

NCET Scheme and Syllabus 1st Year 2019-20

3. H.K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand and Company Private Limited, New Delhi, 3<sup>rd</sup> Edition, 2014, ISBN: 9788121938907.

**E--Resources:**

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

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**VISION**

Leadership and Excellence in Education.

**MISSION**

To fulfill the vision by imparting total quality education replete with the philosophy of blending human values and academic professionalism.

**Outcome Based Education(OBE)/  
Choice Based Credit System (CBCS) Curricula**

**Syllabus: I & II Sem B.E.  
Outcome Based Education Curricula**

**Scheme and Syllabus**

**With effect from Academic Year**

**2019-20**

**PRINCIPAL**

Nagarjuna College of Engineering & Technology  
Devanahalli (Ta) Bengaluru (Dt), Pin: -

**First Semester – Physics Cycle**

Sl. No.	Course Code	Course	Teaching Dept.	L:T:P:S (Hrs/week)	Total Credits	Marks
1	19MAT11	Calculus and Linear Algebra	MAT	3:2:0:0	4	100
2	19PHY12	Engineering Physics	PHY	3:0:0:0	3	100
3	19CEF13	Civil Engineering Foundation	CV	3:0:0:0	3	100
4	19CED14	Computer Aided Engineering Drawing	ME	2:0:4:0	4	100
5	19ELN15	Basic Electronics (IC)	EC	2:0:2:0	3	100
6	19PHL16	Engineering Physics Laboratory	PHY	1:0:2:0	2	100
7	19CSD17	Communication Skill Development -I	HSS	0:2:0:0	1	100
Total				14:4:8:0	20	700

**First Semester – Chemistry Cycle**

Sl. No.	Course Code	Course	Teaching Dept.	L:T:P:S (Hrs/week)	Total Credits	Marks
1	19MAT11	Calculus and Linear Algebra	MAT	3:2:0:0	4	100
2	19CHE12	Engineering Chemistry (IC)	CHE	3:0:2:0	4	100
3	19CCP13	Computer Concepts and C Programming	CS/IS	3:0:0:0	3	100
4	19MEF14	Mechanical Engineering Foundation (IC)	ME	2:0:2:0	3	100
5	19ELE15	Basic Electrical Engineering (IC)	EC	2:0:2:0	3	100
6	19CPL16	Computer Programming Laboratory	CS/IS	1:0:2:0	2	100
7	19CSD17	Communication Skill Development-I	HSS	0:2:0:0	1	100
Total				14:4:8:0	20	700

IC – Integrated Course

L – Lecture

T-Tutorials

P-Practical

S – Self Study

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**Module – IV****Partial Differential Equations(PDE's):**

Formation of PDE –Eliminating the Arbitrary constants and arbitrary functions, solutions of non homogenous PDE by direct integration, Homogeneous PDEs involving derivative with respect to one independent variable only, Method of separation of variables. Solution of one dimensional wave equation, one dimensional heat equation and two dimensional Laplace equation by the method of separation of variables.

08 hours

**Module – V****Curve fitting and Statistical methods:**

Curve fitting by the method of least square: Straight line, parabola and exponential curves, Moments, skewness and kurtosis-problems. Rank correlation, Correlation and regression lines-problems.

08 Hours

**Course Outcomes:**

On completion of this course, students will be able to:

- Solve the ordinary differential equations as applied to various engineering applications.
- Solve the higher order linear differential equations using different methods
- Solve simultaneous first order differential equations, linear differential equations with variable coefficients and simple applications.
- Form and solve the partial differential equations with different methods
- Fit the curve and form the regression lines using the given data and determine different statistical coefficients.

**Text Books:**

1. Dr. B.S. Grewal, "Higher Engineering Mathematics"(Chapters 11-14,17,18,24, 25), Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014, ISBN: 9788174091956.
2. N.P. Bali and Dr. Manish Goyal, "A Text Book of Engineering Mathematics" (Chapters 2, 7, 13,14,16,17,21), Laxmi Publications (P) Ltd, New Delhi, 9<sup>th</sup> Edition, 2014, ISBN: 9788131808320.

**Reference Books:**

1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley Pvt Ltd India, New Delhi, 9<sup>th</sup> Edition, 2011, ISBN 13: 9788126531356.
2. B.V. Ramana "Higher Engineering Mathematics", Tata McGraw – Hill Publishing Company Limited, New Delhi, 2007, ISBN -13: 978-0-07-063419-0.

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### Differential Equations and Statistical Methods

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19MAT21	3:2:0:0	4	CIE:50 SEE:50	3 Hours	BS

#### Course Objectives:

This course will enable students to :

- Understand the concept of mathematical modelling of system using differential equations
- Use the application of mathematical skill in solving engineering problems.
- Fit the curves for the given data
- Learn the application of Partial Differential Equations

#### Syllabus

##### Module – I

##### Differential equations -I

Solutions of ordinary differential equations of first order and first degree:-Bernoulli's equations, Exact differential equations. Applications of Differential equations:- Orthogonal trajectories, Newton's law of cooling. Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p only; Clairaut's and reducible to Clairaut's equation only  
08 Hours.

##### Module – II

##### Differential equations-II

Linear differential equations with constant coefficients:- Solution of second and higher order differential equations --By inverse differential operator method, Method of variations of parameter.  
08 Hours

##### Module – III

##### Differential equations-III

Solution of simultaneous differential equations of first order. Linear differential equation with variable coefficients :- Solution of Cauchy's and Legendre's Linear equations.

Application of Linear differential equations: - Simple Harmonic motion and simple pendulum.  
08 Hours

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### Second Semester – Physics Cycle

Sl. No.	Subject Code	Subject	Teaching Dept.	L:T:P:S (Hrs/week)	Total Credits	Marks
1	19MAT21	Differential Equations and Statistical Methods	MAT	3:2:0:0	4	100
2	19PHY22	Engineering Physics	PHY	3:0:0:0	3	100
3	19CEF23	Civil Engineering Foundation	CV	3:0:0:0	3	100
4	19CED24	Computer Aided Engineering Drawing (IC)	ME	2:0:4:0	4	100
5	19ELN25	Basic Electronics (IC)	EC	2:0:2:0	3	100
6	19PHL26	Engineering Physics Laboratory	PHY	1:0:2:0	2	100
7	19CSD27	Communication Skill Development-II	HSS	0:2:0:0	1	100
<b>Total</b>				<b>14:4:8:0</b>	<b>20</b>	<b>700</b>

### Second Semester – Chemistry Cycle

Sl. No.	Course Code	Course	Teaching Dept.	L:T:P:S (Hrs/week)	Total Credits	Marks
1	19MAT21	Differential Equations and Statistical Methods	MAT	3:2:0:0	4	100
2	19CHE22	Engineering Chemistry (IC)	CHE	3:0:2:0	4	100
3	19CCP23	Computer Concepts and C Programming	CS/IS	3:0:0:0	3	100
4	19MEF24	Mechanical Engineering Foundation (IC)	ME	2:0:2:0	3	100
5	19ELE25	Basic Electrical Engineering (IC)	EC	2:0:2:0	3	100
6	19CPL26	Computer Programming Laboratory	CS/IS	1:0:2:0	2	100
7	19CSD27	Communication Skill Development-II	HSS	0:2:0:0	1	100
<b>Total</b>				<b>14:4:8:0</b>	<b>20</b>	<b>700</b>

IC – Integrated Course

L – Lecture

P-Practical

T-Tutorials

S – Self Study

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**CALCULUS AND LINEAR ALGEBRA**

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19MAT11	3:2:0:0	4	CIE:50 SEE:50	3 Hours	BS

**Course Objectives:**

This course will enable students to :

- Learn the basic mathematical subjects for Engineering subjects
- Get the basics of Linear algebra in solving system of equations
- Use special functions evaluate the definite integrals
- Understand the fundamentals of vector differentiation and integration.

