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

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (ODD SEMESTER)

CO-PO MAPPING

Course: ENGINEERING CHEMISTRY			
Type: Core		Course Code: 18CHE12	
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	**Utilize** 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 and to apply their Knowledge in 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	**Utilize** the knowledge of sewage treatment, desalination of sea water and Control of Environmental Pollution.	**Applying (K3)**
CO5	**Build** the knowledge of Instrumental method of analysis and able to explain the synthesis, properties & applications of Nanomaterials.	**Applying (K3)**

Syllabus Content

MODULE-I: 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&PushpaIyengar,"*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 E12	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 - Dept

Dr. C. VASUDEV
Professor & Head
Department of Basic Science
KS School of Engineering and Management
Bangalore - 560 109.

Principal

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

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (ODD SEMESTER)

CO-PO MAPPING

Course: Calculus and Linear Algebra			
Type: Core		Course Code: 18MAT11	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	5	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

- To familiarize the important tools of calculus and differential equations that are essential in all branches of engineering.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

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

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.	**Applying (K3)**
CO2	**Demonstrate** the partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.	**Applying (K3)**
CO3	**Solve** first order linear/nonlinear differential equation analytically using standard methods	**Applying (K3)**
CO4	**Use** matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process	**Applying (K3)**
CO5	**Determine** the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes and solve the definite integrals by using Beta and Gamma functions.	**Applying (K3)**

Syllabus Content

Module 1: **Differential Calculus-1:** Review of elementary differential calculus, Polar curves	**CO1**

– angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms; Centre and circle of curvature (All without proof-formulae only) –applications to evolutes and involutes. (RBT Levels: L1 & L2) **LO:** At the end of this session the student will be able to 1. Find the angle between the radius vector and tangent, angle between two curves. 2. Find the Pedal equation of the curve. 3. Find the curvature and radius of curvature,evolutes and involutes.	10 hrs PO1-3 PO2 -2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 2: **Differential Calculus-2:** Taylor's and Maclaurin's series expansions for one variable(statements only), indeterminate forms - L' Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Maxima and minima for a function of two variables; Method of Lagrange multipliers with one subsidiary condition. Applications of maxima and minima with illustrative examples. Jacobians-simple problems. (RBT Levels: L1 & L2) **LO:** At the end of this session the student will be able to 4. Obtain the series solution for the given functions.. 5. Evaluates the given limits. 6. Find the Total derivatives, maxima and minima for a function of two variables and Lagrange multipliers.	**CO2** 10 hrs. PO1-3 PO2 -2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 3 **Ordinary differential equations(ODE's)of first order**: Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions ; Solvable for p only; Clairaut's and reducible to Clairaut's equations only.(RBT Levels: L1,L2 and L3) **LO:** At the end of this session the student will be able to 1. Solve first order linear/nonlinear differential equation analytically using standard methods.	**CO3** 10 hrs PO1-3 PO2 -2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-3 PSO2-2

Module 4: **Linear Algebra:** Rank of a matrix-echelon form. Solution of system of linear equations –consistency. Gauss-elimination method, Gauss –Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and eigenvectors-Rayleigh's power method. Diagonalization of a square matrix of order two. (RBT Levels: L1,L2 and L3) **LO:** At the end of this session the student will be able to 1. Define Rank of a matrix and echelon form. 2. Solve the system of equations using Gauss-elimination method, Gauss – Jordan method and Gauss-Seidel method. Diagonalizable the square matrix	**CO4** 10hrs PO1-3 PO2 -2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-3 PSO2-2
Module 5: **Integral Calculus:** Review of elementary integral calculus. Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals-change of order of integration and changing into polar co-ordinates. Applications to find area volume and centre of gravity Beta and Gamma functions: Definitions, Relation between beta and gamma functions and simple problems.(RBT Levels: L1 & L2) **LO:** At the end of this session the student will be able to 1. Evaluate the multiple integrals 2. Find area, volume and centre of gravity. 3. Prove the relation between Beta and Gamma functions. Evaluate the definite integrals by using Beta and Gamma functions	**CO5** 10hrs PO1-3 PO2 -2 PO4-1 PO9-1 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 (specify minimum two foreign authors text 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 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	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PS O1	PSO 2
18 MA T11	K-level														
CO1	K3	3	2	-	1	-	-	-	-	1	1	-	1	3	2
CO2	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

Head of the Department 23/02/2021

Dr. C. VASUDEV
Professor & Head
Department of Basic Science
KS School of Engineering and Management
Bangaloro - 560 109.

