuit lines. After completing these chapters, students will be able to 1. Calculate inductance of single and three phase transmission lines with equilateral and unsymmetrical spacing. 2. Calculate capacitance of single and three phase transmission lines with equilateral and unsymmetrical spacing. 3. Explain advantages of single and double circuit lines. 4. Discuss geometric mean radius (GMR) and geometric mean distance (GMD).	**CO2** 10 hrs. PO1-3 PO2-2 PO6-2 PO12-1 PSO1-3 PSO2-1
Module-3: Performance of Transmission Lines: Classification of lines – short, medium and long. Current and voltage relations, line regulation and Ferranti effect in short length lines, medium length lines considering Nominal T and nominal circuits, and long lines considering hyperbolic form equations. Equivalent circuit of a long line. ABCD constants in all cases. After completing these chapters, students will be able to 1. Classify transmission lines as short, medium and long transmission lines. 2. Find voltage and current relations in a short, medium and long transmission lines considering nominal T and π model. 3. Calculate efficiency and regulation of short, medium and long transmission lines. 4. Calculate the ABCD constants of transmission lines.	**CO3** 10 hrs PO1-3 PO2-2 PO3-2 PO6-2 PO12-1 PSO1-3 PSO2-1
Module–4: Corona: Phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona. **Underground Cable**: Types of cables, constructional features, insulation resistance, thermal rating, charging current, grading of cables – capacitance and inter-sheath. Dielectric loss. Comparison between ac and DC cables. Limitations of cables. Specification of power cables.	**CO4** 10hrs PO1-3 PO2-2

After completing these chapters, students will be able to 1. Explain Phenomena of Corona and calculate disruptive and critical voltages. 2. List advantages and disadvantages and explain methods of reducing corona. 3. Explain use of underground cables and Compare AC and DC cables. 4. Explain use of underground cables and calculate dielectric loss and other parameters in cables.	PO3-2 PO6-2 PO12-1 PSO1-3 PSO2-1
Module–5: Distribution: Primary AC distribution systems – Radial feeders, parallel feeders, loop feeders and interconnected network system. Secondary AC distribution systems – Three phase 4 wire system and single phase 2 wire distribution, AC distributors with concentrated loads. Effect of disconnection of neutral in a 3 phase four wire system. **Reliability and Quality of Distribution System**: Introduction, definition of reliability, failure, probability concepts, limitation of distribution systems, power quality, Reliability aids. After completing these chapters, students will be able to 1. Explain different types of Primary AC and Secondary distribution systems. 2. Calculate different parameters in AC distributors with different loads. 3. Describe the effect of disconnection of neutral in 3 phase 4 wire system 4. Discuss power quality and reliability of distribution systems.	**CO5** 10hrs PO1-3 PO2-2 PO6-2 PO12-1 PSO1-3 PSO2-1

Text Books

1. A Course in Electrical Power Soni Gupta and Bhatnagar Dhan Patrai
2. Principles of Power System V.K. Mehta, Rohit Mehta S. Chand 1st Edition 2013

Reference Books

1. Power System Analysis and Design J. Duncan Gloverat el Cengage Learning 4th Edition 2008
2. Electrical power Generation, Transmission and Distribution S.N. Singh PHI 2nd Edition,2009
3. Electrical Power S.L. Uppal Khanna Publication
4. Electrical power systems C. L. Wadhwa New Age 5 th Edition,
5. Electrical power systems Ashfaq Hussain CBS Publication 2009
6. Electric Power Distribution A.S. Pabla McGraw-Hill 6 th Edition,2012

Useful Websites

1. www.jpowers.co.jp/english/product/pdf/gap_c1.pdf
2. https://www.electrical4u.com/transmission-line-in-power-system/

Useful Journals

1. **Energies: https://www.mdpi.com/1996-1073/14/1/85**
2. Science Direct: https://www.sciencedirect.com/science/article/pii/S1877050916304458

Teaching and Learning Methods

1. Lecture class: 50 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation (CIE): 60 marks (30 marks -Average of three tests + 10 marks Assignments)

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1:30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:** Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Management & Finance **PO12:** Lifelong Learning

PSO1: Graduates should be able to develop an inclination towards acquiring analytical, technical, managerial and communicative skills by gaining knowledge in fundamental concepts in the field of Electrical sciences and allied subjects.

PSO2: Graduates should be able to Contribute for the development of society by providing technical solutions to complex electrical engineering problems through life-long learning.