**Syllabus****Module – I****Differential calculus-I**

Revision of differentiation. Taylor's and Maclaurin's series for functions of one variable-(statements only)- problems. Polar curves-angle between radius vector and tangent, length of the perpendicular from pole on the tangent, angle between two polar curves-problems, pedal equations for polar curves-problems. Derivative of arc lengths in Cartesian, parametric and polar forms (without proof)-problems. **08Hours**

**Module – II****Differential calculus-II**

Curvature and Radius of Curvature in Cartesian, parametric, polar and pedal forms-problems. Partial derivatives:- simple problems, total derivatives, partial derivatives of composite functions-problems. Jacobian definition and simple problems: **08 Hours**

**Module – III****Integral calculus:**

**Multiple integrals:** Evaluation of double and triple integrals . Evaluation of double integrals by changing the order of integration and changing into polar coordinates.

**Beta and Gamma functions:** Definition, relations and simple problems. **08 Hours**

**Module – IV****Linear algebra:**

Rank of the matrix by elementary transformations(Echelon form only), solutions of system of linear equations- Gauss elimination method and Gauss Seidel method. Linear transformations. Eigen values and Eigen vectors of a square matrix – problems. Rayleigh's power method to find the largest Eigen value and corresponding Eigen vector – problems. Cayley-Hamilton theorem – problems. **08 Hours**

- Improve nature and style of sensible writing and acquire employment and workplace communication skills.
- Improve their Technical Communication Skills through Technical Reading and Writing practices.
- Perform well in campus recruitment, engineering and all other general competitive examinations.

**Text Books:**

1. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2018.
2. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018. Refer it's workbook for activities and exercises — "Communication Skills — If (A Workbook)" published by Oxford University Press—2018. Reference Books:

**Reference Books:**

1. High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd—2015.
2. English Language Communication Skills — Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] — 2018.
3. Technical Communication - Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4. Effective Technical Communication - Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited-2018.
5. Intermediate Grammar, Usage and Composition by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan-2016.

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## Communication Skill Development - II

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSD27	0:2:0:0	1	CIE:50 SEE:50	3 Hours	HSS

### Course Objectives:

This course will enable students to:

- Implement English vocabulary at command and ensure language proficiency.
- Achieve better Technical writing and Presentation skills Identify the common errors in speaking and writing English.
- Acquire Employment and Workplace communication skills.
- Augment LSRW and GV skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred.

### Syllabus

#### Module – I

Tenses, Simple Present, Past, Future, Present continuous, Past continuous, Future continuous Present Perfect, Past Perfect, Future Perfect. Present perfect continuous, Past perfect continuous, Future perfect continuous. 05 Hours

#### Module – II

The same word as different parts of speech, all, as, but, like, near, round, since, that, Degrees of comparison of Adjectives and Adverbs, Punctuation and the use of capital letters. 05 Hours

#### Module – III

Subject and predicate, Phrases and clause. 06 Hours

#### Module – IV

Analysis of sentences, Transformation of sentences. 05 Hours

#### Module – V

Direct and Indirect Speech, Conversation, Short answers, Question tags. 05 Hours

### Course Outcomes:

On completion of this course, students will be able to:

- Identify common errors in spoken and written communication.
- Get familiarized with English vocabulary and language proficiency.

## Module – V

### Vector Calculus:

**Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative; curl and divergence; solenoidal and irrotational vector fields- problems.

**Vector Integration:** Line integrals-simple problems, surface and volume integrals-definition only, Green's theorem in a plane, Stokes' and Gauss-divergence theorem(without-proof)-problems.

\*No problems on verification of the theorems.

08 Hours

### Course Outcomes:

On completion of this course, students will be able to:

- Express functions of single variable in the series form and determine the characteristics of polar curves.
- Determine the radius of curvature in different curves, and finding partial derivatives of the different functions.
- Evaluate the multiple integrals by using various methods and improper integrals using Beta and Gamma functions.
- Evaluate the system of linear equations and compute Eigen values and Eigen vectors.
- Find the differentiation of scalar and vector point functions and evaluate vector integrals.

### Text Books:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", (Chapters 2,4,5,7&8), Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014, ISBN : 9788174091956.
2. N.P. Bali and Dr. Manish Goyal, "A Text Book of Engineering Mathematics". (Chapters 3,5,6,11,12,15), Laxmi Publications (P) Ltd, New Delhi, 9<sup>th</sup> Edition, 2014, ISBN: 9788131808320.

### Reference :

1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley Pvt. Ltd , New Delhi, India, 9<sup>th</sup> Edition, 2011, ISBN 13: 9788126531356.
2. H.K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand and Company Private Limited, New Delhi, 3<sup>rd</sup> revised Edition, 2014, ISBN: 9788121938907.

### Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

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## Engineering Physics

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19PHY12/22	3:0:0:0	3	CIE:50 SEE:50	3 Hours	BS

### Course Objectives:

This course will enable students to:

- Understand the concepts of Laser and its applications in various fields.
- Get the knowledge of solid state physics.
- Learn the concepts of quantum mechanics.
- Understand basics of Optical fibers and dielectric properties of materials.
- Acquire the knowledge of elastic and electrical conductivity in metals.

### Syllabus

#### Module – I

**Laser:** Interaction of radiation with matter (induced absorption, spontaneous emission and stimulated emission), Einstein coefficients, Expression for Energy density. Requirements of lasing system, Conditions for Laser action (metastable state, population inversion). Construction and working of Nd-YAG LASER, Applications of laser. Basic Principle of Holography, recording and reconstruction of Image on Hologram, applications of holography. 08 Hours

#### Module – II

**Crystal Structure:** Space lattice, Bravais lattice, Unit cell, Primitive cell, Lattice Parameters, Seven Crystal systems, Miller indices, Expression for inter-planar spacing in terms of Miller indices, Atomic packing factor for SC, BCC & FCC, Crystal structure of NaCl, Quartz crystal and its applications. Bragg's law, Determination of wave-length of X-rays using Bragg's X-ray spectrometer. 7 Hours

#### Module - III

**Quantum Mechanics:** Wave Particle dualism, de-Broglie hypothesis, Matter waves. Davission–Germer experiment. Heisenberg's uncertainty principle and its application (Non-existence of electron in nucleus). Wave function, Properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger's wave equation. Eigen values and Eigen functions. Applications of Schrodinger's wave equation. Energy Eigen values and Eigen functions for a particle in one dimensional potential well of infinite height. 08 Hours

9	Design a C program for a private bus seating arrangement where only a senior citizen should occupy a seat, where the seat number is a prime number. Check whether the seat is occupied by senior citizen or not (Prime number).
10	The company is maintaining employee database. Using structures design a C program that accepts the details such as Employee_ID, Employee name and Basic, DA and HRA of employees and prints their details along with their gross salary.