Principal 24/2/202

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Manag

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

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (ODD SEMESTER)

CO-PO MAPPING

Course: Transform Calculus, Fourier series and Numerical Techniques			
Type: Core		Course Code: 18MAT31	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3	0	5	40
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

1. To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms.
2. To develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods.

Course Learning Outcomes

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

CO1	**Solve** first order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.	**Applying (K3)**
CO2	**Determine** the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis **and Solve** second order ordinary differential equations.	**Applying (K3)**
CO3	**Use** Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.	**Applying (K3)**
CO4	**Demonstrate** Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.	**Applying (K3)**
CO5	**Make** use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.	**Applying (K3)**

Syllabus Content

Module 1: : Numerical Solutions of Ordinary Differential Equations(ODE's): Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Runge -Kutta method of fourth order, Milne's and Adam-Bash forth predictor and corrector method (No derivations of formulae)-Problems. **LO:** At the end of this session the student will be able to 1. Solve the first order ODE by various numerical methods. 2.Obtain the series solution of the given function using Taylor's series method ,Runge kutta method. Modified Euler's method.	**CO1** 8 hrs PO1-3 PO2-2 PO4-1 PO9-1 PO10-1 PO12-1

	PSO1-2 PSO2-1
Module 2 **Numerical Solution of Second Order ODE's:** Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae). Calculus of Variations: Variation of function and functional, variational problems, Euler's equation, Geodesics, hanging chain, problems. **LO:** At the end of this session the student will be able to 1. Solve the first order ODE by various numerical methods. 2. Derive Euler's equation. 3. Find the functional value of the given function. 4.Show that the Geodesics on a plane are straight lines	**CO2** 8 hrs. PO1-3 PO2-2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-2 PSO2-1
Module 3: **Laplace Transform:** Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems. **Inverse Laplace Transform:** Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms. **LO:** At the end of this session the student will be able to 1. Find the Laplace transform and inverse laplace transform of the given function. 2. Find the Laplace transform of the Periodic function & Unit Step function. 3. Find the Inverse Laplace transform using Convolution theorem. Solve the Difference equations using Laplace transforms.	**CO3** 8 hrs PO1-3 PO2-2 PO4-2 PO9-1 PO10-1 PO12-1 PSO1-2 PSO2-1
Module 4: **Fourier Series:** Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis. **LO:** At the end of this session the student will be able to 1. Explain periodic functions and Dirichlet's conditions 2.Find the Fourier series ,half range Fourier series ,harmonic analysis, complex Fourier series of functions f(x) in the given limits	**CO4** 8 hrs PO1-3 PO2-2 PO4-2 PO9-1 PO10-1 PO12-1 PSO1-2 PSO2-1
Module 5: Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems. **Difference Equations and Z-Transforms:** Difference equations, basic definition, z-	**CO5** 8 hrs

transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations. . **LO:** At the end of this session the student will be able to 1. Find the infinite Fourier-transform, Fourier sine and cosine transform, inverse Fourier transform. 2. Find the Z-transforms of given functions and solve the difference Equations Z-transformation	PO1-3 PO2-2 PO4-1 PO9-1 PO10-1 PO12-1 PSO1-2 PSO2-1

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 (specify minimum two foreign authors text 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

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

1. Annals of Mathematics
2. Acta Mathematica
3. International Journal of Mathematics
4. Communications on pure and applied Mathematics.

Teaching and Learning Methods

1. Lecture class: 40 hrs
2. Practical classes: 3hrs

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 30 marks (Average of three 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

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	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18MAT31	K-level														
CO1	K3	3	2	-	1	-	-	-	-	-	1	-	-	3	2
CO2	K3	3	2	-	1	-	-	-	-	-	1	-	-	3	2
CO3	K3	3	2	-	1	-	-	-	-	-	1	-	-	3	2
CO4	K3	3	2	-	1	-	-	-	-	-	1	-	-	3	2
CO5	K3	3	2	-	1	-	-		-	-	1	-	-	3	2

Vinutha S.V.
Course In charge

05/10/2020
Dr.C.Vasudev
Head - Dept

Dr. K. Ramanarasimha
Principal

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS O1	PS O 2
18 MAT11	K-leve l														
CO1	K3	3	2	-	1	-	-	-	-	1	1	-	1	3	2
CO2	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