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
15EE81	K-level														
CO1	K3	3	2	-	-	-	2	-	-	-	-	-	1	3	1
CO2	K3	3	2	-	-	-	2	-	-	-	-	-	1	3	1
CO3	K3	3	2	-	-	-	2	-	-	-	-	-	1	3	1
CO4	K3	3	2	-	-	-	2	-	-	-	-	-	1	3	1
CO5	K3	3	2	-	-	-	2		-	-	-	-	1	3	1

Course In charge **Head of the Department** **Principal**

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

Course: RESEARCH METHODOLOGY

Type: Core | **Course Code: 20MBA23**

No of Hours

Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3	2	5	52

Marks

Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

1. To understand the basic components of research design.
2. To Gain an insight into the applications of research methods.
3. To equip students with various research analytical tools used in business research.
4. To equip students with necessary critical thinking skills using excel.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	Understand various research approaches, techniques and strategies in the appropriate in business.	**Applying (K3)**
CO2	Apply a range of quantitative / qualitative research techniques to business and day to day management problems.	**Applying (K3)**
CO3	Understand various research Sampling techniques and strategies in the appropriate in business.	**Applying (K3)**
CO4	Demonstrate knowledge and understanding of data collection methods and Measurement and Scaling Techniques	**Applying (K3)**
CO5	Demonstrate knowledge and understanding of data analysis, interpretation and report writing.	**Applying (K3)**
CO6	Develop necessary critical thinking skills in order to evaluate different research approaches in Business using excel in particular	**Applying (K3)**

Syllabus Content

Module-1 : Business Research Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study. **LO:** At the end of this session the student will be able to 1. Understand the significance of research 2. Formulate the research Hypothesis 3. Understand the process of research	**CO1** **9 hours** PO1, PSO2
Module -2 Business Research Design Meaning, types and significance of research design. Exploratory and Conclusive Research Design.	**CO2** **09 hours**

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

Exploratory Research: Meaning, purpose, methods- Literature search, experience survey, focus groups and comprehensive case methods. Conclusive Research Design - Descriptive Research - Meaning, Types – Cross sectional studies and longitudinal studies. Experimental Research Design – Meaning and classification of experimental designs- formal and informal, Pre experimental design, Quasi-experimental design, True experimental design, statistical experimental design. **LO:** At the end of this session the student will be able to 1. Understand the different types of businesses such design 2. Explain the different methods in exploratory research design 3. Explain the different methods in descriptive research design 4. Explain the different methods in experimental research design	PO1, PSO1,PSO2
Module -3 Sampling Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling Non Probability Sampling –convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors in sampling. **LO:** At the end of this session the student will be able to 1. understand the significance of sampling in research 2. Differentiate between probability sampling and non probability sampling 3. Distinguish the different types of sampling techniques within probability sampling and non probability sampling	**CO3** **07 hours** PO4, PSO1,PSO2
Module -4 Data Collection Meaning of Primary and Secondary data, Primary data collection methods observations, survey, interview and Questionnaire, Qualitative Techniques of data collection, Questionnaire design – Meaning - process of designing questionnaire. Secondary data -Sources – advantages and disadvantages. **Measurement and Scaling Techniques:** Basic measurement scales Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert's Scale, Semantic Differential Scale, Thurstone scale, Multi-Dimensional Scaling. Case Study as per the chapter needs. **LO:** At the end of this session the student will be able to 1. Understand the meaning of primary and secondary data 2. Understand the primary data collection methods 3. Comprehend thesecondary data collection methods 4. Understand the basic measurement and scaling techniques	**CO4** **09 hours** PO1, PO4, PSO2
Module -5 Data Analysis and Report Writing Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation- Report writing and presentation of results: Importance of report writing, types of research report, report structure, guidelines for effective documentation. **LO:** At the end of this session the student will be able to 1. analyze the different ways in which data can be collected and analyzed 2. Comprehend different ways of coding data, classifying and tabulating the	**CO5** **7 hours** PO3, PSO1,PSO2

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

4. Journals - Methodology, Measurement & Analysis - UCF
5. International Journal of Quantitative and Qualitative Research
6. International Journal of Science and Research Methodology

Teaching and Learning Methods

1. Lecture class: 44 hrs
2. Practical classes: 08 hrs

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation(CIE) : 40 marks (Average of TWO tests will be considered)
Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.
Test duration: 1 :30 hrs **Examination duration:** 3 hrs