### PART-B

Mini project using C concepts like Arrays, Structures and User defined functions.

**NOTE:** All lab programs should be executed in UBUNTU / LINUX platform only.

### Assessment Method:

**SEE:** Students has to execute any one program given by the examiner and another from PART B.

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**C Programming Laboratory**

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CPL16/26	1:0:2:0	2	CIE:50 SEE:50	3 Hours	EFC

**List of Programs**

Sl. No.	PART-A
1	<p>a. For producing a certain product in manufacturing company, suppose the total costs are represented by a quadratic equation. Design a C program to find the roots of the quadratic equation, for non-zero coefficients.</p> <p>b. The three pupils from a training academy are to be selected for the army, navy and air force. Design a C program using branching statements to find the tallest candidate selected for the army, second tallest to the navy and third tallest to air force.</p>
2	<p>a. Design a C program to find greatest (GCD) &amp; least (LCM) number of arrangements using Euclid's algorithm to make use of every balloon.</p> <p>b. Software company issues bonus to its employees on leap years. Given a year design a C program to find whether the employee is due for bonus or not using ternary operator.</p>
3	A criminal leaves a four digit number as his calling card. Design an algorithm and develop a C program to test the four digit number left by the criminal is palindrome or not.
4	A detective finds a clue at crime scene. Develop a C program to search the found clue in his database which helps to find the criminal.
5	The books in the library are randomly placed on the shelves. Design a C program that sorts the books based on ISBN (use bubble sort to implement the program).
6	Design a C program to search and display student details in a college database, using the student's USN (using binary search technique).
7	Design, develop and execute a program in C to read two matrices A (m x n) and B (p x q) and compute the product of A and B.
8	<p>You are given two envelopes, each containing money. Design, develop and execute a program in C to swap two envelopes using methods:</p> <p>a. Call by value.</p> <p>b. Call by reference</p>

**Module -IV**

**Optical Fibers:** Principle of optical fiber, Angle of acceptance, Numerical aperture (derivation), Types of Optical fibers. Attenuation, Applications: Point to point communication system. Advantages of optical fiber communication.

**Dielectric materials:** Polar and non polar dielectrics, Electronic polarization, dielectric susceptibility, relation between polarization and dielectric constant, Polarizability, types of polarization, internal fields in a solid (Derivation), Clausius-Mossotti equation, frequency dependence of dielectric constant.

08 Hours

**Module -V**

**Elasticity:** Introduction, Stress, Strain, Hooke's law, Young's modulus, bulk modulus, Rigidity modulus (qualitative), Poisson's ratio, Relation between Bulk modulus (K), Young's modulus (Y) and Poisson's ratio.

**Quantum free electron theory of metals:** Review of classical free electron theory, mention assumptions and failures. Assumptions of quantum free electron theory, density of states, Fermi-Dirac statistics (qualitative), Fermi level, Fermi energy, Fermi factor, dependence of Fermi factor on temperature and effect on occupancy of energy levels, success of quantum free electron theory.

08 Hours

**Course Outcomes:**

On completion of this course, students will be able to:

- Use principles of Laser for engineering applications.
- Apply the knowledge of crystal structure to study various engineering materials.
- Demonstrate the knowledge of formulation of quantum mechanical equations to solve engineering problems.
- Apply the concepts of optical fibers and dielectric properties of materials to engineering applications.
- Develop firm understanding of elastic properties of materials and electrical conductivity in metals.

**Text Books:**

1. Dr. M N Avadhanulu, Dr. P G Kshirsagar, "Text Book of Engineering Physics", (Chapters 10,20,24,33) S Chand & Company Ltd., New Delhi, 2014, ISBN: 9788121908177.
2. Prof. S P Basavaraju, "Engineering Physics", (Chapters 1,2,3,4,6,7,9) Subhash Stores, Bangalore, 2<sup>nd</sup> Edition, 2015, ISBN: 9789383214501.

**Reference Books:**

1. M. Ali Omar, "Elementary Solid State Physics", (Chapters 1, 6), Pearson Education, 2013, ISBN: 9788177583779.
2. Ajoy Ghatak, "Optics", (Chapters 21,26,27) Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 5<sup>th</sup> Edition, 2013, ISBN13: 9781259004346.
3. Wiley Precise Text, "Engineering Physics", (Chapters 3, 8, 13 & 15) Wiley India Pvt. Ltd, New Delhi, 1<sup>st</sup> Edition, 2014, ISBN: 9788126543151.
4. R. K. Gaur and S. L. Gupta, " Engineering physics", (Chapters 7, 31, 32, 56, 57 & 58), Dhanpat Rai Publications, 8<sup>th</sup> Edition, 2011, ISBN: 9788189928223.

**E- Resources:**

1. [http://www.markfox.staff.shef.ac.uk/PHY332/phy332\\_notes.pdf](http://www.markfox.staff.shef.ac.uk/PHY332/phy332_notes.pdf)
2. <http://nptel.ac.in/courses/115101010/>



**Text Books:**

1. Kulshreshtha D.C., "Basic Electrical Engineering", (Chapters 1 to 5), 1<sup>st</sup> Edition, McGraw - Hill Education, 2012, ISBN-13: 9780071328968.

**Reference Books:**

1. Theraja. B.L: "Fundamentals of Electrical Engineering and Electronics", Reprint Edition 2013, S.Chand & Company Ltd., ISBN-13: 9788121926607.
2. RajendraPrasad: 'Fundamentals of Electrical Engineering', 2<sup>nd</sup> Edition, Prentice Hall of India, Pvt Ltd., New Delhi, 2009, ISBN: 9788120339286.

**E-Resources:**

1. <http://vlab.amrita.edu/index.php>
2. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=108105053>
3. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=108108076>
4. <http://nptel.ac.in/courses/108108076>



**Transformers:** Principle of operation and construction of single phase transformers (core and shell type). Emf equation, condition for maximum efficiency, power losses and illustrative examples. **06 Hours**

### Module – V

**DC & AC Machines:** Electro-mechanical energy conversion machines, importance of DC machines, need for three phase synchronous generator, introduction, construction and working principle of induction motors, concept of rotating magnetic field, slip and its importance with illustrative examples.

**Electrical safety and wiring:** Safety measures in Electrical system, Two way and Three way position control switch. **06 Hours**

#### List of experiments:

1. Verification of ohm's law.
2. Verification of effective resistance between the terminals of series and parallel combination of resistors.
3. Verification of voltage and current distribution in both series and parallel circuits.
4. Verification of Kirchhoff's law.
5. RLC series AC Circuit.