VINUTHA S.V.
Course In charge

05/10/2020
Dr.C.Vaudev
Head - Dept

Dr. K. Ramanarasimha
Principal

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

DEPARTMENT OF BASIC SCIENCE

SESSION: 2020-2021 (ODD SEMESTER)

CO-PO MAPPING

Course Title: Engineering Physics			
Type: Fundamental		Course Code: 18PHY12	
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

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	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS O1	PS O 2
18PH Y22	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
Department of Basic Science
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

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO Mapping

Course: : WEB TECHNOLOGY AND ITS APPLICATIONS			
Type: Core		Course Code: 17CS71	
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. Illustrate the Semantic Structure of HTML and CSS.
2. Compose forms and tables using HTML and CSS.
3. Design Client-Side programs using JavaScript and Server-Side programs using PHP.
4. Infer Object Oriented Programming capabilities of PHP.
5. Examine JavaScript frameworks such as jQuery and Backbone.

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

CO1	**Make use of** HTML and CSS syntax and semantics to build web pages.	Applying (K3)
CO2	**Construct** tables & forms using HTML, CSS and format visually	Applying (K3)
CO3	**Develop** client-side scripts using JavaScript and Server-Side Scripts using PHP and display the contents dynamically.	Applying (K3)
CO4	**Contrast** the principles of object-oriented development using PHP with CSS, html	Analyzing (K4)
CO5	**Inspect** JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features	Analyzing (K4)

Syllabus Content

Module1:	CO1
Introduction to HTML: What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements.	**10hrs**
Introduction to CSS: What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.	PO1-3 PO2-3
LO: At the end of this session the student will be able to, 1. Identify the importance of HTML concepts	PO3-2 PO4 - 1

2. Experiment with HTML Elements and HTML5 Semantic Structure Elements 3. Develop the web pages using HTML and CSS	PO5 - 1 PO12 - 1 PSO1-2 PSO2-2
Module 2: **HTML Tables and Forms:** Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats. **Advanced CSS Layout:** Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks. LO: At the end of this session the student will be able to, 1. Apply the concepts of HTML to create tables, forms in web pages. 2. Make use of form control elements to develop web pages. 3. Develop web pages using the advanced CSS Frameworks.	CO2 **10hrs.** PO1-3 PO2-3 PO3-3 PO4-2 PO6-1 PO12 -1 PSO1-2 PSO2-2
Module 3: **JavaScript Client-Side Scripting:** What is JavaScript and What can it do? JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms. **Introduction to Server-Side Development with PHP**: What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions. LO: At the end of this session the student will be able to, 1. Build Client-Side Scripting application using java script. 2. Organize JavaScript Events, Forms for DOM. 3. Make use of Server-Side applications with PHP for web applications development.	CO3 **10hrs** PO1-3 PO2-3 PO3-3 PO4-2 PO5-1 PO12 -1 PSO1-3 PSO2-3
Module 4: **PHP Arrays and Superglobals**, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files. **PHP Classes and Objects:** Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design. **Error Handling and Validation**: What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling. LO: At the end of this session the student will be able to, 1. Infer the concepts of PHP for sever applications 2. Contrast the importance of Object Oriented Design in PHP 3. Discover the need of Error Reporting and Exception Handling in PHP	CO4 **10hrs** PO1-3 PO2-3 PO3-2 PO4 - 2 PO5 - 1 PO12 -1 PSO1-3 PSO2-3