PO1: Acquire sufficient theoretical knowledge and are enabled to apply them to solve practical problems in business and other organizations/ institutions of importance.
PO2: Apply effective communication skills with a high degree of lateral and critical thinking that enhances learn ability, developed for being continuously employable.
PO3: Demonstrate leadership qualities, ethically sound, enabled with decision making skills that reflect a high degree of social consciousness
PO4: Recognize the need for sustained research orientation to comprehend a growing complex, economic, legal and ethical environment
PO5: Possess self- sustaining entrepreneurship qualities that encourages calculated risk taking.
PSO1: Develop viable Managerial solutions in the dynamic Business eco system
PSO2: Establish and Encourage Entrepreneurial zeal along with Ethical Values in the business

CO		PO						
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
20MBA23	K- Level							
CO1	K3	3			2			
CO2	K3	2			3			
CO3	K3			2			3	
CO4	K3		1					3
CO5	K3	3	2	1		2		
CO6	K3	2		3	2	1		

V. Vidyashree
Course In charge

Head of the Department

KSSEM

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF MECHANICAL ENGINEERING

SESSION: 2020-2021 (EVEN SEMESTER)

CO-PO MAPPING

Course Title: Kinematics of Machines			
Type: Core		Course Code: 18ME44	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	0	3	42
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

1. Familiarize with mechanisms and motion analysis of mechanisms.
2. Understand methods of mechanism motion analysis and their characteristics.
3. Analyze motion of planar mechanisms, gears, gear trains and cams.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	Model displacement diagrams for followers with various types of motions and Cam profile drawing for various followers.	K3 Applying
CO2	Understanding the basic terminology of planar mechanisms and their motion study.	K2 Understanding
CO3	Evaluating the transmission of power by application of various gears and gear trains.	K4 Analyzing
CO4	Constructing velocity and acceleration diagrams for planar mechanisms by Graphical method	K4 Analyzing
CO5	Inspect velocity and acceleration of planar mechanisms by complex algebra method and kinematic synthesis of four bar and slider crank kinematic chain	K4 Analyzing

Syllabus Content

Module 1: **Cams:** Types of cams, types of followers, displacement, velocity and acceleration curves for uniform velocity, Simple Harmonic Motion, Uniform Acceleration Retradation, Cycloidal motion. Cam profiles: disc cam with reciprocating / oscillating follower having knife-edge, roller and flat-face follower inline and offset. **Analysis of Cams:** Analysis of arc cam with flat faced follower LO: At the end of this session the student will be able to.	**CO1** 10 hrs PO1-3 PO2-3 PO3-2 PO4 - 2 PO5-1 PO12 -1 PSO1-3 PSO2-1

1. Understand the concept of cams and analysis of cams 2. Construct cam profile for specific follower motion 3. Explain the concept symmetric cams	
Module 2: **Introduction:** Definitions: Link, kinematic pairs, kinematic chain, mechanism, structure, degrees of freedom, Classification links, Classification of pairs based on type of relative motion, Grubler's criterion, mobility of mechanism, Groshoff's criteria, inversions of Grashoff's chain. **Mechanisms:** Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Oldham's coupling, Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms: Geneva wheel mechanism, Ratchet and Pawl mechanism, toggle mechanism, pantograph, condition for correct steering, Ackerman steering gear mechanism. LO: At the end of this session the student will be able to. 1. Understand the mechanism analysis 2. Explain different mechanisms 3. Understand the terminology of mechanisms	**CO2** 10 hrs. PO1-3 PO2-3 PO3-2 PO4-2 PO5-1 PO6-1 PO12-1 PSO1-3 PSO2-1
Module 3: **Spur Gears:** Gear terminology, law of gearing, path of contact, arc of contact, contact ratio of spur gear. Interference in involute gears, methods of avoiding interference, back lash, condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact **Gear Trains:** Simple gear trains, compound gear trains. Epicyclic gear trains: Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains, torque calculation in epicyclic gear trains LO: At the end of this session the student will be able to. 1. Explain concept of interference and minimum number of teeth 2. Understand the motion transmission through gear trains 3. Explain Gear terminology and law of gearing 4. Understand the concept of path of contact, arc of contact	**CO3** 10 hrs PO1-3 PO2-3 PO3-2 PO4-2 PO5-1 PO6-1 PO12-1 PSO1-3 PSO2-1
Module 4: **Velocity and Acceleration Analysis of Mechanisms (Graphical Method):** Velocity and acceleration analysis of four bar mechanism, slider crank mechanism. Mechanism illustrating. Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing. **Velocity Analysis by Instantaneous Center Method:** Definition, Kennedy's theorem, Determination of linear and angular velocity using instantaneous center method.	**CO4** 10hrs PO1-3 PO2-3 PO3-2 PO4-2 PO5-1 PO6-1