#### Study Experiments:

1. Study the characteristics of a Fluorescent tube
2. Study experiment on domestic wiring and TWO way & THREE way Control of a lamp.

#### Virtual Lab Experiments:

1. Analysis of current flowing in series and parallel RL circuit.
2. Analysis of current flowing in series and parallel RC circuit.
3. To plot the frequency and current characteristic of series and parallel RLC circuits.

#### Course Outcomes:

On completion of this course, students will be able to:

1. Apply the concepts to analyze and solve DC circuits.
2. Analyze the concepts of Electromagnetism.
3. Evaluate Single phase R, L, C, RL, RC and RLC AC circuits.
4. Solve three phase AC Circuits and apply the principles of electromagnetism to design single phase transformer.
5. Explain the construction of AC and DC machines and to gain the fundamental knowledge of wiring and earthing.

## Civil Engineering Foundation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19CEF13/23	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EFC

#### Course Objectives:

This course will enable students to:

- Learn the importance of infrastructure development and smart city concepts.
- Understand the force and force systems on a structural element under static conditions.
- Analyze the concurrent and non-concurrent force system.
- Study the Equilibrium of Concurrent, Non-Concurrent Forces and Support Reactions.
- The concept of Centroid and Moment of Inertia

#### Syllabus

##### Module -- I

**Introduction to Civil Engineering:** Scope of different fields of civil engineering- surveying Building materials, Construction technology, Geotechnical engineering, Structural engineering, Hydraulics, Water resources and irrigation engineering, Transportation Engineering, Environmental engineering etc.

**Types of Infrastructure:** Types of infrastructure, Role of civil engineer in the infrastructural development, effect of infrastructural facilities on socio-economic development of a country.

**Roads:** Classification of roads and their functions, Comparison of flexible and rigid pavements (advantages and limitations).

**Bridges:** Types of bridges and culverts, RCC, Steel and composite bridges.

**Dams:** Different types of dams based on material, structural behaviour and functionality with simple sketches.

**Smart Cities:** Concept, Features, Advantages and limitations. **06 Hours**

##### Module - II

**Introduction to Civil Engineering Mechanics:** Basic idealizations of Particle, Continuum and Rigid Body and its Characteristics. Types of Forces. Classification of Force System.

**Introduction to SI Units, Couple, Moment of a Couple.** Characteristics of Couple,

Moment of a Force. Equivalent Force-Couple System. Numerical Problems on

Moment of Forces and Couples and Equivalent Force-Couple System. **08 Hours**

### Module - III

**Analysis of Force System:** Concurrent Force System-Composition of Forces- Definition of Resultant. Composition of Coplanar-Concurrent Force system. Parallelogram Law of Forces Principle of Resolved Parts. Numerical Problems on Composition of Coplanar Concurrent Force System.

**Non-Concurrent Force System:** Composition of Coplanar- Non-Concurrent Force System. Varignon's Principle of Moments. Numerical problems on Composition of Coplanar Non Concurrent Force System. **08 Hours**

### Module - IV

**Equilibrium of Concurrent and Non Concurrent Forces:** Equilibrium of Forces-Definition of Equilibrant, Conditions of Static Equilibrium for Different Force Systems, Lami's Numerical Problem on Equilibrium of Coplanar- Concurrent and Non-Concurrent Force Systems.

**Support Reactions:** Types of Loads and Supports. Statically Determinate Beams. Numerical Problems on Support Reactions for Statically Determinate Beams with Point Loads (Normal and Inclined), Uniformly Distributed Loads and Varying Loads.

**08 Hours**

### Module - V

**Centroid and Centre of Gravity:** Definition, Derivation of expressions for Centroidal distances of simple planar laminas like Rectangle, Triangle, Quarter and Semicircle. Determination of Centroidal distances of Compound Laminas.

**Moment of Inertia:** Introduction, Definition, Theorems of Perpendicular and Parallel Axis. Concept of Axis of Symmetry, Derivation of expressions for Moment of Inertia of simple planar laminas like Rectangle, Triangle, Quarter, Semicircle and Circle. Definition of Polar Moment of Inertia, Radius of Gyration. Determination of Moment of Inertia. **08 Hours**

#### Course Outcomes:

On completion of this course, students will be able to:

- Explain the importance of Civil engineering infrastructure development and smart city concepts.

## Basic Electrical Engineering (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19ELE15/25	2:0:2:0	3	CIE:50 SEE:50	3 Hours	EFC

#### Course Objectives:

This course will enable students to:

- Understand the working principle of DC circuits.
- Understand the fundamental concepts of Electromagnetism.
- Analyze the behaviour of single phase AC circuits.
- Analyze the behaviour of three phase AC circuits and apply the concepts of electromagnetism in designing transformers.
- Emphasize the concepts of AC and DC machines and causes of electric shock and its precautionary measures.

#### Syllabus

##### Module – I

**DC Circuits:** Ohm's law, Kirchoff's current law, Kirchoff's voltage law- applications of these law for the analysis of series, parallel and series parallel resistive circuits excited by independent voltage sources, Mesh analysis, Illustrative examples. **06 Hours**

##### Module – II

**Electromagnetism:** Definitions of Magnetic force, flux, flux density, reluctance, magnetomotive force (MMF). Faraday's Laws, Lenz's laws, Fleming's Rules, Induced emf's and inductances, concept of coefficient of coupling, Energy stored in magnetic field, Illustrative examples. **05 Hours**

##### Module – III

**Single Phase A.C Circuits:** Generation of sinusoidal AC voltage, definition of average value, rms value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis with phasor diagram of R, L, C, R-L, R-C, R-L-C series and parallel circuits. Definitions of Real power, reactive power, apparent power and power factor with illustrative examples. **06 Hours**

##### Module – IV

**Three Phase Circuits:** Necessity and advantages of three phase systems, generation of three phase power. Relationship between line and phase values of balanced star and delta connections. Power in balanced three phase circuits, measurement of power by two-wattmeter method. Determination of power factor using wattmeter readings with illustrative examples.

**Text Books:**

1. V.K.Manglik: "Elements of Mechanical Engineering", (Module – I, II, III, IV, V), 1<sup>st</sup> Edition, PHI Publications, New Delhi, 2014, ISBN-13: 9788120346291.
2. MikellP.Groover: "Automation, Production Systems & CIM", (Module-V), 3<sup>rd</sup> Edition, PHI Publication, New Delhi, 2015, ISBN-13: 9789332549814.
3. K.R.Gopalkrishna: "A Text Book of Elements of Mechanical Engineering", (Module I, II, III, IV, V), 35<sup>th</sup> Edition, Subhash Publishers, Bangalore, 2015.

**Reference Books:**

1. K.P.Roy, S.K. Hajra Choudhury, Nirjhar Roy: "Elements of Mechanical Engineering", (Module – II, IV,V), 7<sup>th</sup> Edition, Media Promoters & Publishers Pvt. Ltd., Mumbai, 2012.
2. S.K.Garg: "Workshop Technology (Manufacturing Processes)", (Module – IV, V), 3<sup>rd</sup> Edition, University Science Press, Bangalore, 2013, ISBN-13: 9788131806975.
3. C.P.Arora: "Refrigeration and Air Conditioning", (Module - III) Tata McGraw-Hill Publishing Company Ltd, New Delhi, 3<sup>rd</sup> Edition, 2008, ISBN-13: 9780074630105.
4. G.D.Rai: "Solar Energy Utilization", (Module - I), 5<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2014, ISBN-10: 817409134X.