Module 5: **Managing State:**, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching. **Advanced JavaScript and jQuery:** JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File, Transmission, Animation, Backbone MVC Frameworks. **XML Processing and Web Services:** XML Processing, JSON, Overview of Web Services. LO: At the end of this session the student will be able to, 1. Distinguish the need of Passing Information via Query Strings, Passing Information via the URL Path 2. Contrast the importance of Advanced JavaScript and jQuery 3. Analyze the concepts of XML Processing and Web Services with JSON	**CO5** **10hrs** PO1-3 PO2-3 PO3-3 PO4 - 2 PO5 - 1 PO12 -1 PSO1-3 PSO2-3
Text Books: - (specify minimum two foreign authors text books) 1. Randy Connolly, Ricardo Hoar, **"Fundamentals of Web Development", 1st Edition,** Pearson Education India. (**ISBN:**978-9332575271) 2.Robert W. Sebesta, **"Programming the World Wide Web", 5th Edition,** Pearson Education India (**ISBN** : 9789332518827)	
Reference Books: 1 Robin Nixon, **"Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5",** 4thEdition, O'Reilly Publications, 2015. (**ISBN:**978-9352130153) 2) Luke Welling, Laura Thomson, **"PHP and MySQL Web Development",** 5th Edition, Pearson Education, 2016. (**ISBN:**978-9332582736) 3) Nicholas C Zakas, **"Professional JavaScript for Web Developers",** 3rd Edition, Wrox/Wiley India, 2012. (**ISBN:**978-8126535088) 4) David Sawyer Mcfarland, **"JavaScript & jQuery: The Missing Manual",** 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014 (**ISBN:**978-9351108078) 5) Zak Ruvalcaba Anne Boehm, **"Murach's HTML5 and CSS3",** 3rdEdition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016. (**ISBN:**978-9352133246)	
Useful Websites: W1: https://www.w3schools.com/ W2: https://nptel.ac.in W3: https://www.json.org/	
Useful Journals • Journal of World Wide Web Internet and Web Information Systems • The World Wide Web Journal	
Teaching and Learning Methods: 1. Lecture class: 50 hrs. 2. Self-study: --- 3. Field visits/Group Discussions/Seminars: -	

4. Practical classes: 3hrs/week

Assessment:
Type of test/examination: Written examination
Continuous Internal Evaluation(CIE) : 40 marks (Average of best two 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	PO 1	PO 2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO 2
17CS7 1	K-Level														
CO1	K3	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO2	K3	3	3	3	2	-	1	-	-	-	-	-	1	2	2
CO3	K3	3	3	3	2	1	-	-	-	-	-	-	1	3	3
CO4	K4	3	3	2	2	1	-	-	-	-	-	-	1	3	3
CO5	K4	3	3	3	2	1	-	-	-	-	-	-	1	3	3

Course In charge

Head of the Department

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

Principal

Principal / Director
K.S School of Engineering & Management
Bangalore-560 062

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SESSION: 2020-2021 (ODD SEMESTER)

CO-PO MAPPING

Course: Analog Electronic Circuits			
Type: Core		Course Code: 18EE34	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	3	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course

1. To predict the output response of a clipper and clamper diode configuration.
2. To determine the dc levels and perform a load-line analysis of the BJT configurations.
3. To understand the basic operation of transistor switching networks.
4. To become familiar with the r_e, hybrid, and hybrid π models for the BJT transistor and use the equivalent model to find the important ac parameters for an amplifier.
5. To familiar with the construction and operating characteristics of Junction Field Effect (JFET), Metal-Oxide Semiconductor FET (MOSFET) and sketch the transfer characteristics from the drain characteristics of a JFET, MOSFET.
6. To understand the concept of negative feedback, various types of oscillator and power amplifier circuits.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Design** clipper and clamper circuits, **design** and **compare** biasing circuits for transistor amplifiers.	**Applying (K3)**
CO2	**Develop** h parameter and r_e model for different transistor biasing circuits.	**Applying (K3)**
CO3	**Explain** the concept of multistage amplifiers and feedback, its types and **design** feedback circuits.	**Applying (K3)**
CO4	**Explain** and **design** the power amplifier circuits and oscillators.	**Applying (K3)**
CO5	**Explain** the construction, working, characteristics of JFET and MOSFET and **design** of FET and MOSFET amplifiers.	**Applying (K3)**

Syllabus Content

Module 1: Diode Circuits: Diode clipping and clamping circuits. **Transistor Biasing and Stabilization**: Operating point, analysis and design of fixed bias circuit, self- bias circuit, Emitter stabilized bias circuit, voltage divider bias circuit, stability factor of different biasing circuits. Problems. Transistor switching circuits. **LO:** At the end of this session the student will be able to, 1) Explain operation of different clipping and clamping circuits.	**CO1** PO1-3 PO2-3 PO3-2 PO5-1 PO12-2