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism. LO: At the end of this session the student will be able to, 1. Determine position, displacement, velocity and acceleration of various parts in mechanisms. 2. Apply the knowledge of graphical method & instantaneous centre method to determine velocity and acceleration of links	PO12-1 PSO1-3 PSO2-1
Module 5: **Velocity and Acceleration Analysis of Mechanisms (Analytical Method):** Velocity and acceleration analysis of four bar mechanism, slider crank mechanism using complex algebra Method. **Freudenstein's equation** for four bar mechanism and slider crank mechanism. **Function Generation** for four bar mechanism LO: At the end of this session the student will be able to, 1. Understand the Concept of analytical method to determine velocity and acceleration of links. 2. Understand mechanism synthesis. Apply the knowledge of mechanism synthesis to evaluate function generation	**CO5** 10hrs PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO12-1 PSO1-3 PSO2-1
Text Books 1. . Theory of Machines, Rattan S.S. Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2009. 2. Mechanism and Machine Theory, A. G. Ambekar PHI, 2007	
Reference Books (specify minimum two foreign authors text books) 1. Michael M Stanisic, Mechanisms and Machines-Kinematics, Dynamics and Synthesis, Cengage Learning, 2016. 2. Sadhu Singh, Theory of Machines, Pearson Education (Singapore)Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006. 3. Theory of Machines, Thomas Beavan	
Useful Websites • http://www.sciencedirect.com/ • https://nptel.ac.in/courses/112104114/ • https://www.youtube.com/playlist?list=PL46AAEDA6ABAFCA78	
Useful Journals • www.journals.elsevier.com/mechanism-and-machine-theory • www.sciencedirect.com/journal/journal-of-mechanisms	

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism. LO: At the end of this session the student will be able to. 1. Determine position, displacement, velocity and acceleration of various parts in mechanisms. 2. Apply the knowledge of graphical method & instantaneous centre method to determine velocity and acceleration of links	PO12-1 PSO1-3 PSO2-1
Module 5: **Velocity and Acceleration** Analysis of Mechanisms **(Analytical Method):** Velocity and acceleration analysis of four bar mechanism, slider crank mechanism using complex algebra Method. **Freudenstein's equation** for four bar mechanism and slider crank mechanism. **Function Generation** for four bar mechanism LO: At the end of this session the student will be able to. 1. Understand the Concept of analytical method to determine velocity and acceleration of link 2. Understand mechanism synthesis Apply the knowledge of mechanism synthesis to evaluate function generation	**CO5** 10hrs PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO12-1 PSO1-3 PSO2-1
Text Books 1. . Theory of Machines, Rattan S.S. Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 20[illegible]. 2. Mechanism and Machine Theory, A. G. Ambekar PHI, 2007	
Reference Books (specify minimum two foreign authors text books) 1. Michael M Stanisic, Mechanisms and Machines-Kinematics, Dynamics and Synthesis, Cengage Learning, 2016. 2. Sadhu Singh, Theory of Machines, Pearson Education (Singapore)Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006. 3. Theory of Machines, Thomas Bearing	
Useful Websites • http://www.sciencedirect.com • https://nptel.ac.in/courses/112[illegible]/ • https://www.youtube.com/playlist?list=PL46AAEDA6ABAFCA78	
Useful Journals • www.journals.elsevier.com/mechanism-and-machine-theory • www.sciencedirect.com/journal/journal-of-mechanisms	

Teaching and Learning Methods

1. Lecture class: 42 hours
2. Practical classes: 0 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Mngmt & Finance **PO12:** Life long Learning

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

CO	PO	PO1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS O1	PS O 2
17 ME44	K-level														
CO1	K3	3	3	2	2	1	--	-	-	-	-	-	1	3	1
CO2	K2	3	3	2	2	1	1	-	-	-	-	-	1	3	1
CO3	K4	3	3	2	2	1	1	-	-	-	-	-	1	3	1
CO4	K4	3	3	2	2	1	1	-	-	-	-	-	1	3	1
CO5	K4	3	3	2	1	1	1		-	-	-	-	1	3	1

Course In charge

Head of the Department

Principal