**List of Experiments**

1. Performance studies on Solar PV panel
2. Valve Timing Diagram
3. Port Timing Diagram
4. Demonstration of Pelton Wheel, Francis and Kaplan Turbines.
5. Joining process by Soldering
6. Demonstration of Welding
7. Performance studies on a vapour compression refrigeration system
8. Robotics programming

**E-Resources:**

1. [https://www.eia.gov/energyexplained/?page=renewable\\_home](https://www.eia.gov/energyexplained/?page=renewable_home)
2. [https://en.wikipedia.org/wiki/Internal\\_combustion\\_engine](https://en.wikipedia.org/wiki/Internal_combustion_engine)
3. <https://www.britannica.com/technology/turbine>
4. [http://www.efunda.com/materials/materials\\_home/materials.cfm](http://www.efunda.com/materials/materials_home/materials.cfm)
5. <https://en.wikibooks.org/wiki/Robotics>

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- Apply the concepts and principles of force system to a given coplanar concurrent force system.
- Illustrate the problems on concurrent and non-concurrent force system.
- Determine the Equilibrium of Concurrent, Non-Concurrent Forces and Support Reactions.
- Compute centre of gravity and moment of inertia for a given lamina.

**Text Books:**

1. F. P. Beer and E. R. Johnston: "Vector Mechanics for Engineers – Volume I- Statics", (Chapter 1-5, 7, 9), Tata McGraw Hill, 9th Edition, 2011, ISBN: 978-0077402280.
2. S. S. Bhavikatti, "Elements of civil Engineering and Engineering Mechanics", (Chapter 1-5, 8), New Age International Pvt. Ltd., New Delhi, 5th Edition, 2015, ISBN:978-81-224-3003-5.

**Reference Books:**

1. P. G. Varghese, "A Textbook Building Materials", (Chapter 1,3,19), PHI Learning publication, 2<sup>nd</sup> Edition, April 2015, ISBN: 81-203-2848-5.
2. B.K. Kolhapure, "Elements of Civil Engineering and Mechanics" eastern book promoters, 11<sup>th</sup> Edition 2018, ISBN : 978-93-86729-651.
3. M.N. Shesha Prakash and Ganesh B. Mogaveer, "Elements of Civil Engineering and Mechanics", PHI Learning Publication, 3rd Edition 2017, ISBN : 978-81-203-5001-4.

**E-Resources:**

1. <http://elearning.vtu.ac.in/CV1323.html>
2. <http://moud.gov.in/model>
3. [https://en.wikipedia.org/wiki/smart\\_city](https://en.wikipedia.org/wiki/smart_city)
4. [www.labour.gov.hk/eng/public/os/D/Constructionsite.pdf](http://www.labour.gov.hk/eng/public/os/D/Constructionsite.pdf)

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## Computer Aided Engineering Drawing

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CED14/24	2:0:4:0	4	CIE:50 SEE:50	3 Hours	EFC

### Course Objectives:

This course will enable students to:

- Understand the importance of engineering drawing as a means of communication.
- Use CAD software to produce engineering drawing.
- Apply the concept of orthographic projections.
- Draw the Development of lateral surfaces of solids.
- Apply the concept of isometric projections

### Syllabus

#### Module – I

**Introduction to Computer Aided Sketching:** Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity, etc.

Introduction to orthographic projections and Principle Planes. Concept of projections of points and projection of straight lines.

**Orthographic Projection of Plane Surfaces:** Introduction, Projections of plane surfaces—triangle, square, rectangle, pentagon, hexagon and circle, in different positions by change of position method only. 09 Hours

#### Module – II

**Orthographic Projection of Simple Solids:** Introduction, Projections of regular prism, pyramid, tetrahedron and hexahedron in simple positions. 09 Hour

#### Module – III

**Orthographic Projections of Solids:** Projection of pyramids in slant edge and slant triangular face resting positions. Projection of cylinders and cones in different positions. 09 Hours

#### Module – III

**Machine Tools:** Introduction to Machine Tools, Machine Tool operations, Turning, facing, knurling, Thread cutting, Taper Turning by swiveling the compound rest, Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling, Slot milling. (No sketches of Machine tools, sketches to be used only for explaining operations. Students to be shown the available machine tools in the Machine Shop of the college before explaining the operations).

**Robotics and Automation:** Introduction, classification based on robots configuration; polar, cylindrical, Cartesian coordinate and spherical. Application, Advantages, and disadvantages. 05 Hours

#### Module – IV

**Engineering Materials:** Types and applications of Ferrous & Non-ferrous metals and alloys. Composites: Introduction: Definition, classification and applications (Aircraft and Automobiles)

**Joining processes: Soldering, Brazing and Welding:** Definitions, classification and method of Soldering, Brazing and Welding. Process of soldering by soldering iron gun method. Differences between soldering, brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding. 05 Hours

#### Module – V

**Refrigeration:** Working principle of vapor compression refrigeration and vapour absorption refrigeration. Refrigerants, properties of refrigerants, list of commonly used refrigerants. Definitions of Refrigeration, Refrigerating effect, Tonne of Refrigeration, Ice making capacity, COP, Relative COP, Unit of Refrigeration. Numericals.

**Air-Conditioning:** Working principle of split room air conditioner, comparison of air conditioner and refrigerator. Impact of refrigerants on Global warming. 05 Hours

### Course Outcomes:

On completion of this course, students will be able to,

- Identify various types of energy sources and evaluate the application of steam.
- Analyse the working principles of various types of prime movers.
- Analyse the metal removal process using different machine tools and importance of Robots and their application.
- Recognise various application of engineering materials and different metal joining methods.
- Recognise the working principles of refrigeration and Air conditioning systems.

**Mechanical Engineering Foundation (IC)**

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19MEF14/24	2:0:2:0	3	CIE:50 SEE:50	3 Hours	EFC

**Course Objectives:**

This course will enable students to:

- Impart the fundamental concepts related to Mechanical Engineering and Renewable energy resources.
- Expose the students to the working of various prime-movers.
- Provide the basic knowledge of various machine tools and robots.
- Introduce to various engineering materials and metal joining methods.
- Understand the working principle of Refrigeration and Air-conditioning systems.

**Syllabus****Module – I**

**Energy Resources :** Non-renewable and renewable energy resources, **Petroleum based** solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fuels, **Solar Power :** Solar Radiation, Solar constant, Solar Thermal energy harvesting devices such as liquid flat plate collector and solar pond. Solar photovoltaic principle. **Wind Power :** Principle of operation of a typical windmill. **Hydro Power :** Principle of electric power generation from hydropower plant.