2) Sketch output waveform and transfer characteristic of different clipping, clamping circuits. 3) Explain different transistor biasing circuits and find operating points. 4) Design different transistor biasing circuits. 5) Explain the operation of transistor as a switch. 6) Derive stability factor for different biasing circuits.	PSO1-3 PSO2-2 8hrs
Module 2: Transistor at Low Frequencies: BJT transistor modeling, CE fixed bias configuration, voltage divider bias, emitter follower, CB configuration, collector feedback configuration, analysis using h – parameter model, relation between h – parameters model of CE, CC and CB modes, Millers theorem and its dual. **LO:** At the end of this session the student will be able to, 1) Develop h parameter and r_e model for different transistor biasing configuration. 2) Explain Millers theorem. 3) Derive the expression for Millers input and output capacitance.	**CO2** PO1-3 PO2-3 PO3-1 PO5-1 PO12-2 PSO1-3 PSO2-2 8hrs
Module 3: Multistage Amplifiers: Cascade and cascode connections, Darlington circuits, analysis and design. **Feedback Amplifiers:** Feedback concept, different types, practical feedback circuits, analysis and design of feedback circuits. **LO:** At the end of this session the student will be able to, 1) Explain cascade and cascode connection. 2) Derive the expression for input impedance, output impedance, voltage gain and current gain of the emitter follower circuit. 3) Explain the advantages of negative feedback and its effect on bandwidth. 4) Explain different types of feedback amplifier circuits. 5) Derive the expression for input, output resistance of different feedback amplifier circuits.	**CO3** PO1-3 PO2-3 PO3-3 PO5-1 PO12-2 PSO1-3 PSO2-2 8hrs.
Module 4: Power Amplifiers: Amplifier types, analysis and design of different power amplifiers. **Oscillators:** Principle of operation, analysis and derivation of frequency of oscillation of phase shift oscillator, Wien bridge oscillator, RF and crystal oscillator and frequency stability. **LO:** At the end of this session the student will be able to, 1) Explain the operation of different types of power amplifier circuits. 2) Explain Barkhausen's criteria for sustained oscillations. 3) Explain different types of oscillators and derive expression for frequency of oscillations. 4) Design oscillator circuit.	**CO4** PO1-3 PO2-3 PO3-3 PO5-1 PO12-2 PSO1-3 PSO2-2 8hrs
Module 5: FETs: Construction, working and characteristics of JFET and MOSFET. Biasing of JFET and MOSFET. Analysis and design of JFET (only common source configuration with fixed bias) and MOSFET amplifiers.	**CO5** PO1-3 PO2-3 PO3-3 PO5-1 PO12-2

LO: At the end of this session the student will be able to, 1) Explain the construction, working, characteristics of JFET and MOSFET. 2) Analyze different biasing circuits of JFET and MOSFET. 3) Analyze and design common source fixed bias JFET and MOSFET amplifier circuit.	PSO1- 3 PSO2 - 2 8hrs

Text Books

1. Robert L Boylestad Louis Nashelsky **Electronic Devices and Circuit Theory.** 11th Edition. Pearson, 2015.
2. Millman and Halkias **Electronic Devices and Circuits.** 4th Edition. Mc Graw Hill, 2015.
3. David A Bell **Electronic Devices and Circuits.** 5th Edition. Oxford University Press, 2008.

Reference Books

1. Muhammad Rashid. **Microelectronics Circuits Analysis and Design**. 2nd Edition. Cengage Learning, 2014.
2. B.L. Theraja, A.K. Theraja, **A Text Book of Electrical Technology, ElectronicDevices and Circuits**. Reprint Edition. S.Chand, 2013
3. Anil K. Maini Vasha Agarval **Electronic Devices and Circuits.** 1st Edition, Wiley 2009.
4. S.Salivahanan N.Suresh **Electronic Devices and Circuits.** 3rd Edition, Mc Graw Hill 2013.
5. Thomas L Floyd. **Fundamentals of Analog Circuits**. 2nd Edition, Pearson, 2012.

Useful Websites

https://nptel.ac.in/courses/108/102/108102095
http://elearning.vtu.ac.in/econtent/courses/EEE/AEC/index.php

Useful Journals

https://link.springer.com/chapter/10.1007/978-3-642-27296-7_82
https://www.sciencedirect.com/science/article/pii/S1738573319308575

Teaching and Learning Methods

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

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (Average of three 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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18 EE35	K-level														
CO1	K3	3	3	2	-	1	-	-	-	-	-	-	2	3	2
CO2	K3	3	3	1	-	1	-	-	-	-	-	-	2	3	2
CO3	K3	3	3	3	-	1	-	-	-	-	-	-	2	3	2
CO4	K3	3	3	3	-	1	-	-	-	-	-	-	2	3	2
CO5	K3	3	3	3	-	1	-	-	-	-	-	-	2	3	2