**Nuclear Power:** Principles of Nuclear power plants, **Bio Fuels:** Introduction to bio fuels, Types of bio fuels and applications of biofuels, comparison of bio fuels with petroleum fuels in terms of calorific value and emission. Steam formation, steam properties and applications of different types of steams. **05 Hours**

**Module – II**

**Turbines and steam IC Engines :** Classification, Principle of operation of Impulse and reaction turbines, Delaval's turbine, Parson's turbine. **Gas turbines:** Classification, Working principles and operations of open cycle and closed cycle gas turbines. **Water turbines:** Classification, principles and operations of impulse and reaction water turbines.

**Internal Combustion Engines:** Classification, I.C. Engines parts, working principles of 2-S and 4-S Petrol engines, 4-S Diesel engines. Numericals on I.C. Engines.

**Introduction to hybrid and electric vehicles**

**06 Hours**

**Module – IV**

Development of Lateral Surfaces of Solids: Development of lateral surfaces of regular prisms, pyramids, cylinders and cones resting with base on HP, their frustums and truncations. **09 Hours**

**Module – V**

Isometric Projection (Using Isometric Scale Only): Introduction, Isometric scale, Isometric projection of cube, prisms, pyramids, cylinders, cones, spheres, hemispheres and combination of two solids. **09 Hours**

**Course Outcomes:**

On completion of this course, students will be able to:

1. Generate engineering drawings using CAD software
2. Produce the orthographic projection of plane surfaces.
3. Visualize and draw the orthographic projections of simple solids in various positions.
4. Develop the lateral surfaces of solids.
5. Create the isometric projections of simple objects.

**Text Books:**

1. N.D. Bhat and V.M. Panchal: "Engineering Drawing", (Chapters 1-5) Charotar Publishing House, Gujarat, 49<sup>th</sup> Edition, 2008, ISBN: 81-85594-58-9.
2. K.R. Gopalakrishna, "Computer Aided Engineering and Drawing" Subhas Stores, Bangalore, 36<sup>th</sup>, Edition, 2011.
3. A primer on "Computer Aided Engineering Drawing"-2006 published by VTU Belgaum.

**Reference Books:**

1. S. Trymbaka Murthy, "Computer Aided Engineering Drawing", (Chapters 5-8,10, 11), I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd Edition, 2010, ISBN: 978-93-8057860-6.
2. Luzadder Warren J., Duf John M, "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production", (Chapters 4,5,10,11), Eastern Economy Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 2005, ISBN-13: 978-01-333-8427-7.

3. M.H. Annaiah, "Computer Aided Engineering Drawing", (Chapters 1-6), New Age International Publisher, New Delhi, 4th Edition, 2010, ISBN: 978-81-224-2779-0.

#### E Resources:

1. <https://nptel.ac.in/courses/112104031/>
2. <http://www.nptelvideos.in/2012/12/computer-aided-engineering-design.html>

**Conducting classes:** Classes may be conducted in two slots per week, of 3 Hours each (Instruction 1 hr. + Sketching and Practice 2 hrs.)

#### Scheme of Evaluation

##### Continuous Internal Evaluation (CIE)

CIE-1	-	30 Marks
CIE-2	-	30 Marks
Surprise Test	-	10 Marks
Submission of Sketch Book	-	30 Marks
<b>Total</b>	<b>-</b>	<b>100 Marks</b>

##### Semester End Examination (SEE)

Two Questions shall be set from each module. Students have to answer any one question from each module. Only Manual sketching for module I and II. For Modules III and IV, the students have to produce the drawings on computer and take the print outs. For Module V, both manual sketching and computer printout is essential.



#### Course Outcomes:

On completion of this course, students will be able to:

- Apply the Concepts of C Language for writing programs.
- Achieve Knowledge of design and development of C problem solving skills.
- Design and Develop program for simple applications of real time.
- Design and develop modular programming skills.
- Effective utilization of memory using pointer technology

#### Text Book:

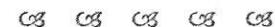
1. Behrouz A. Forouzan: "Computer Science: A Structured programming approach using C", (Chapters: 1-6,8,11,12), 3<sup>rd</sup> Edition, Thomson India Edition, India, 2009, ISBN-13: 9788131507629.

#### Reference Books:

1. Brian W. Kernighan and Dennis Ritchie: "The C Programming Language", 2<sup>nd</sup> Edition, PHI, 2015, ISBN-13: 9789332549449.
2. Peter Norton: "Introduction to Computers", 7<sup>th</sup> Edition, Tata McGraw Hill, 2017, ISBN-13: 9780070671201.
3. Byron Gottfried, Schaum's: "Programming with C", 2<sup>nd</sup> Edition, Schaum's Outlines, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2000, ISBN-13: 9780070240353.
4. Yashvant Kanetkar: "Let Us C", 14<sup>th</sup> Edition, 2016, ISBN-13: 9788183331630.

#### E-Resources:

1. [www.tutorialspoint.com/cprogramming\\_tutorial.pdf](http://www.tutorialspoint.com/cprogramming_tutorial.pdf)
2. <http://phy.ntnu.edu.tw/~cchen/pdf/ctutor.pdf>.
3. <http://www.literateprogramming.com/ctraps.pdf>



**Computer Concepts and C Programming**

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19CCP13/23	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EFC

**Course Objectives:**

This course will enable students to:

- Understand the basic concepts of computer system and Programming Language.
- Learn Problem solving skills using C language.
- Study the concepts of C programming.
- Gain knowledge of programming to solve problem through computer.
- Study effective usage of arrays, functions and pointers.

**Syllabus****Module – I**

**Introduction to the C Language:** C Programs, Identifiers, Types, Variables, Constants, Formatted Input/Output, Programming Examples. **08 Hours**

**Module – II**

**Operators:** Arithmetic Operator, Relational and logical Operators, Type Conversions, Increment and Decrement operators, Bitwise Operators, Assignment operators and Expressions, Conditional Expressions, Precedence and Order of Evaluation.

**Branching:** Branch Statements and Blocks, If-Else, Else-if, Switch. **08 Hours**

**Module – III**

**Loops:** While, For, Do-While, Break, Continue and Goto.

**Arrays:** Concepts of Using Arrays in C, Sorting, Searching, Two Dimensional Arrays, Programming Examples. **08 Hours**

**Module – IV**

**Functions:** Functions in C, Argument Passing – call by value, call by reference, Functions and program structure, Programming examples. **08 Hours**

**Module – V**

**Strings:** String Concepts, C Strings, String Input/Output Functions, Array of Strings, String Manipulation functions.

**Pointers:** Pointers and address, pointers and functions (call by reference) arguments, pointers and arrays, address arithmetic, character pointer and functions, Initialization of pointer arrays, Memory allocation Functions. Programming examples **08 Hours**

**Basic Electronics (IC)**

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19ELN15/25	2:0:2:0	3	CIE:50 SEE:50	3 Hours	EFC

**Course Objectives:**

This course will enable students to:

- Understand the working of Semiconductor Diodes, Zener Diodes and its applications.
- Describe the working of Transistors and Oscillators.
- Learn the basics of number systems and Digital Electronic Fundamentals.
- Describe the working of OP-AMPs and their applications.
- Understand the basics principles of Communication Systems.

**Syllabus****Module – I**

**SEMICONDUCTOR DIODES AND APPLICATIONS:** PN- junction diode, Equivalent circuit of a diode, Zener diode, Zener diode as a voltage regulator, Rectification - Half wave rectifier, Full wave rectifier, Bridge rectifier. **06 Hours**

**Module - II**

**BJT AND APPLICATIONS:** Construction and working of a transistor, Transistor configurations (CE, CB, CC) BJT as a switch, BJT as an amplifier, Feedback amplifiers - Principle, Properties and advantages of negative feedback, Oscillators – Barkhausen's criteria for oscillation, RC phase shift oscillator. **06 Hours**

**Module - III**

**DIGITAL ELECTRONICS FUNDAMENTALS:** Difference between analog and digital signals, Number system – Binary, Decimal, Octal and Hexadecimal and conversion from one base to another base. Addition and subtraction using 1's and 2's complements, Boolean algebra, Basic and Universal gates, Half adder, Full adder. **06 Hours**

**Module – IV**

**OPERATIONAL AMPLIFIERS AND APPLICATIONS:** Introduction to Op-Amps, Differential Amplifier Configurations, Ideal Characteristics, Op-Amp parameters – CMRR, PSRR, Slew Rate, Input offset voltage, Bias Current, Frequency response, Pin Configuration of 741 Op-Amp. Applications – Inverting/Non-inverting amplifier, Adder, Voltage follower, Integrator, Differentiator, Comparator. **06 Hours**

**Module - V**

**COMMUNICATION SYSTEMS:** Introduction, Elements of Communication Systems, Modulation, Need for modulation, Amplitude Modulation, Spectrum Power, Frequency modulation, comparison of AM and FM. **05 Hours**

**List of Experiments:****Hardware experiments:**

1. Verification of all logic gates.
2. Simplification of Boolean expression and verify using gates.
3. Inverting amplifier using OP-AMP.
4. Non inverting amplifier using OP-AMP.
5. Voltage follower using OP-AMP.

**Virtual Lab experiments:**

6. Half wave rectifier.
7. Full wave rectifier.

**Demonstration experiments:**

8. RC phase shift oscillator.
9. AM modulation.

**Course Outcomes:**

On completion of this course, students will be able to:

- Analyse the characteristics and working of Semiconductor Diode and analyze its use in rectification and regulation.
- Describe the operation of BJT as an Amplifier/Switch and its use in various circuits.
- Identify different number systems, convert from one base to another base, understand the working of different logic gates and design logic circuits using them.
- Analyze and design op-amp circuits for basic mathematical operations.
- Apply the principles of amplitude modulation and frequency modulation.

**Text Books:**

1. David A Bell: "Electronic Devices and Circuits", (Chapters 1-3), Oxford University Press, New Delhi, 5th Edition, 2014, ISBN: 9780195693409.

- Production and consumption of energy for industrialization of Country and living standards of people.
- Identify water contamination and take appropriate preventive measures.
- Use the knowledge of Polymers and analytical techniques in the material selections for engineering applications.

**Text Books:**

1. Palanna O. G: "Engineering Chemistry", (Chapters: 1-8), 1<sup>st</sup> Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011, ISBN-13: 9780071068345.
2. Mahesh B, and Roopashree B: "Engineering Chemistry", (Chapters: 1-3,5), 2<sup>nd</sup> Edition, Sunstar Publisher, Bangalore, 2015, ISBN-13: 9789385155-70-3.
3. Kulkarni V. R. and Ramakrishna Reddy K: "Engineering Chemistry", (Chapters: 1-10), 1<sup>st</sup> Edition, New Age International Publishers, New Delhi, 2016, ISBN-13: 9788122439908.

**Reference Books:**

1. Kuriacose J. C. and Rajaram J: "Chemistry in Engineering and Technology", (Chapters: 13-19), 5<sup>th</sup> Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010, ISBN-13: 9780074517352.
2. Puri, Sharma and Pathania: "Principles of Physical Chemistry", (Chapters: 22-24,28), 44<sup>th</sup> Edition, Vishal Publishing Co., Jalandhar, 2011, ISBN-10: 8188646741.
3. Jeffery G. H., Bassett J., Mendham J and Denny R.C.: "Vogel's text book of quantitative inorganic analysis", (Chapters: 2,3,10,13,15,17), 5<sup>th</sup> Edition, Addison Wesley Longman Inc., New York, 1989, ISBN-13: 981235882X.

**E-Resources:**

1. <http://vlab.amrita.edu/index.php>
2. <http://nptel.ac.in/courses/113108051/>

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average and weight average, numerical problems. Glass transition temperature (T<sub>g</sub>): Significance of T<sub>g</sub>. Conducting polymers: Introduction and applications of conducting polyaniline.

**Instrumental methods of analysis:** Theory, Instrumentation and applications of potentiometry, Conductometry (strong acid vs strong base, strong acid vs weak base), Colorimetry. Determination of Specific conductivity of Soil. **08 Hours**

#### List of Experiments:

##### Regular Lab Experiments

1. Determination of Total Hardness of a sample of water using disodium salt of EDTA.
2. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.
3. Conductometric estimation of an acid mixture (HCl & CH<sub>3</sub>COOH) using standard NaOH solution.
4. Potentiometric estimation of FAS using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
5. Determination of total alkalinity of water sample.

##### Virtual Lab Experiments

6. Soil Analysis-Determination of Specific conductivity of Soil.
7. Spectrophotometric estimation of metal ions.
8. Acid-Base titration of strong acid v/s strong base.
9. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
10. Measurement of electrode potential (EMF) with respect to metal electrodes.

#### Course Outcomes:

On completion of this course, students will be able to:

- Use the knowledge of electrochemistry and familiarize with the selection criteria for commercial battery systems according to different applications.
- Investigate the ill effects of corrosion by adopting the appropriate remedial measures and modification of surface properties of metals to develop resistance to corrosion.

2. Kothari, D.P., and I. J. Nagrath: "Basic Electronics", (Chapters 4,5), McGraw Hill Education (India) Private Limited, 2nd Edition, 2018, ISBN: 9789332901582.
3. George. Kennedy: "Electronic Communication Systems", TMH, 4th Edition, 1993, ISBN: 0074636820.

#### Reference Books:

1. Boylestad .R.L., and Louis. Nashlesky: "Electronic Devices and Circuit Theory", Pearson Education, 10th Edition, 2012, ISBN: 9788131764956.
2. Thomas L. Floyd: "Digital Fundamentals", 3<sup>rd</sup> Edition, UBS, 2001, ISBN-13:9788185274591

#### E-Resources:

1. <http://www.vlab.co.in>
2. <http://www.basicelectronics.iitkgp.ernet.in>

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### Engineering Physics Laboratory

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19PHL16/26	1:0:2:0	2	CIE:50 SEE:50	3 Hours	BS

#### Course Objectives:

This course will enable students to:

- Acquire experimental skills and understand the importance of Physics in practical applications.
- Apply the fundamental concepts of laser and semiconductor physics to understand the characteristics, properties and applications of devices and materials.
- Learn the basics of data acquisition, interpretation and analysis.