Course In charge

Head of the Department

Principal

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

DEPARTMENT OF MECHANICAL ENGINEERING

CO-PO Mapping

Course: Mechanics of Materials			
Type: Core		**Course Code: 18ME32**	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	2	5	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. To know the different types of stresses and strains developed in the member subjected to axial, bending, shear, torsion & thermal loads.
2. To know behaviour & properties of engineering materials.
3. To understand the stresses developed in bars, compounds bars, beams, shafts, and cylinders.
4. To understand the concepts of calculation of shear force and bending moment for beams with different supports.
1. To expose the students to concepts of Buckling of columns and strain energy.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Develop** the concept of stress and strain	**Applying (K3)**
CO2	**Construct** the concepts for cylinder and shafts in strength analysis	**Applying (K3)**
CO3	**Derive** the bucking equation for columns and strain energy	**Applying (K3)**
CO4	**Analyze** the mechanics of beams.	**Applying (K3)**
CO5	**Solve** problems on compound loading	**Applying (K3)**

Syllabus Content

	CO1
Module 1: Stresses and Strains: Introduction, Properties of materials, Stress, Strain and Hooke's law, Stress strain diagram for brittle and ductile materials, True stress and strain, Calculation of stresses in straight, Stepped and tapered sections, Composite sections, Stresses due to temperature change, Shear stress and strain, Lateral strain and Poisson's ratio, Elastic constants and relations between them. **LO:** At the end of this session the student will be able to 1. Understand the concept of stress, strain and its classification 2. Analysis of stress and strain in structures of different cross section 3. Evaluate the effect of temperature on stress development	10 hrs PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1

Module 2: Cylinders: Thin cylinder: Hoop's stress, maximum shear stress, circumferential and longitudinal strains, Thick cylinders: Lames equations. **Torsion**: Circular solid and hallow shafts, Torsional moment of resistance, Power transmission of straight and stepped shafts, Twist in shaft sections, Thin tubular sections, Thin walled sections. **LO:** At the end of this session the student will be able to 1. Understand the difference between different thin and thick cylinder 2. Derive the lames equation 3. Analysis of stress and strain in solid and hallow cylinders.	**CO2** 10 hrs. PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1
Module 3: Columns: Buckling and stability, Critical load, Columns with pinned ends, Columns with other support conditions, Effective length of columns, Secant formula for columns. **Strain Energy:** Strain energy due to axial, shear, bending, torsion and impact load. Castigliano's theorem I and II and their applications. **LO:** At the end of this session the student will be able to 1. Derive the buckling equations. 2. Define Castigliano's theorem I and II.	**CO3** 10 hrs PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1
Module 4 Shear Force and Bending Moment: Type of beams, Loads and reactions, Relationship between loads, shear forces and bending moments, Shear force and bending moments of cantilever beams, Pin support and roller supported beams subjected to concentrated loads, uniformly distributed constant / varying loads. **Stress in Beams:** Bending and shear stress distribution in rectangular, I and T section beams. **LO:** At the end of this session the student will be able to 1. Analyze the shear and bending stresses in beams	**CO4** 10hrs PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1
Module 5 Analysis of Stress and Strain: Introduction to three dimensional state of stress, Stresses on inclined planes, Principal stresses and maximum shear stress, Principal angles, Shear stresses on principal planes, Maximum shear tress, Mohr circle for plane	**CO5** 10hrs

stress conditions. **Theories of Failure:** Maximum Principal stress theory, Maximum shear stress theory. **LO:** At the end of this session the student will be able to 1. Derive the equation for principal stresses in a loaded member 2. Failure analysis of structures	PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1

Text Books

1. J M Gere, B J Goodno, **"Mechanics of Materials"**, Cengage, 2013.
2. R K Rajput, **"Fundamentals of Strength of Materials"**, PHI Learning Pvt. Ltd, 2013.

Reference Books

1. S. S. Ratan, **"Strength of Materials"**, McGraw Hill Education, 2008

Useful Websites

- W1 Nptel.ac.in
- https://en.wikipedia.org/wiki/Strength_of_materials
- https://en.wikipedia.org/wiki/List_of_materials_properties

Useful Journals

- Journal of ACTA Materialia
- Ain Shams Engineering Journal
- Materials Today: Elsevier

Teaching and Learning Methods

1. Lecture class: 68 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	**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:**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
18 ME32	K-level														
CO1	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO2	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO3	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO4	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO5	K3	3	3	2	1	1	-		-	-	-	-	1	3	1

Course In charge

Head of Department

Principal