#### Syllabus

##### List of Experiments:

1. Laser Diffraction. (Determination of wavelength of laser using diffraction grating).
2. Photodiode characteristics. ( Study the V-I characteristics of Photodiode).
3. Planck's Constant (Determination of Planck's constant).
4. Dielectric constant ( Determination of dielectric constant of a dielectric material).
5. Series LCR circuits ( Determination of resonance frequency, self inductance, quality factor of a Series LCR circuit).
6. Zener diode characteristics (Determination of Knee voltage and breakdown voltage of a Zener diode).
7. Parallel LCR circuits (Determination of resonance frequency, self inductance, quality factor of a Parallel LCR circuit).
8. Verification of Stefan's law ( Verification of Stefan's law of black body radiation)

##### Virtual Lab experiments:

1. Ultrasonic Interferometer (To find the velocity of ultrasonic sound through different liquid media and adiabatic compressibility of the given liquid).
2. Numerical aperture (To find the numerical aperture of a given optical fiber and hence to find its acceptance angle)

Nature of corrosion product, ratio of anodic and cathodic areas. Nature of medium -  $P^H$ , Conductivity and temperature. Corrosion control: metal coatings – galvanization, cathodic protection - sacrificial anodic and impressed current methods.

**Metal finishing:** Introduction, Technological importance, Electroplating, Factors influencing the nature of electro deposit- Current density, concentration of metal ion, complexing agents, throwing power. Electroplating of decorative Cr. Electroless plating – Introduction, electroless plating of copper, manufacture of PCB by electroless plating of copper. **08 Hours**

#### Module – III

##### Chemical fuels and Photovoltaic cells

**Chemical fuels:** Introduction, classification, definitions of calorific value, GCV & NCV, determination of calorific value of a solid/liquid fuel using Bomb calorimeter and numerical problems. Petroleum cracking: definition, Reformation of petrol, Petrol knocking – mechanism and their ill effects. Fuel rating system – Octane and Cetane number, catalytic converter, Biodiesel.

**Photovoltaic cells:** Introduction, Photovoltaic cells – construction, working & advantages, Design: modules, panels & arrays. Doping of silicon by diffusion technique (n & p type), zone refining. **08 Hours**

#### Module – IV

**Water technology:** Introduction, Impurities in the water, Hardness – definition, types of hardness and its determination by EDTA method, Alkalinity - determination by phenolphthalein and methyl orange indicator. Determination of dissolved (DO) oxygen by Winkler's method. Biological Oxygen Demand (BOD) - definition, determination and numerical problems. Chemical Oxygen Demand (COD) - determination and numerical problems. Sewage treatment - Primary treatment, Secondary treatment by activated sludge treatment and tertiary treatment. Potable water - softening of water by ion exchange process, Desalination of sea water by reverse osmosis. **08 Hours**

#### Module – V

##### Polymers and Instrumental methods of analysis

**Polymers:** Introduction, addition and condensation polymerization, Free radical polymerization mechanism of vinyl chloride. Molecular weight of polymers: number

**Engineering Chemistry (IC)**

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CHE12/22	3:0:2:0	4	CIE:50 SEE:50	3 Hours	BS

**Course Objectives:**

This course will enable students to:

- Impart the fundamental concepts of engineering chemistry.
- Explore knowledge in engineering chemistry for building technical competence in industries, research and development.
- Enlighten the applications of engineering chemistry in a comprehensive, economic, environmental and social context.
- Understand the basics of polymer and its applications.

**Syllabus****Module – I****Electrochemistry and Energy storage systems**

**Electrochemistry:** Introduction, Derivation of Nernst equation for single electrode potential and numerical problems. Types of electrodes: metal-metal ion, metal-metal salt ion, gas, amalgam, redox and ion selective. Reference electrodes - calomel electrode, Ag-AgCl electrode. Electrolyte concentration cells and numerical problems.

**Energy storage systems:** Introduction, Classification of batteries – primary, secondary and reserve batteries, battery characteristics - cell potential, capacity, cycle life and shelf life. Construction, working & applications of Lead acid battery & Li-ion battery. Fuel cell – Introduction, difference between conventional cell and fuel cell, limitations and advantages. Construction, working and applications of  $\text{CH}_3\text{OH}-\text{O}_2$  fuel cell.

08 Hours

**Module – II****Corrosion and Metal Finishing**

**Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion - differential metal corrosion, differential aeration corrosion - pitting and water line corrosion, stress corrosion. Factors affecting the rate of corrosion: Nature of metal,

**Course Outcomes:**

On completion of this course, students will be able to:

- Apply the knowledge of optics to determine the wavelength of laser.
- Understand the characteristics of photo diode.
- Apply the knowledge of properties of materials in various applications.
- Develop skills to choose the appropriate electrical and electronic components in practical applications.
- Understand the usage of new instruments in real time applications in engineering studies.

**E-Resources:**

1. <https://vlab.amrita.edu/index.php?sub=1&brch=201&sim=803&cnt=1>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=5>

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**Communication Skill Development - I**

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSD17	0:2:0:0	1	CIE:50 SEE:50	3 Hours	HSS

**Course Objectives:**

This course will enable students to:

- Impart basic English grammar and essentials of language skills.
- Train to identify the nuances of phonetics, intonation and enhance.
- Pronunciation skills. To enhance with English vocabulary and language proficiency Language Lab.
- Augment LSRW and GV skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred.

**Syllabus****Module – I**

Introduction to Communication Skills, Basics of English, Spelling, Synonyms, Antonyms, Rhyming words, Related words, Words and Sentences, Types of Sentences. 05 Hours

**Module – II**

Parts of speech: Noun, Pronoun, Verb, Adjective, Adverb, Preposition, Conjunction, Interjection. 05 Hours

**Module – III**

Numbers, Gender, Case. 06 Hours

**Module – IV**

Articles: a, an, the. 05 Hours

**Module – V**

Principal and Auxiliary verbs, Strong and Weak verbs, shall and Will, Modals, Voice, Gerunds, Subjects and objects of a verb. 05 Hours

**Course Outcomes:**

On completion of this course, students will be able to:

- Use grammatical English and essentials of language skills and identify the nuances of phonetics, intonation and flawless pronunciation.
- Implement English vocabulary at command and language proficiency.
- Identify common errors in spoken and written communication.
- Understand and improve the non verbal communication and kinesics.

- Perform well in campus recruitment, engineering and all other general competitive examinations.

**Text Book:**

1. S.L.N. Sharma, K. Shankaranarayana: "Basic Grammar", Navakarnataka Vinyasa Pvt. Limited.

**Reference Books:**

1. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2018; Refer It's workbook for activities and exercises — "Communication Skills — I (A Workbook)" published by Oxford University Press—2018.
2. English Language Communication Skills (Lab Manual cum Workbook), Cengage learning India Pvt Limited [Latest Revised Edition]—2018. Reference Books.
3. English for Technical Communication by N.P.Sudharshana and C.Savitha, Cambridge University Press— 2016.

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